MISSISSIPPI

ACADEMY OF SCIENCES

SIXTY-THIRD ANNUAL MEETING

February 25 & 26, 1999

TUPELO, MISSISSIPPI

Ramada Inn

854 North Gloster Street

Hosted by

University of Mississippi

Journal of the Mississippi Academy of Sciences

Volume 44 January 1999 Number 1

The Journal of the Mississippi Academy of Sciences (ISSN 0076-9436) is published in January (annual meeting abstracts), April, July, and October, by the Mississippi Academy of Sciences. Members of the Academy receive the journal as part of their regular (non-student) membership. Information regarding subscriptions, availability of back issues, and address changes is available from The Mississippi Academy of Sciences, 405 Briarwood Drive, Suite 107E, Jackson, MS 39206; 601-977-0627; msacad@bellsouth.net.

The *Mississippi Academy of Sciences* maintains a website for Academy announcements, the latest issue of this journal, and general information about the Academy. The address is http://www.msstate.edu/Org/MAS/MAS.HTML (case sensitive).

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 24, 1999

TIME	EVENT	LOCATION
4:00 PM to 6:00 PM	Board of Directors Meeting	Gloster 205 Restaurant

THURSDAY, FEBRUARY 25, 1999

TIME	EVENT	LOCATION
8:00 AM to 5:00 PM	Registration	Convention Center Lobby
8:00 AM to 4:30 PM	Divisional Programs	See Pages 11–106
8:30 AM	Philosophy of Science Symposium	Imperial Room
9:00 AM to 7:00 PM	Exhibits	Room 4
9:15 AM	Explorations in Social Scientific Research	Room 604
1:00 PM	Mississippi Research Initiatives in the Social Sciences	Room 604
1:15 PM	Neuropsychiatry Symposium	Room 2
2:45 PM	Social Sciences Discussion on Minorities in Mississippi Higher Education: Focus on Science and Mathematics Majors	Room 604
5:00 PM	1999 Dodgen Lecture & Presentation of Awards; lecture will be given by Dr. Harold Henderson	Room 2
6:00 PM to 7:00 PM	Hospitality Hour	Room 4
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7:00 PM	IMAGE Student Meeting	Room 2

FRIDAY, FEBRUARY 26, 1999

TIME	EVENT	LOCATION
7:15 AM	Past-Presidents' Breakfast	Embassy Room
8:15 AM to 8:45 AM	MAS Business Meeting	Imperial Room
8:00 AM to 2:00 PM	Registration	Convention Center Lobby
8:00 AM to 5:00 PM	Divisional Programs	See Pages 11–106
9:00 AM to 1:00 PM	Exhibits	Room 4
12:15 PM	Mississippi Association of Biologists Luncheon	Embassy Room
3:50 PM	American Statistical Association, Mississippi Chapter Business Meeting	Room 604

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

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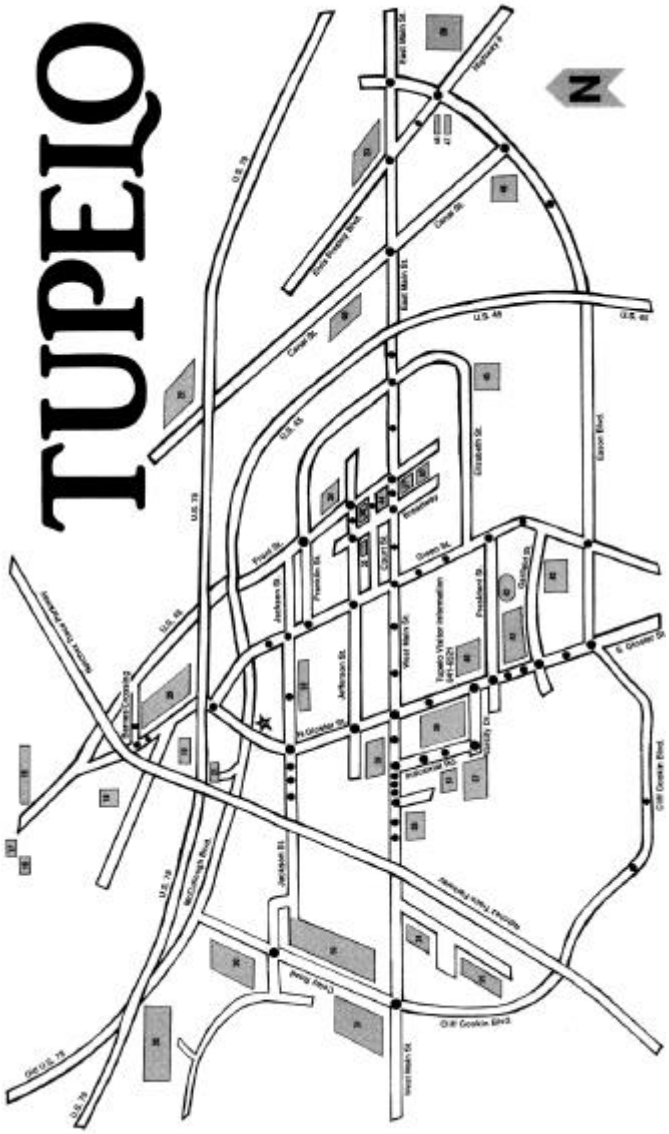
Mississippi University for Women
Mississippi Valley State University
Pearl River Community College
University of Mississippi
University of Mississippi Medical Center
University of Southern Mississippi

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	Philosophy of Science Symposium	Marine and Atmospheric Sciences	Physics and Engineering	Psychology and Behavioral Neurosciences Social Sciences	Geology and Geography	Science Education
Thursday Afternnoon	Registration	Chemistry and Chemical Engineering	Health Sciences Symposium	Cellular, Molecular and Developmental Biology	Exhibits	Philosophy of Science Symposium	Marine and Atmospheric Sciences	Physics and Engineering	Social Sciences Discussion	Geology and Geography	Science Education
Thursday Evening			Dodgen Lecture		Hospitality Hour						
Friday Morning	Registration	Chemistry and Chemical Engineering	Health Sciences	Cellular, Molecular and Developmental Biology	Exhibits	Agriculture and Plant Sciences	Marine and Atmospheric Sciences	Physics and Engineering	Mathematics, Computer Science and Statistics	Geology and Geography Zoology and Entomology	Science Education
Friday Afternoon	Registration		Health Sciences	Cellular, Molecular and Developmental Biology	Exhibits	Agriculture and Plant Sciences	Marine and Atmospheric Sciences	Physics and Engineering	Mathematics, Computer Science and Statistics	Zoology and Entomology	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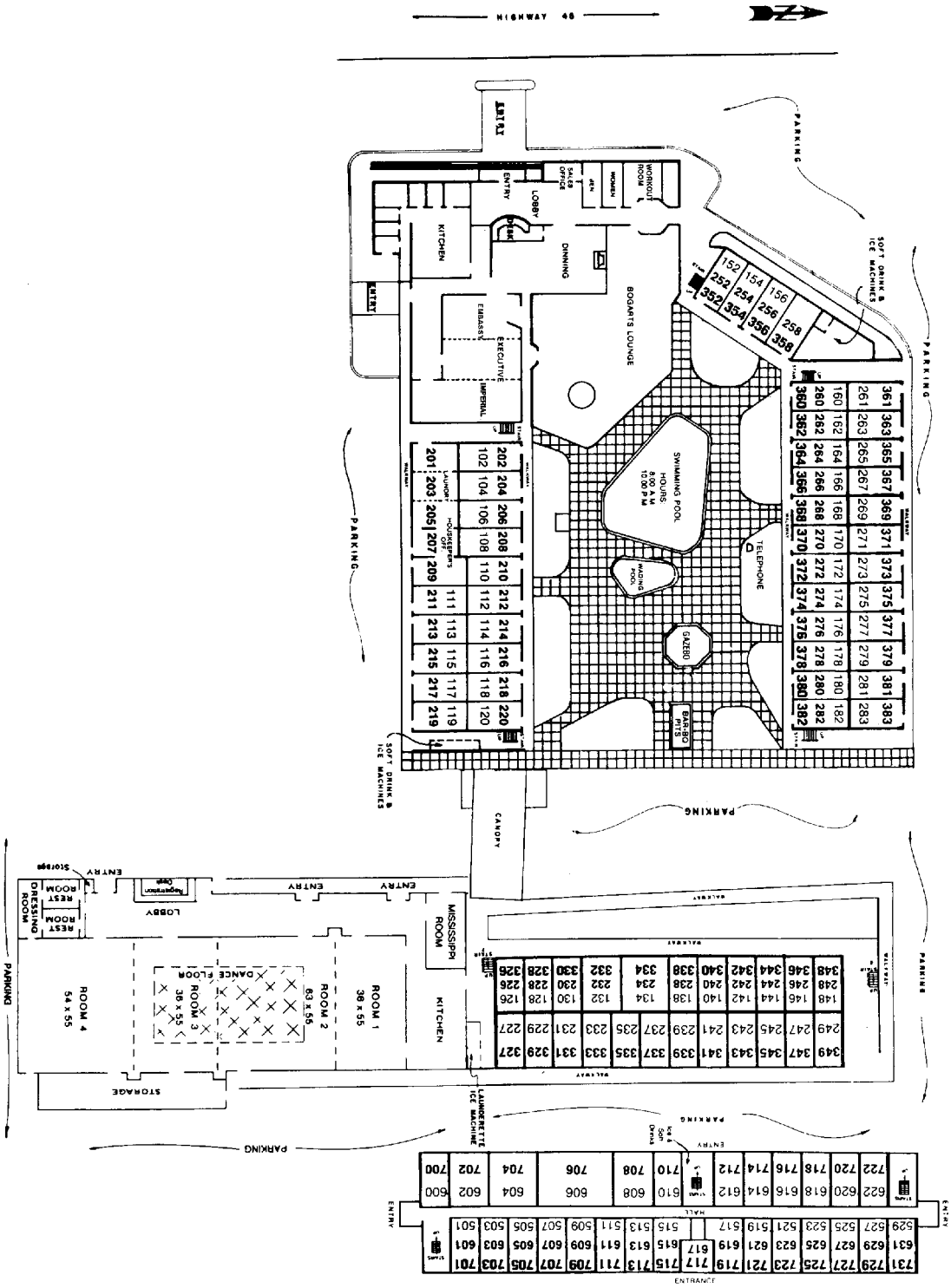
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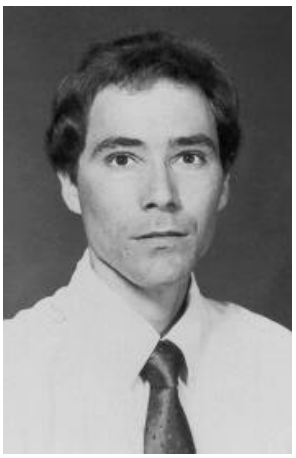
SOFT DRINK & ICE MACHINES
ENTRANCE

The Face of HIV/AIDS in Mississippi

Dodgen Lecture—1999

Harold Henderson
Associate Professor of Medicine



Dr. Harold Henderson is associate professor of medicine at the University of Mississippi Medical Center where he has been a member of the faculty since 1991. He came to the Medical Center from the University of Cincinnati Medical Center where he completed a fellowship in infectious diseases. He completed an internal medicine residency at the University of Alabama Birmingham. He holds the MD from Louisiana State University School of Medicine and the BS from Tulane University. At the Medical Center, he specializes in the care of patients infected with HIV. He is principal investigator for the more than $2 million grant project, HIV Early Intervention Training for Mississippi Community Health Centers, funded by the Health Resources and Services Administration. This grant is one of only two in the Southeast region designated as Special Projects of National Significance (SPNS). Physicians, nurse practitioners and dentists in community health centers across Mississippi use personal computers in their workplace to learn about the special needs of HIV patients from infectious disease specialists like Dr. Henderson. The technology allows both parties to ask and answer questions, access scientific information, view x-rays and discuss cases. The goal is to give HIV patients the opportunity to receive primary care close to their homes to help them avoid unnecessary travel and reduce expenses.

He is also the principal investigator for the Mississippi Resource Center of the Delta Region AIDS Education and Training Center (a $477,844 grant from the Health Resources and Services Administration) and is responsible for the supervision and implementation of HIV educational programs for other health care workers throughout the state. He is a member of the National Institute of Allergy and Infectious Diseases (of the National Institutes of Health) Mycoses Study Group which develops active protocols for histoplasmosis, blastomycosis and cryptococcal meningitis in persons with or without HIV disease.

Dr. Henderson also conducts and analyzes an educational outreach program for general practitioners in small, rural clinics to increase the identification and improve the care of those infected with HIV.

A reviewer for the American Journal of Medicine, Clinical Infectious Diseases, and the American Journal of the Medical Sciences, Dr. Henderson is the author of two book chapters and numerous articles in the scientific press. He is included in the references, Best Doctors in America, 1998–2000 and in Best Doctors in America: Southeast Region, 1996–1997.

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.

FUNDING OPPORTUNITY FOR GRADUATE STUDENTS

The Mississippi-Alabama Sea Grant Consortium
MARINE SCIENCE SCHOLARS PROGRAM

The Mississippi-Alabama Sea Grant Consortium announces the Marine Science Scholars Program to support graduate studies in the marine or coastal sciences. The Marine Science Scholars Program provides opportunities for graduate students enrolled at Consortium member institutions to conduct research through a $5,000 fellowship award. The program is very competitive with selection based on the candidate's qualifications, research proposal, and other criteria.

The Sea Grant Consortium requests applications from highly performing graduate students by January 30, 1999. Application guidelines and instructions can be obtained through the research and sponsored programs offices at Consortium member institutions. Sea Grant is a federal-state-university partnership with support provided by the National Sea Grant College Program of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and other donors. Mississippi-Alabama Sea Grant member institutions are Auburn University, Marine Environmental Sciences Consortium at the Dauphin Island Sea Laboratory, Mississippi State University, The University of Alabama, The University of Alabama at Birmingham, The University of Mississippi, University of South Alabama, and The University of Southern Mississippi.

Contact Dr. John C. A. Marr, **jmarr@seahorse.ims.usm.edu;** Telephone: 228-875-9341

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Chair: Liang C. Huam, Alcorn State University
Vicechair: James O. Garner, Mississippi State University

FRIDAY MORNING

Imperial Room

9:00 FIELD EVALUATION OF VEGETABLE AMARANTH

Sandra Hollins* and Patrick E. Igbokwe, Alcorn State University, Lorman, MS 39096

A field experiment each was used in the summer of 1997 and 1998 to evaluate the effect of three within-row plant spacings (0.3, 0.6, and 0.9 m) on the growth and development of vegetable amaranth (*Amaranths cruentus* L.). The study was also used to compare the effect of harvesting stage and drying environment on leaf quality. A randomized complete block experiment design was used, with four replications of each within-row spacing. In 1997, stem diameter and marketable yield per plant increased as plant density decreased, whereas marketable yield per block (6.5 sq. m.) and plant residue cover increased as plant density increased. In 1998, stem diameter, marketable yield per plant, and root dry weight increased as plant density decreased, whereas marketable yield per block, and plant residue cover increased as plant density increased. Leaf quality generally decreased with age. Oven-dried leaves were of better quality compared to shaded and unshaded leaves dried in a glass-greenhouse.

9:15 DEVELOPMENTAL STAGES OF STRAWBERRY FLOWERS, FRUIT, AND RECEPTACLES

Kenneth J. Curry* and B.J. Smith, University of Southern Mississippi, Hattiesburg, MS 39406, and ARS-USDA Small Fruit Research Station, Poplarville, MS 39470

Strawberries are an aggregate-accessory fruit. The numerous simple pistils of the flower develop into tiny achenes, commonly called seeds but technically the true fruit. The edible part of the fruit (actually accessory tissue) is the receptacle, which is fleshy and greatly enlarged. Our work with anthracnose disease of strawberry has indicated a need to identify precise morphological stages during the development of strawberry flowers, fruit, and receptacles. We have identified 10 developmental stages beginning with a small, closed bud and ending with a mature receptacle and fruit. Each of these stages is based on one or more obvious morphological features of development. Stage 1 is a closed bud surrounded by sepals. Stage 2 indicates a bud beginning to open with white petals visible. Stage 3 represents a fully opened flower. Stage 4 is a post anthesis flower with sepals closed and petals abscised and the receptacle beginning to enlarge with green appressed achenes and anthers dehisced. Stage 5 is a receptacle with green achenes separated by less than one achene width within a single whorl. Stage 6 indicates a receptacle with green achenes separated by more than one achene width. Stage 7 characterizes a receptacle with embedded achenes, stage 8 a white receptacle, and stage 9 a pink receptacle. Stage 10 is a fully ripe, red receptacle.

9:30 INFLUENCE OF EDTA ON Pb UPTAKE IN TWO WEED SPECIES, SESBANIA AND IPOMOEA, IN HYDROPONIC CULTURE

Susmita Ghosh* and Charles Rhyne, Jackson State University, Jackson, MS 39042

Phytoremediation is a new technology of using plants to clean contaminated soil and water. Successful phytoremediation depends on the availability of heavy metals to plants. Synthetic chelates are known to render insoluble cations soluble by forming metal-chelate complexes which affect plant metal uptake. Two plant species, *Ipomoea lacunosa* and *Sesbania exaltata* were used in the laboratory to observe the effects of ethylenediaminetetraacetate (EDTA), a synthetic chelate, on their bioaccumulation capabilities. A modified hydroponic growing system was used to suspend plants in aqueous solutions of either Hoagland's nutrient medium or varying concentrations of $Pb(NO_3)_2$ and EDTA. The plants were exposed Pb concentrations of 100 and 250 ppm. For each of these concentrations, EDTA concentrations of 0.5, 1.0, 2.0, and 5.0 mM/L were used. After four weeks of exposure, plants were harvested and separated into leaves, stems, and roots to analyze and locate the accumulations of lead. At 250 ppm of lead concentration, in the case of *Ipomoea lacunosa*, addition of 0.5 or 1.0 mM/L EDTA resulted in a 50% reduction in lead uptake by leaves, stems, and roots; *Sesbania exaltata*, on the other hand, showed a 100 % increase. Height and weight of the plants were also observed for morphological characterization.

9:45 ASSESSING THE BENEFITS AND COSTS OF USING BLACK PLASTIC MULCH AND SWEET POTATO AND SQUASH AS INTERCROPS IN SMALL-SCALE OKRA CULTIVATION

Liang C. Huam, Robin Case*, and Charles Butler, Alcorn State University, Alcorn State, MS 39096

Mulching is a cultural practice frequently use by commercial and small vegetable growers and its benefits are well-documented in the literature. However, with the growing concern about the effects of agricultural chemicals on underground water quality, food residues, human health and

farm-worker safety, there is renewed interest in the use of mulch as an alternative farming practice, particularly in vegetable production. A field experiment was conducted on six experimental plots measuring 20' x 25' in size to determine the benefits and costs of using black plastic and intercrops (sweet potatoes and squash) as mulching media in small-scale okra cultivation. Weed counts and fruit yields were calculated and compared between the different mulching practices. Results from the study indicate that black plastic mulch provided the best weed control among the three mulching media and produced significantly more yield than the intercrops and unmulched okra. Yield was significantly different among the mulching media. Budgetary analysis showed that the three mulching practices were economically viable alternatives for use by small scale okra growers.

10:00 PESTICIDE UPTAKE BY LEGUMINOUS PLANTS

Courtney Snell*, Joseph M. Wahome, and William C. Mahone, Mississippi Valley State University, Itta Bena, MS 38941

Pesticide uptake by bean and pea plants was analyzed using High Performance Liquid Chromatography. Plant were grown at different temperatures and then challenged with a Diazinon based pesticide. The supernatant from macerated plant tissues was assayed for pesticide residues using HPLC. Both beans and pea plants accumulated pesticide residues. Biodegradation and bioconversion of pesticides changed with temperature. The implication of these findings on habitat contamination is discussed.

10:15 Break

10:30 ASSESSING THE MICROBIAL AND PHOTOCHEMICAL EFFECTS OF 2,4,6-TRINITROTOLUENE (TNT) IN MISSISSIPPI RIVER WATER

Sharma D. Wiggins*, Latonja Slaughter, and Huey-Min Hwang, Jackson State University, Jackson, MS 39217

Disposal of TNT and its degradation products from munitions manufacturing plants poses a serious environmental problem. The solution to the problem must be accomplished in an environmentally acceptable manner. Because of the presence of highly oxidized nitro groups in TNT, only limited catabolic potential is present in native microbial communities, leading to only partial biodegradation of TNT. This partial degradation results in intermediates such as aminodinitrotoluenes which are resistant to further biodegradation of TNT may require a combination of biodegradation with other physical/chemical processes such as UV irradiation. Microbial bioassays are widely applied in toxicity measurements based on the assumption that they may act as surrogates for higher organisms in the environment. Microbial tests are also relatively simple, rapid, and inexpensive. Although photolysis has been reported for a wide variety of many organic pesticides in aquatic environments, photoinduced toxicity at low concentrations has been reported for a variety of xenobiotic compounds. In this study UV-photochemical degradation was conducted using natural solar irradiation. Also, because of its actions as an environmentally friendly sensitizer, riboflavin was used. We found that TNT is stable in the dark, with no significant degradation being detected. In addition, our study indicated that riboflavin significantly enhances the degradation of TNT in river water. Ecotoxicity testing was conducted with microbial bioassays, including plate counting and direct counting.

10:45 ACCEL, ETHEPHON, AND WILTHIN DECREASE APPLE FRUIT SET AND EFFECT FRUIT YIELD AND QUALITY

Ejaz Ansari* and Frank B. Matta, Mississippi State University, Mississippi State, MS 39762

The influence of chemical thinners Accel, Ethephon, and Wilthin on three apple cultivars Royal Gala, Blushing Gold, and Ultra Gold was investigated. Accel at 25, 50, and 75 ppm, Ethephon at 100, 200, and 300 ppm, Wilthin at 0.5, 1.0, and 1.5%, and control (water only) were sprayed on trees. Parameters measured were; fruit length, fruit diameter, fruit weight, yield, fruit juice pH, fruit juice acidity, fruit juice SSC, fruit juice sucrose, fruit juice glucose, fruit juice fructose, fruit firmness, and fruit set. Accel, Ethephon, and Wilthin reduced fruit set of Royal Gala, Ultra Gold, and Blushing Golden. Accel increased fruit yield of Royal Gala in 1995. Ethephon and Wilthin increased yield. In general Accel, Ethephon, and Wilthin increased fruit weight of Royal Gala, Ultra Gold, and Blushing Golden during both years. Accel and Ethephon, increased fruit length and diameter of Royal Gala, Ultra Gold, and Blushing Golden during both years. Wilthin increased fruit length and diameter of Royal Gala and Ultra Gold but did not effect fruit length of Blushing Golden. Fruit quality parameters such as juice pH, total acidity, soluble solids concentrations, fructose, glucose, and sucrose were, also, effected by the fruit thinners.

11:00 ULTRASTRUCTURAL STUDY OF ANTHRACNOSE INFECTION OF STRAWBERRY (*FRAGARIA* X *ANANASSA*) BY *COLLETOTRICHUM ACUTATUM* AND *C. FRAGARIAE*

Maritza Abril[1]*, Kenneth J. Curry[1], Jana B. Avant[1], and B.J. Smith[2], [1]University of Southern Mississippi, Hattiesburg, MS 39406, and [2]ARS-USDA Small Fruit Research Station, Poplarville, MS 39470

The anthracnose pathogens, *Colletotrichum acutatum* and *C. fragariae*, may both incite anthracnose infection of strawberry petioles and stolons. Previous studies at the light

microscope level indicated that *C. fragariae* has a biotrophic nature and quickly penetrates cell walls and grows into the cell lumena. However, *C. acutatum* grows throughout the tissue within the plant cell walls before penetrating the cell lumena. Utilizing the electron microscope, we examined lesions caused by both these fungal species on plants of the anthracnose susceptible strawberry cultivar, 'Chandler.' Plants with one or more stolons and no flowers or fruit were inoculated with conidial suspensions (1.5×10^6 spores/ml) of each *Colletotrichum* sp. Inoculated material was incubated at approximately 26°C and 100% RH. Representative tissue of late stage lesions in petioles infected by *C. fragariae* and *C. acutatum* (three and four days respectively) were examined at the ultrastructural level. Despite the faster and more aggressive, destructive nature of *C. fragariae*, no major differences were noticed between the two species. We intend to explore earlier stages of infection on petioles and stolons in order to elucidate the invasion pattern of host tissue by *C. fragariae* and *C. acutatum.* We anticipate finding earlier invasion of living cells by *C. fragariae* while *C. acutatum* is expected to confine its invasion largely to cell walls, entering host cells only after they are dead.

11:15 Divisional Poster Session

EFFECTS OF WINTERTIME FLOODING ON CHEMISTRY OF COTTON AND SOYBEAN SOILS FROM THE MISSISSIPPI DELTA

Scott A. Milburn* and Clifford A. Ochs, University of Mississippi, University, MS 38677

Soil erosion is a severe problem for farmers in the Mississippi Delta. New soil conservation methods have led to the flooding of some Mississippi Delta agricultural soils during the non-growing season as a means to decrease soil erosion. This experiment examined the effects of flooding on soil and overlying water chemistry. Soils were collected from three cotton and three soybean fields in the Mississippi Delta during December 1997. The soils were transported to the University of Mississippi, and placed into outdoor mesocosms. Half of the soils were flooded for 60 days; the other half of the soils were unflooded, but maintained at a constant moisture content. After 60 days of flooding the soils were drained. Chemical and biological measurements were made prior to treatment, at several times during treatment, and 14 days following drainage. During the treatment period, ammonia concentrations were higher but nitrate levels were lower in flooded soils. There was no detectable difference in nitrogen concentrations in the two treatments following drainage.

POTENTIATING EFFECT OF FORMALDEHYDE: A CYTOGENETIC STUDY IN *VICIA FABA* ROOT TIPS

Anita Patlolla [1]*, Babu Patlolla[2], and B.S. Sekhon[3], [1]University of Mississippi Medical Center, Jackson, MS 39216, [2]Alcorn State University, Lorman, MS 39096, and [3]Jackson State University, Jackson, MS 39217

Industrial wastewater and effluents are undesirable by-products of economic development and technological advancement. Of all the wastewater effluents, benzene, dichloromethane, formaldehyde and sodium dichromate are among the industrial priority pollutants (Rank and Nielsen, 1994). In this investigation individual and combined effects of these priority pollutants on genetic endpoints were studied in the root tips of *Vicia faba*. Lateral roots were treated with different concentrations of test chemicals and are kept in water for 24 hours as recovery period. Three hours prior to fixation the root tips were treated with 0.05% colchicine. After the hydrolysis with 1N HCl root tips were stained with feulgen stain and squashed on the clean slide. Results showed no increase in chromosomal aberrations and micronuclei in the root tip cells treated with formaldehyde at the selected concentrations, however, it has potentiated to the damage when combined with benzene, dichloromethane and sodium dichromate. The magnitude of the damage that results on combined exposure to massive quantities of wastewater effluents warrants caution. Financial assistance through Office of Education Grant # P03 I B044000.

PHYTOEXTRACTION OF LEAD FROM THE CONTAMINATED SAND AND SOIL USING *RAPHANUS SATIVUS* (RADISH)

Dionne A. Brown[1]*, Murty S. Kambhampati [1], Julie Whitbeck[2], and Elana Florian[2], [1]Southern University at New Orleans, New Orleans, LA, and [2]Tulane University, New Orleans, LA 70126

We investigated the efficacy of radish in phytoremediation, a recent approach to the clean-up of contaminated soils. We focused our attention on radish's potential to accumulate and translocate Pb from several different substrates into the shoots of the plant. We evaluated radish's ability to extract Pb from three substrates, sand, Commerce clay soil, and Commerce clay soil contaminated with approximately 80 ppm Pb (obtained from Bayou Trepagnier, near Norco, LA). Plants grown in sand were watered daily with a half strength Hoagland's nutrient solution (modified) to provide 0, 80, or 240 ppm Pb. For each substrate, at each Pb level, eight replicate plants were supplied with 0, 1, or 5 mM EDTA. Survival and biomass were greatest at low Pb or EDTA concentrations and declined with increases in either substance. In sand, Pb accumulation in shoots reached its maximum at 240 ppm Pb and 5 mM EDTA. In the contaminated soil, Pb accumulation in shoots also peaked at 5 mM EDTA. Measurements of leaf gas exchange at 8 weeks revealed that CO_2 uptake and conductance declined with increasing levels of EDTA in all Pb treatments. Because radish

tolerates Pb concentrations as high as 240 ppm, and accumulates significant levels of Pb in its shoots at this Pb supply, especially in conjunction with EDTA, we suggest radish may be useful in phytoremediation of Pb contaminated soils. We appreciate Tulane LAMP Program for the financial support provided to carry out this research.

PHYTOEXTRACTION OF LEAD FROM THE CONTAMINATED SAND AND SOIL USING *FAGORYRUM ESCULENTUM* (BUCKWHEAT)

Dana Bageon[1]*, Julie Whitbeck[2], Murty S. Kambhampati [1], and Elana Florian[2], [1]Southern University at New Orleans, New Orleans, LA, and [2]Tulane University, New Orleans, LA 70126

We investigated the efficacy of buckwheat in phytoremediation, one of the recent innovative approaches to the clean-up of contaminated soils. In studies conducted under greenhouse conditions, we addressed the following questions~ How much lead (Pb) will buckwheat take up from sand and soil growth media? In which plant parts does buckwheat accumulate this Pb? How does Pb affect buckwheat shoot growth rates? At what concentrations is Pb determined to buckwheat growth and/or survival? How does the chelator EDTA affect Pb uptake and/or storage within the buckwheat plant? We evaluated buckwheat's ability to extract Pb from three substrates, sand, Commerce clay soil, and Commerce clay soil contaminated with approximately 80 ppm Pb (obtained from Bayou Trepagnier, near Norco, LA). Plants grown in sand were watered daily with a half strength Hoagland's nutrient solution (modified) to provide 0, 80, or 240 ppm Pb. For each substrate, at each Pb level, eight replicate plants were supplied with 0, 1, or 5 mM EDTA. Survival and biomass accumulation were lowest at high levels of substrate Pb and also at high levels of EDTA, regardless of Pb concentration. Pb concentrations in stems and leaves increased with increasing EDTA concentration, indicating that more Pb absorbed by the roots was translocated aboveground at higher levels of EDTA. We appreciate Tulane LAMP Program for the financial support provided to carry out this research.

SCREENING VEGETABLE SOYBEAN LINES FOR STRESS AND BIOLOGICAL EFFICIENCY

Franklin O. Chukwuma, Alcorn State University, AlcornState, MS 39096

Both greenhouse and field studies were used to screen suitable vegetable soybean lines for stress and biological efficiency at Alcorn State University in Lorman, Mississippi. The screening and identifying of the lines were based on their P and Al absorption ratios and harvest index values. Fifty three soybean lines (14 large seeded, 12 tofu and 27 speciality) were grown in the green house in potted Memphis silt loam soil to test for Al tolerance and P absorption (pH 5–5.5) in P deficient soil (ranging between 10 to 24 ppm of available P). The plants were harvested after 35 days and analyzed for total P and Al. The same lines were grown in the field plots until maturity (pH 6.5–7.0) under sufficient range of available P (40 to 80 ppm). The matured plants were harvested and were used for harvest index determination (Dry wt of seed/Dry wt of the upper biomass including seed at maturity). Based on the results of the P/Al absorption values and their harvest index efficiency the soybean lines were categorized in to three groups; highly resistant, medium resistant, and low resistant. Eighteen of the lines were categorized as highly resistant, 30 as medium resistant and 5 as low resistant.

CHELATE-ENHANCED PHYTOEXTRACTION OF LEAD FROM CONTAMINATED SOILS USING MORNING-GLORY (*IPOMOEA LACUNOSA* L.)

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The success of phytoextraction as a phytoremediation strategy for clean up of meta 1-contaminated soils depends on the selection of suitable species that produce large biomass and also accumulate and tolerate toxic metals. To further evaluate the effectiveness of *I. lacunosa* as a phytoextraction species, a study was conducted at the Jackson State University greenhouse to determine whether a synthetic chelate, ethylenediaminetetra acetic acid (EDTA), can enhance the shoot uptake of Pb from a contaminated soil. Seeds of morningglory were planted in 1.8 L plastic pots containing planting mix: top soil (2:1, v:v) amended with aqueous solutions of Pb and EDTA. Experimental units were arranged in a 4 Pb x 5 EDTA factorial in RCB with 5 replications. Results revealed that shoot dry biomass of morningglory were not significantly affected by the various Pb/EDTA treatments. However, for each level of applied Pb, root biomass was reduced at the two highest EDTA treatments. Pb uptake in the shoot increased with increasing rates of Pb and EDTA. Although Pb accumulation in the roots increased with increasing concentration of Pb treatments, EDTA did not affect root Pb contents. Moreover, for each Pb treatment, the residual soil Pb after harvest declined with increasing levels of added chelate.

EFFECTS OF SEED AND SEEDLING ROOT EXUDATES OF VELVETLEAF AND BIRDSFOOT TREFOIL ON GROWTH OF RHIZOBACTERIA

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The effects of seed and seedling root exudates of

velvetleaf (*Abutilon theophrasti* Medik.) and birdsfoot trefoil (*Lotus corniculatus* L.) on the growth of homologous rhizobacteria (VLBR 01, VLBR 07, LCBR 04 and LCBR 07) in artificial medium was studied. Exudates were added to a Pseudomonas minimal medium (PMS) at a concentration of 2% (v/v). Glucose (0.8 g/L) was added to control flasks in an amount approximating the carbon content of the exudates. Results showed that velvetleaf and birdsfoot trefoil seed and seedling root exudates did not enhance the growth of VLBR 01 as indicated by its slower growth rate in comparison to control medium during incubation. However, growth of VLBR 01 in PMS amended with seed exudate was higher than the seedling root exudate-amended medium. VLBR 07 exhibited a faster growth rate in the presence of both exudates beginning at 24 hr compared to control medium. Growth rates of LCBR 04 and LCBR 07 in PMS amended with seedling exudates were much faster during the entire incubation period in comparison to control medium.

EVALUATION OF DIFFERENT MULCHES FOR CHINESE MELON (*MOMORDICA CHARANTIA* L.) PRODUCTION

O.P. Vadhwa[1]*, C.R. Reddy[1], and James Spiers[2], [1]Alcorn State University, Alcorn State, MS 39096, and [2]USDA Small Fruit Research Station, Poplarville, MS 39470

Chinese melon (*Momordica charantia* L.) yield as influenced by five different mulching treatments was evaluated. Chinese melon seeds of an introduction from India were used for this study and planted on May 18, 1998. All plants were grown on vertical trellis system.Chinese melon plants grown without any mulch (control) were the least productive. Maximum yield was obtained with weed barrier fabric, followed by hay and pine bark. First harvest date was July 6, 1998 (48 days after transplanting) and final harvest date was November 6, 1998 (171 days after transplanting).

EFFECTS OF GROWTH PARAMETERS (LEAF AREA INDEX, PLANT HEIGHT AND ROOT DEPTH) ON YIELD OF FIELD PEAS

A.H. Al-Humadi*, Liang C. Huam, and J. Harness, Alcorn State University, Lorman, MS 39096

This field research was done on highly erodible Memphis Silt Loam Soil between years 1992–1996 to evaluate the yields of field peas (*Vigna unguilata* L.) planted in three summer seasons using their leaf area index (LAI), plant height (PH) and root depth (RD) measurements. All cultivars were raised at a planting density of 0.904 x 0.152 m. Irrigation, fertilization, insecticides and herbicides were applied uniformly across all planting seasons. Four destructive harvest studies were conducted each season. The statistical analyses was performed at 0.05 level of probability to determine the significant difference between the yield and the growth parameters. The yield was highly significant in summer 1992, 11,177 kg/ha followed by summer 1995, 9,493 kg/ha and summer 1996, 6,749 kg/ha.

FRIDAY AFTERNOON

Imperial Room

1:30 DEGRADATION OF 2,4-DICHLOROPHENOXY-ACETIC ACID BY FENTON'S REAGENT

Abul B. Kazi, William C. Mahone, and Gregory D. Williams*, Mississippi Valley State University, Itta Bena, MS 38941

Any reagent that generates hydroxyl radicals will degrade many different kinds of organic molecules. Fenton's reagent is one of a number of widely used reagents which fall into this category. It has been used in a variety of applictions, including organic pollutant degradation, toxicity reduction, biodegradability enhancement, and dissolved oxygen control. In this study we focused on the efffectiveness of Fenton's reagent for degradation of 2,4-dichlorophenoxyacetic acid, a commonly used herbicide. Preliminary results indicate that significant degradation occurs after as little as one hour of exposure. The analysis was based on measurements of UV absorbance of chloroform extracts of saturated aqueous solutions of the pretreated pesticide and posttreatment mixtures. Optimization of the effects of various parameters, such as concentrations of peroxide and iron catalyst, pH of the reaction mixture, temperature, and reaction time is in progress. Details of this study aimed at demonstrating the use of Fenton's reagent as an easy and cost effective way to treat pesticide contaminated waters, will be discussed.

1:45 EFFECT OF CALCIUM, LECITHIN, AND STORAGE DURATION ON POSTHARVEST APPLE QUALITY

Tauqir Abbas* and Frank B. Matta, Mississippi State University, Mississippi State, MS 39762

In 1996, Golden Delicious Apples were treated postharvest, with 2%, 3%, 4% calcium chloride alone or in combination with 1% lecithin. Fruit were treated by dip method (1 minute) and injection method (0.5 ml solution was injected through calyx end with syringe needle). After the postharvest treatments, fruit were stored at 1°C for 6 months. At 2 month intervals, ⅓ of the fruit were removed from cold storage and placed for 15 days at room temperature. After storage fruit were subjected to analyses. Data showed that water core was reduced by1% lecithin dip in 1996. Bitter pit was completely controlled by all calcium and lecithin treatments compared to the control. In 1997, water core and bitter pit were completely controlled possibly due to a preharvest spray treatment of calcium chloride. Rot percentage, weight loss percentage in cold storage and room

temperature storage were reduced in 1997 compared to 1996. Calcium chloride at 3% injection kept fruit firm, reduced weight loss, and maintained calcium concentration in the fruit. Calcium chloride 4% + lecithin 1%, and lecithin 1% alone reduced weight loss percentage at room temperature conditions in 1996 and 1997. Results showed that a preharvest treatment was more effective than a postharvest treatment in controlling water core, bitter pit, and in maintaining fruit quality.

2:00 TOXICITY EFFECTS OF THE ORGANOPHOSPHATE INSECTICIDE DIAZINON ON FIVE NON-TARGET FRESHWATER SPECIES

Deron E. Burkepile[1]*, Matthew T. Moore[1], Marjorie M. Holland[1], John H. Rodgers, Jr., [1]University of Mississippi, University, MS 38677, and [2]Clemson University, Pendelton, SC

Diazinon, an organophosphate insecticide, is widely used on rice, fruit trees, sugarcane, corn, tobacco, and on horticuhural plants. Mortality of organisms exposed to diazinon is caused by inhibition of the enzyme acetylcholinesterase which degrades the neurotransmitter acetylcholine. Because diazinon and other pesticides are often applied near or adjacent to water bodies (lakes, streams, reservoirs, etc.), effects on non-target organisms may occur. Hence, determining the organisms' susceptibility to diazinon is important, and the determination of effects of diazinon on non-target organisms could be used in ecological risk assessments, either prospectively or retrospectively. Aqueous 48-h toxicity experiments were performed to contrast responses of *Ceriodaphnia dubia* (waterflea), *Daphnia magna* (waterflea), *Hyallela azteca* (amphipod), *Chironomus tentans* (non-biting midge), and *Pimphales promelas* (fathead minnow) to diazinon exposures. *Ceriodaphnia dubia* (mean LC50 of 0.92 µg/L) was the most sensitive species tested, while *P. promelas* (mean LC50 of 15.94 mg/L) was the least sensitive species tested. All of the invertebrates were over 300 times more sensitive to diazinon than was the vertebrate. Among the two daphnid species, *C. dubia* was at least an order of magnitude more sensitive than *D. magna* (mean LC50 of 2.39 µg/L). These determinations provide baseline information concerning the relative sensitivity of a suite of freshwater non-target organisms to diazinon.

2:15 THE EFFECT OF CHITOSAN ON ANTHRACNOSE INFECTION OF STRAWBERRY BY *COLLETOTRICHUM ACUTATUM*

Jana B. Avant[1]*, Kenneth J. Curry[1], Jami Webb[1, 2], and B.J. Smith[2], [1]University of Southern Mississippi, Hattiesburg, MS 39406, and [2]ARS-USDA Small Fruit Research Station, Poplarville, MS 39470

Chitin is a common component of fungal walls. Commercial chitosan is a β-(1-4)-glucosamine polymer derived from the chitin in crab shells. Chitosan applied to plants may act as a fungicidal agent, either directly by preventing fungal spore germination or indirectly by eliciting plant defense responses. The use of chitosan as a fungal deterrent is beneficial because it is a natural biological product that is ordinarily neither harmful to humans or the environment. We studied the effectiveness of chitosan against a common anthracnose pathogen *Colletotrichum acutatum*. Ripe fruit of the strawberry cultivar 'Chandler' were dipped in chitosan solution and subsequently in a conidial suspension of *C. acutatum*. The fruit was incubated at 26°C and 100% RH. Squashes of epidermal layers from the fruit were observed with a microscope at various times after inoculation to detect spore germination and appressorium formation. Semithin sections of the plastic embedded fruit, using corresponding times, were also inspected microscopically. Initial studies indicate a delay in the fungal invasion of the strawberry fruit inoculated, although the exact mechanism for the delay is unknown. Squashes show that germination of the spores is delayed at least 24 hours. This is supported by observations of the tissue in section; infection is not seen until roughly one day after it is noted in the control tissue. Once the germination has begun though in the chitosan-coated fruit, the invasion process is apparently similar to that of the control tissue. We suggest that chitosan then affects fungal germination either by directly inhibiting the fungus or through evoking a plant defense mechanism to inhibit fungal spore germination, but the chitosan does not appear then to alter the interactions between the fungus and the plant once the invasion has started.

2:30 HYDROLOGY AND FIRE: THE DRIVING CATALYST FOR WETLAND ECOSYSTEMS IN THE PINE FLATWOODS OF SOUTHEAST MISSISSIPPI

R. Michael Hanley*, Brad Humber, David M. Patrick, and Suzanne A. Boyd, University of Southern Mississippi, Hattiesburg, MS 39406-5044

The purpose of this study is to show the importance of the hydrologic regime and natural burn cycle in controlling the type of biotic communities within the wetlands of the pine flatwoods of Southeast MS. The hydrologic regime is the force that drives the nutrient cycling in a wetland ecosystem. The hydrologic regime may vary from highly dynamic as in a riparian wetland to a more static regime like that of a bog or fen. This major difference in the amount of hydrologic energy largely determines not only the type of biotic communities, but their successional stages of development as well. The hydrologic regime provides the energy to drive the nutrient cycling while at the same time protects the biotic community from intense fire. The fire or burn cycle controls the competition of species of vegetation in the herbaceous and shrub/sapling strata. The natural burn cycle is often deliberately disturbed by

the forestry management practice of controlled burning. Once the natural burn cycle is disturbed the wetland communities are out competed by pioneer species that quickly colonize the vacant strata choking out hydrophytic species. This disturbance of the natural burn cycle leaves behind ecosystems having moderate to high biodiversity while having low biotic integrity. Thus resulting in the degradation of functional wetland ecosystems.

2:45 DISTURBANCE AND SECONDARY SUCCESSION PATTERNS WITHIN THE UNIVERSITY OF MISSISSIPPI FIELD STATION

Jeff W. Johnson* and Marjorie M. Holland, University of Mississippi, University, MS 38677

Disturbance, in the form of removal of the overstory of vegetation, provided an opportunity to observe the mechanisms of succession on the University of Mississippi Field Station (UMFS), in Oxford, MS. Data collected from twenty plots established in 1996 within UMFS, provided the baseline for comparison to species collected in the summer of 1998. Four plots (20m by 20m) were sampled using a 1 square meter wooden frame as in 1996 to ensure data conformity. Two of these plots were classified as disturbed because of the removal of overstory vegetation. The remaining two plots were considered to be less disturbed because of the presence of overstory foliage. Local environmental conditions varied between the plots. The percent cover of each species within each quadrat was noted, as was the percent open space. Data were compared between the 1996 and 1998 data sets to look for shifts in flora. Increases in total foliar cover and a decrease in the percent open space fit into the expected scheme of continued growth of previous species within each plot. Some flora shifts were seen, yet succession had not progressed to the point of species exclusion at the time of sampling in the summer of 1998. It was interesting to note that species dominant in 1996, *Lonicera japonica* and *Rubus allegheniensis*, were still dominant in the 1998 sampling period. *Vitis rotundifolia* has arisen as a dominant species, where it was relatively minor two years ago. Continued sampling of the plots in two year intervals may reveal evidence of secondary succession over the next ten years.

3:00 PHOTOSYNTHETIC BACTERIA ARE A MAJOR SOURCE OF ORGANIC MATTER TO THE FOOD WEB OF SARDIS RESERVOIR

Clifford A. Ochs* and Kyeongsik Rhew, University of Mississippi, University, MS 38677

Sardis Reservoir, like other large reservoirs in northern Mississippi, is used both for flood control and recreation. Fish yield in these systems is presumably a function of both organic matter inputs and in situ organic matter production by plants and algae. Over a 18-month period we examined the relative importance of unicellular photosynthetic bacteria compared to larger algae to total algal biomass and productivity. Photosynthetic bacteria abundance varied between 15,000 and 700,000 cells/ml, and comprised up to 47% of total algal biomass and 40% of total algal productivity. Both abundance and biomass of photosynthetic bacteria were closely linked to temperature. During the nutrient-depleted summer period, photosynthetic bacteria decreased in number but tended to increase in the percentage of total algal biomass and production, from the riverine zone to the lacustrine zone. Considering the importance of these organisms to the autotrophic foundation of the pelagic food web, we propose that a better understanding of factors regulating their abundance, biomass, and productivity will prove valuable for fisheries management of these systems.

3:15 Divisional Business Meeting and Student Awards

CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY

Chair: Sarah Lea McGuire, Millsaps College
Vicechair: David Carson, Mississippi Univeristy for Women

THURSDAY AFTERNOON

Room 3

9:00 Introduction—Sarah Lea McGuire

9:15 CHARACTERIZATION OF FLUORESCENTLY MODIFIED APOLIPOPHORIN-III FROM THE ORGANISM *MANDUCA SEXTA* IN THE PRESCENCE OF PHOSHOLIPID VESICLES

Paul A. Stroud*, Brian J. Cuevas, Gordon C. Cannon, and Charles L. McCormick, University of Southern Mississippi, Hattiesburg, MS 39406

The protein Apolipophorin-III (Apo-III) *in vivo* is involved in the transport of lipoproteins in the insect *Manduca sexta*, and *in vitro* is known to reorganize dimyristoyl-phosphatidylcholine (DMPC) vesicles into smaller protein-lipid complexes, with the latter structures observed to be 4.8 nm by 18.5 nm discs by transmission electron microscopy (TEM). Apo-III has been labeled with pyrene maleimide and acrylodan through a unique cysteine recombinantly engineered at the 31st amino acid residue position. The acrylodan labeled Apo-III has demonstrated changes in the emission spectrum of the lipid bound and non-lipid bound states. In the presence of the DMPC vesicles, the emission intensity increases with a red shift of the fluorescence maximum indicating that the

acrylodan label lies in a more hydrophobic environment than the nonlipid Apo-III. A difference in anisotropy and fluorescence lifetimes has also been observed between the lipid and non-lipid bound Apo-H1. Pyrene labeled Apo-III will be examined revealing possible eximer formation in addition to quenching studies of the labeled Apo-III with hydrophobic and hydrophilic quenchers. Dynamic light scattering and TEM will be utilized to determine the sizes of the protein-lipid complexes and these results will be compared to the unlabeled Apo-III. These fluorescent studies will further elucidate the ability of Apo-III to reorganize the DMPC vesicles.

9:30 SEQUESTRATION OF HYDROPHOBIC MATERIAL BY THE SC3P HYDROPHOBIN PROTEIN FROM *SCHIZOPHYLLUM COMMUNE*

J. Shawn Goodwin*, Gregory G. Martin, Gordon C. Cannon, and Charles L. McCormick, University of Southern Mississippi, Hattiesburg, MS 39406

The SC3p is a 24 kDa amphipathic protein from *Schizophyllum commune* that self-assembles to form vesicles with hydrophobic interior and hydrophilic exterior surfaces (Wosten et al., 1994, EMBO, 13, 5848-5854). The protein is excreted by *S. commune* during the growth phase in which aerial hyphae are emerging. We are looking at the protein's ability to entrap hydrophobic material from an aqueous environment into the interior of hydrophobin bound vesicles. For our studies we use both the *S. commune* culture supernatant as well as purified protein in an aqueous solution to measure sequestration. Radiolabeled ^{14}C-hexadecane, diluted with either tetradecane or octane, is used to examine how much hydrophobic material can be removed from an aqueous solution when mixed with the hydrophobin. Our results indicate that approximately 80–90% of the ^{14}C-hexadecane can be sequestered and removed from the aqueous phase when the resulting mixture, after vortexing, is filtered through glass fiber filters. In addition, epifluorescence microscopy studies with nile red as a hydrophobic and calcein as a hydrophilic fluorescent probe confirm that the hydrophobin does, in fact, form vesicles that entrap hydrophobic molecules in the interior. From these results, we conclude that hydrocarbons can be sequestered into a hydrophobin bound vesicle and removed from an aqueous environment.

9:45 NON-CATHEPSIN PROTEASES IN NORMAL AND KERATOCONUS CORNEAS

Meghana R.Gillala* and Krishna Sharma, Jackson State University, Jackson, MS 39216, and University of Missouri-Columbia, Columbia, MO 65211

Keratoconus is a corneal disorder characterized by the thinning and scarring of the central region of the cornea resulting in eventual visual impairment. Previous protein studies, both in corneal specimens from affected persons and in cultured cells, indicated that there is a reduction in the normal controls, even though protein synthesis proceeds normally in most cases. This has been attributed to increased levels of proteases and decreased levels of protease inhibitors. Recent studies demonstrated that, in corneas obtained from patients with keratoconus, the levels of proteases identified as cathepsins B and G are elevated. This study was undertaken to detect the presence of proteases other than cathepsins and to examine the differences in the activity of the proteases between normal and keratoconus corneas. Corneal buttons were collected from patients with keratoconus and healthy subjects. Separate extracts of each corneal tissue were prepared. Protease activity was established by using four different substrate assays, two of which were specific for cathepsins. Gelatinase activity was examined through zymography. The activity of cathepsins and other non-cathepsin proteases were also determined using peptide substrate Adipokinetic Hormone G and HPLC analysis. Aliquots of the samples were treated with the cathepsin inhibitor Dilsopropyl fluorophosphate (DFP). Untreated cornea samples were used as controls. Our study detected no significant differences in protease activities between normal and keratoconus corneas. Also, no differences in gelatinase activity were detected between normal and keratoconus corneas. However, cathepsin inhibitor resistant enzymatic activity was observed in all the samples indicating the presence of non-cathepsin enzymes.

10:00 THE STUDY OF THE NONENZYMATIC CONVERSION OF GLUTAMINE TO PYROGLUTAMIC ACID

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

Pyroglutamic acid is found at the N-terminus of many peptide neurotransmitters and hormones. The cyclization of glutamine to pyroglutamic acid is catalyzed by an enzyme, glutamine cyclotransferase. However the rate constant for the nonenzymatic reaction has not been reported. A comparison of the rates of enzymatic and nonenzymatic reaction is required to obtain the rate enhancement, which is a measure of the catalytic efficiency of an enzyme. In this study, the first order rate constant of the nonenzymatic reaction was determined in the presence of phosphate ions. The cyclization of two substrates, glutamine and glutamine-amide was followed at 210 nm. The rate of the reaction increased with an increase in the concentration of phosphate ions. The rate of the reaction was found to be maximum at neutral pH. The formation of the correct product was confirmed by ^{1}H-NMR and TLC.

10:15 RAPID AND LATE ALTERATIONS IN PROTEIN

PHOSPHORYLATION RESULTING FROM INDUCTION OF CELLULAR DIFFERENTIATION IN *TETRAHYMENA VORAX*

Suzanne W. Hellums* and Phillip E. Ryals, Mississippi State University, Mississippi State, MS 39762

Cells of the ciliate *Tetrahymena vorax* can be induced to undergo cytodifferentiation upon the addition of a naturally occurring chemical signal known as stomatin. Addition of stomatin results in rapid (< 2 min) activation of phospholipase C as evidenced by a decline in radiolabeled PIP_2 and a concomitant rise in total intracellular polyphosphoinositols. Early and late changes in whole cell protein phosphorylation were investigated on Western blots probed with anti-phosphoserine, anti-phosphothreonine, and anti-phosphotyrosine antibodies followed by Enhanced Chemiluminescent or metal ion enhanced DAB detection. The data show rapid changes in phosphoserine-containing proteins and later alterations in phosphothreonine and phosphotyrosine-containing proteins. These results are consistent with the participation of a transmembrane signaling cascade involving the activation of protein kinase(s). Supported in part by Mississippi Agricultural & Forestry Experiment Station Project Number MIS-6305 to P.E.R.

10:30 Break

10:45 SODIUM-DEPENDENT UPTAKE OF [^{3}H]*SCYLLO*-INOSITOL BY *TETRAHYMENA* AND ITS INCORPORATION INTO PHOSPHATIDYLINOSITOL, PI-LINKED GLYCANS, AND POLYPHOSPHOINOSITOLS

Michael C. Kersting* and Phillip E. Ryals, Mississippi State University, Mississippi State, MS 39762

[^{3}H]*Scyllo*-inositol was shown to be taken up by *Tetrahymena* cells by means of a sodium-dependent mechanism. Transport of [^{3}H]*myo*-inositol and [^{3}H]*scyllo*-inositol was inhibited when sodium was excluded from the labeling buffer and by phlorizin, an inhibitor of sodium dependent transporters. Cytochalasin B, an inhibitor of facilitated glucose transporters had no significant effect on inositol transport. Internalized [^{3}H]*scyllo*-inositol was readily incorporated, intact, into phosphatidylinositol, phosphatidylinositol-linked glycans, and polyphosphoinositols. These results raise interesting questions regarding the functional significance of the presence of non-*myo*-forms of inositol in molecules known to function in phosphoinositide-based transmembrane signaling. Supported in part by Mississippi Agricultural and Forestry Experiment Station Project Number MIS-6305 to P.E.R.

11:00 MAJOR VS MINOR GROOVE BINDING SPECIFICITY OF H1° FOR DNA

Naila M. Mamoon*, Yuguang Song, and Susan Wellman, University of Mississippi Medical Center, Jackson, MS 39216

H1 histones are small, lysine-rich, DNA-binding proteins that play a crucial role in compacting the DNA of eucaryotic cells into chromatin fibres. The interaction of H1 histones with DNA is not well defined. However, H1 histones are generally regarded as, 'non-specific' proteins, suggesting that when bound to DNA they interact with the bases in the minor groove and the phosphate backbone. We have investigated the binding of H1°, the H1 variant found predominantly in terminally-differentiated cells, to *T4* bacteriophage DNA in order to delineate whether the major or the minor groove is important in this interaction. Wild-type *T4* bacteriophage DNA (glucosylated cytosines in the major groove) and mutant *T4* bacteriophage DNA (unmodified major groove) were isolated and binding of ^{3}H-H1° to each of these molecules was studied. Sedimentation velocity was applied to separate the DNA-H1° complex from unbound H1°. Analysis of the solution at the end of centrifugation allowed us to correctly estimate the bound and unbound ligand concentrations. We found that modification of the major groove had minimal effects on the binding of H1° to *T4* bacteriophage DNA.

11:15 IDENTIFICATION AND CHARACTERIZATION OF REGISTER SHIFTS IN COILED COIL PROTEINS

Allen W. Bryan, Jr.* and Peter S. Kim, Mississippi State University, Mississippi State, MS 39762, and Massachusetts Institute of Technology, Cambridge, MA 02142

Coiled coils, a tertiary structure in proteins, play a key role in such wide-ranging processes as muscle movement and HIV infection. An understanding of these proteins' structure would allow new medical treatments targeted to specific protein functions, The repeating pattern of coiled coils provides the means for statistical analysis and prediction of coil structure. In the past, register shifts in the heptad pattern have proven to be an obstacle to computational analysis. The Skipcoil program is shown to accurately analyze coiled coils with one or more shifts. The position and magnitude of any shifts are identified, and the effect of the shifts on coil structure is predicted. To detect the general region of a register shift, a sliding-box algorithm is applied to the output of Paircoil, an older coiled coil analysis program. The physically realizable shifts in the region are deduced. Likelihoods are then calculated for each allowed shift. The most likely shift and the associated margin of error are selected for output. Using the shift prediction, the probabilities of coiled coil stability in the vicinity of the shift are recalculated. The analysis performed by Skipcoil is shown to produce results that conform to previous predictions of register shifts. In addition, the results indicate that Skipcoil may be useful in the discovery

of shifts in newly sequenced proteins.

11:30 β-TUBULIN ISOTYPES IN INFLAMMATORY CELLS

Christina Valsamakis*, John J. Correia, and Sharon Lobert, University of Mississippi Medical Center, Jackson, MS 39216

Tumor and non-tumor breast tissues demonstrate differential expression of β-tubulin isotypes that correlates with the presence of inflammation. Previous experiments indicated that tissues containing the greatest quantity of class II β-tubulin also were infiltrated with inflammatory cells. The purpose of the present research was to quantify β-tubulin isotypes in inflammatory cells. Inflammatory cells were isolated from "buffy coats." In order to obtain inflammatorv cells, the cells in the "buffy coat" were separated using a polysaccharide gradient and tubulin was extracted from homogenized cells using Arginine Sepharose Chromotography. SDS-PAGE and Western Blots were used to identify tubulin isotypes. Results show that the amount of tubulin per cell increases from 3.5 (± .7) x 10^{-8} µg/cell In unstimulated cells to 2.9 x 10^{-7} µg/cell when stimulated with lipopolysaccharide (LPS) for two hours. Cells that were stimulated with LPS for 18 hours yielded 1.8 X 10^{-8} µg tubulin/cell. Neither unstimulated nor LPS-stimulated inflammatory cells reacted in a quantifiable manner with monoclonal antibodies raised against class II β-tubulin. The primary isotypes identified in these cells were β-tubulin classes I & IV. The results suggest that previously identified class II β-tubulin in inflammatory breast tissue did not originate in the inflammatory cells.

11:45 ISOLATION OF A 68 kDa DNA-BINDING PROTEIN FROM SOYBEAN CHLOROPLASTS AND PREPARATION FOR N-TERMINAL SEQUENCE ANALYSIS

Jenny Allmon*, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Chloroplasts were isolated from actively growing soybean cells and then nucleoids were isolated by step gradients and differential centrifugation. Two methods were used to purify the DNA-binding proteins from nucleoids: salt extraction and dialysis, and column chromatography. The goal of the experiment was to isolate the 68 kDa protein from the chloroplast nucleoids to analyze its presence and involvement in the compaction of chloroplast DNA into nucleoid-like structures. Protein composition of the differential fractions obtained from column chromatography was analyzed on 7.5% denaturing SDS-PAGE gels and prepared for N-terminal sequencing. The necessary concentration of the 68 kDa DNA-binding protein was successfully retrieved using purification of a heparin agarose column and a phenyl sepharose column and electrotransfer onto PVDF membranes for sequencing. Through the isolation of the 68 kDa protein, more information can be acquired by identifying the N-terminal sequence of amino acids and better understand the functions of chloroplast DNA-binding proteins and the relationship between cellular DNA and chloroplast DNA.

THURSDAY AFTERNOON

Room 3

1:30 Invited speaker

INVESTIGATING THE REGULATION OF FLAVONOID PRODUCTION IN MAIZE

Brian Scheffler[1]*, Regina Rojek[2], Inka Pusch[2], Natascha Techen[2], Susan Watson[1], and Udo Wienand[2], [1]USDA-ARS-NPURU, University, MS 38677, and [2]Universität Hamburg, 22609 Hamburg, Germany

The investigation of the anthocyanin pathway in maize has been fundamental to our understanding of genetics and gene interaction in plants. During the rediscovery of Mendalian Laws, investigators were able to use genetic mutations of this pathway to discover simple and complex inheritance patterns. These genes were also used in helping to define the association of a gene to a chromosome, the bridge-breakage-fusion cycle and eventually transposable elements. At the beginning of the 1980s the stage was set to use this combined genetic information to isolate these genes via molecular biology techniques and transposon tagging. During the last 18 years, a large number of investigators have been employed in the isolation and characterization of the structural and regulatory genes of the anthocyanin pathways in maize, snapdragon and petunia. In maize most of the genes were isolated by 1996, but there is still insufficient knowledge to understand the total regulation of anthocyanin biosynthesis. One of the more interesting questions of this regulation involves the gene *Intensifier* (*In*). *In* was isolated through transposon tagging and then characterized by sequencing, Northern and Western analysis. The *In* gene shares significant homology with a known class of transcriptional activators. Surprisingly, *In* regulates the expression of one of the two-chalcone synthase (CHS), the first committal step to the production of flavanoids, through suppression and not activation. In addition, this suppression is at the level of translation and not transcription. To make the situation more confusing, the expression of *In* is self regulated by miss-splicing events and there is an allele of *In* that is dominant to the wild-type allele that suppresses both CHS genes.

2:15 IDENTIFICATION AND CHARACTERIZATION OF DNA BINDING PROTEINS FROM *GLYCINE MAX* CHLOROPLAST NUCLEOIDS

Harn-Cherng Shiue*, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406-5043

Chloroplast genomes are organized into DNA-protein complexes called nucleoids. Variations in the structure of chloroplast nucleoids at different chloroplast developmental stages suggest that DNA packaging in nucleoids plays an important role in the control of chloroplast gene expression. Thus, it would be valuable to learn how DNA is organized in nucleoids by identifying the proteins involved in DNA packaging. Previously, a 68 kD protein with significant DNA binding and condensation activity was identified and purified by salt extraction and hydrophobic interaction chromatography. In this study, we attempted to identify and characterize acid-soluble DNA binding proteins found in *Glycine max* chloroplast nucleoids to determine how chloroplast genomes are packaged. DNA binding activity was detected using a gel retardation assay, and DNA condensation was observed using fluorescent microscopy. An acid-soluble fraction of nucleoid proteins was found to have significant DNA binding and condensation activity. Reducing SDS-PAGE suggested that a protein approximately 40 kD in size may be responsible for this activity. Future work includes the identification of the protein associated with the DNA binding and condensation activity of the acid-soluble fraction and analysis of the effect of this protein and the 68kD protein on the chloroplast genome function as a replication and transcription template.

2:30 CLONING AND CHARACTERIZATION OF COTTON FIBER cDNAS ENCODING MYB-TYPE PROTEINS

Chuan-Yu Hsu[1]*, Din-Pow Ma[1], Roy G. Creech[1], and Johnie N. Jenkins[2], [1]Mississippi State University, Mississippi State, MS 39762, and [2]USDA/ARS Crop Science Research Laboratory, Mississippi State, MS 39762

Plant Myb-domain proteins are DNA-binding proteins which control both general and specific gene transcription. Based on the conserved Myb peptide sequences of GKSCRL and PGRTDN, two sets of oligonucleotides, 5'-AAGGAATTCAGTTGYMGATTAAGATGG-3' and 5'-GGAAGCTTRTCTGTTCKKCCTGG-3', were synthesized and used as PCR primers to amplify cDNAs synthesized from 15 DPA (days post anthesis) fiber mRNAs. The amplified PCR products (-200 bp) were cloned into the pGEM-T vector and sequenced. Sequencing data confirmed that they are cDNAs encoding parts of Myb proteins. Additional primers based on the partial myb cDNA sequences were then synthesized and used in 5' and 3' RACEs (rapid amplification of cDNA ends) to clone the full-length cDNAs. The derived amino acid sequences from two full-length fiber *myb* cDNAs indicate that fiber Mybs consist of three distinct functional domains, a basic N-terminal DNA-binding domain, an acidic transactivation domain, and a negative regulatory domain.

2:45 CLONING AND EXPRESSION OF THE *AV1* GENE OF THE SQUASH LEAF CURL GEMINIVIRUS

Elizabeth M Yoste[1]*, Soumitra Ghoshroy[2], Judith K Brown[2], and Kajal B Ghoshroy[1], [1]Mississippi University for Women, Columbus, MS 39701, and [2]University of Arizona, Tucson, AZ 85745

Geminiviruses cause leaf curl diseases of various crop plants and are transmitted by whiteflies (*Bemisia tabaci*). These viruses have two icosahedral capsids entirely made of coat proteins, inside which are the twin genomes. The Squash Leaf Curl Virus (SqLCV) is a form of Geminivirus that infects plants like pumpkin. The coat protein (CP) of the SqLCV is necessary for encapsidation of the twin genome structure and possibly whitefly transmission and virion assembly. The CP is coded by the AV1 gene. To understand the function of this protein in detail and to use this protein in cell to cell transmission of the virus, AV1 gene from the field-collected SqLCV was first cloned into a high copy number plasmid using PCR and TOPO cloning techniques. The cloned AV1 gene was then transferred into the expression vector pET32. The CP was expressed as a His•Tag fusion protein in *E. coli*. Experiments are underway to purify this protein on His• binding column. We expect to express Green Fluorescent Protein bound CP in future to study cell to cell movement of the virus.

3:00 Break

3:15 STUDIES OF SOYBEAN CHLOROPLAST DNA REPLICATION AND RECOMBINATION USING TWO-DIMENSIONAL GEL ELECTROPHORESIS

Rebecca Walters*, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406-5043

Because of the difficulty of using recombinant DNA methods to study plastid DNA replication, investigators have relied heavily on electron microscopy and *in vitro* DNA synthesis to develop a generalized model of chloroplast (ct) DNA replication. While these methods have provided useful information, other approaches are necessary to elucidate the molecular mechanisms of ctDNA replication. We have employed two-dimensional gel electrophoresis, which allows separation of DNA fragments according to shape, to determine the nature of replication intermediates of various ctDNA fragments. We are using a green cell suspension culture of soybean that has been shown to be very active in chloroplast replication so that high yields of chloroplast replication enzymes and intermediates are possible. Preliminary results

from two-dimensional electrophoresis using probes derived from the inverted repeat regions of ctDNA points to the presence of a large number of recombination intermediates inside the inverted repeats. We are examining the possibility that the abundance of these intermediates might indicate a link between recombination and ctDNA replication and also might reveal recombinational hot spots on the chloroplast genome that could be used in the future for investigation of ctDNA replication mechanisms.

3:30 HOMOLOGOUS RECOMBINATION IN SOYBEAN CHLOROPLASTS

Dechelle B. Smothers*, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406-5043

The presence of a RecA-like protein in higher plant chloroplasts suggests that exchange of genetic information via homologous recombination plays an important role in repair and/or replication of the chloroplast genome. Since no other molecular components of recombination have been identified so far in chloroplasts, we have begun to employ an *in vitro* assay to detect the end products of recombination between two identical plasmids with non-overlapping deletions in an antibiotic resistance marker. The restored functional marker can be scored after transformation of *E. coli*. Preliminary results indicate that a relatively crude soybean chloroplast extract is capable of mediationg genetic exchange between the two plasmid templates. We are currently attempting to further dissect the enzymatic activities necessary for recombination and to characterize the recombination products.

3:45 A HOLLIDAY JUNCTION RESOLVING ENDONUCLEASE IN SOYBEAN CHLOROPLASTS

Cecilia Chi-Ham*, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406-5043

Homologus recombination plays an important role not only in the repair of damaged DNA, but also as a mechanism of DNA replication. Intrigued by the discovery of a RecA homolog in higher plant chloroplasts which, together with numerous lines of circumstantial evidence, points to a role for recombination in the replication in soybean chloroplasts. A crucial component of the recombination process is the resolution of the four-stranded Holliday junction intermediate by an endonuclease that specifically recognizes the structural features of the junction. Site-specific cleavage leads to separation of the resulting double stranded DNA products. Using a synthetic Holliday junction, we have found a resolving activity in soybean chloroplast which yields specific cleavage products. We have partially purified the resolving endonuclease and are in the process of characterizing its products and its biochemical requirements.

4:00 CREATING GENETIC MARKERS FOR THE FERN *CERATOPTERIS RICHARDII*

Wende C. Joyner*, Cindy Moon, Amanda Millsaps, and Robert G. Hamilton, Mississippi College, Clinton, MS 39058

The fern *Ceratopteris richardii* is used in genetic and developmental studies of plants because it has an independent gametophyte life history phase that matures within two weeks of spore germination. There are, however, few markers for genetic analysis of developmental mutants. to produce new markers, DNA fragments generated using random amplified polymorphic DNAs (RAPDs) were cloned and sequenced, and the resulting sequence data used to create DNA primers that can be used to generate single RAPDs fragments from genomic DNA using the polymerase chain reaction (PCR), thus creating sequence tagged sites (STS). Since RAPDs is used as a survey for genetic variation, and can result in the generation of large numbers of polymorphisms in comparisons of closely related individuals, this method has the potential to reveal large numbers of markers linked to gender expression mutants.

4:15 THE *TETRAHYMENA THERMOPHILA* disA MUTANT EXHIBITS LOW LEVELS OF PHOSPHATIDYLETHANOLAMINE. A ROLE FOR PE IN EUKARYOTIC MEMBRANE PROTEIN FOLDING?

Phillip E. Ryals* and Norman E. Williams, Mississippi State University, Mississippi State, MS 39762, and University of Iowa, Iowa City, IA 52242

The *Tetrahymena thermophila* disA (disorganized-A) mutant is a single-locus recessive mutation primarily affecting the striated rootlets of the ciliary-row basal bodies and results in severe disorganization in the positioning and orientation of the basal bodies and their associated cytoskeletal elements (Jerka-Dziadosz *et al.*, 1995. Dev. Biol., 169, 644). In light of recent reports that PE acts as a molecular chaperone in the assembly of certain bacterial membrane proteins we compared whole cell phospholipid composition of wild type and mutant cells by means of radiolabeling with [^{32}P]orthophosphate, [^{3}H]myristic acid, and [^{3}H]acetate. Data from each labeling experiment show a substantial reduction in the relative amount of PE in disA mutant total phospholipid. Although attempts to induce phenocopies of the mutant phenotype in wild type cells by forcing a change in the normal PE levels were not successful, the role played by PE in protein folding in *Tetrahymena* may yet be of importance. Supported in part by Mississippi Agricultural and Forestry Experiment Station Project Number MIS-6305.

4:30 *IN VITRO* EVOLUTION OF RNA CATALYSTS

Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406-5043

The discovery of RNA catalysis has invigorated speculations about RNA's roles in the early evolution of life. Evidence from a variety of disciplines suggests that our modem organisms might have evolved from an "RNA world" in which RNA molecules served as both genetic information carriers and metabolic catalysts. As predicted by the RNA world hypothesis, RNA's functions might have once included diversified activities. Many of the early RNA functions, however, have vanished in modern cells because of the emergence and evolution of superior protein at the dawn of our modern DNA/RNA/protein world. To provide experimental support for the RNA world hypothesis, I have used *in vitro* evolution techniques to identify novel RNA catalysts, and succeeded in isolating two new RNA catalysts (a pyrophosphatase and a capping enzyme) from pools of random RNA sequences. The pyrophosphatase catalyzes the hydrolytic release of inorganic pyrophosphate from the 5'-end of RNA: H_2O + pp**p**RNA → **p**RNA + PPI. The capping RNA catalyzes the formation of the same mRNA caps as produced by the protein enzyme GTP:RNA guanylyltransferase. Impressively, the RNA enzyme has additional multiple activities including decapping, cap-exchange, and phosphoryl coupling. The existence of such a versatile RNA enzyme suggests that catalytic capability of RNA may exceed current expectations. Future experiments in catalytic RNA will likely to demonstrate RNA's power and lend further support for the existence of an RNA world in the path to our modem world.

4:45 A STUDY TO COMPARE AND CONTRAST THE BIOCHEMICAL AND MOLECULAR DIFFERENCES OF GLUTAMYL CYCLASE (QC) IN BOVINE SPLEEN AND BOVINE PITUITARY

Rachell E. Booth*, Paul A. Sykes, Stephanie J. Watson, and Robert C. Bateman, Jr., University of Southern Mississippi, Hattiesburg, MS 39406-5043

Small biologically active peptides are derived from larger inactive precursor proteins. These active peptides result from the posttranslational modifications such as the formation of a pyroglutamyl (pGlu) residue. Initially the appearance of a pGlu residue was thought to be a spontaneous cyclization, but it is too slow under neutral conditions to be functional *in vivo*. In 1987, Kizer and Spiess reported the presence of a mammalian enzyme, glutaminyl cyclase (QC), that converts N-terminal glutamine residues to pGlu. Then in 1991, Spiess and coworkers isolated a cDNA clone from bovine pituitary and expressed it. Recently, the bovine spleen form of QC has been examined and found to exhibit major biochemical differences from that of the bovine pituitary form. These differences included substrate specificity, molecular weight, pH effects, and glycosylation. These results indicate that the spleen and pituitary forms of QC may have the same primary structure but they function differently due to posttranslational modifications. We have used RT-PCR of spleen mRNA and a highly purified preparation of spleen QC to clarify the molecular and biochemical differences and similarities between the tissue specific isozymes.

FRIDAY MORNING

Room 3

8:30 GLOBIN SYNTHESIS IN K562 CELLS IS ASSOCIATED WITH DIFFERENTIAL EXPRESSION OF TRANSCRIPTION FACTOR GENES

Lakeyra McCoy[1]*, Alisha Brinson[1]*, Lovell E. Agwaramgbo[1], Maria Plonczynski[1], Cheryl Hardy[2], Surinda Safaya[2], and Martin Steinberg[2], [1]Tougaloo College, Tougaloo, MS 39174, and [2]VA Medical Center, Jackson, MS 39216

Identifying proteins expressed during globin gene switching should increase understanding their role in the induction of specific globin genes and the γ → β gene switch. Na butyrate induction of globin synthesis in K562 cells was measured by the activity of a transduced $^{A}\gamma$-globin gene promoter linked to a luciferase reporter gene, that showed a maximum 44-fold increase from baseline. RT-PCR, used A, G, and C anchored primers and arbitrary amplimers calculated to amplify -50% of all expressed genes. We recovered over 100 cDNA fragments that appeared to originate from up- or down-regulated mRNA transcripts during erythroid differentiation, 50 fragments with >95% homology to known GenBank sequences, and 60 fragments without matches. Eighteen fragments with characteristics of transcription factors were cloned. These included differentiation-related gene-1 (drg-1); PAX 3/forkhead transcription factor; HZF2, a Kruppel-related zinc finger protein; heir-1, Id3, and GOS8, helix-loop-helix proteins; αNAC transcriptional coactivator; LIM domain protein; and trophoblast hypoxia regulating factor. Unidentified open reading frames were also isolated. We confirmed by direct amplification from induced cells, differential expression of the drg-1, and αNAC transcriptional coactivator genes. Erythroid maturation in induced K562 cells is associated with differential expression of numerous genes, some encoding transcription factors that could play key roles in the expression of γ-globin genes.

8:45 ISOLATION AND CHARACTERIZATION OF DIFFERENTIALLY EXPRESSED GENES IN TAURA SYNDROME VIRUS-INFECTED SHRIMP

Lu Yufeng* and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

Taura Syndrome Virus (TSV) is a ssRNA virus in the

family *Piconaviridae* that infects penaeid shrimp and can cause mortality rates as high as 90% at shrimp aquaculture facilities. The PCR-based differential display (DD) technique was used to examine differences in the pattern of gene expression between control shrimp (*Penaeus vannamei*) and those experimentally infected with TSV. One of the primary objectives of the study is to isolate and characterize virus encoded cDNA in order to develop a RT-PCR based technique for the molecular diagnosis of TSV in shrimp. Using cDNA synthesized from four different anchor primers as template and four random primers, a total of 19 differentially displayed PCR products unique to TSV infected shrimp were observed. After repeating the experiment using a different population of TSV-infected shrimp, seven cDNAs that appeared to be expressed only in TSV-infected shrimp in both experiments were selected for reamplification and characterization. The DD products ranged from approximately 200 to 800 bp and preliminary DNA sequencing information revealed five of the cDNAs to be unique. Experiments using 5' Rapid Amplification of cDNA Ends (5'-RACE) are in progress to isolate the full length cDNAs. Their sequence will be used to design primers for the development of a RT-PCR based technique to diagnose the presence of TSV in shrimp.

9:00 IDENTIFICATION AND ANALYSIS OF CLONABLE EXTRAGENIC SUPPRESSORS OF THE NIMX^{CDC2}F223L MUTATION OF *ASPERGILLUS NIDULANS*

Brett Carter*, Suzanne E. Wahrle, Melanie Schrader, Chad Young, and Sarah Lea McGuire, Millsaps College, Jackson, MS 39210

The nimX^{cdc2} protein kinase of *Aspergillus nidulans* regulates progression of nuclear division during G_1, S, and G_2 phases of the cell cycle. To identify genes which encode proteins that interact with nimX^{cdc2}, we have generated a collection of strains with mutations that suppress the temperature-sensitive nimX^{cdc2}F223L mutation. The suppressor strains were screened for the presence of an additional phenotype that could be used in cloning. Of 1500 suppressors isolated, 37 contained additional phenotypes. 14 suppressor strains with additional phenotypes were crossed with a wild-type strain to determine if the suppressor mutations were intragenic or extragenic. This yielded two strains with extragenic suppressor mutations that cosegregate with the additional phenotype. These strains have been designated *snx*A and *snx*B (for suppressor of *nimX*). Both *snx*A and *snx*B suppressor mutations have been shown to be recessive by diploid analysis, and phenotypic analysis has shown that both mutations stop the cell cycle during interphase. The growth phenotype of *snx*B contains aberrant nuclear and cytoplasmic morphologies that indicate deregulation of tyrosine phosphorylation of nimX^{cdc2}. We are currently performing analyses to determine at which point during interphase the nuclear division cycle is halted in these strains. In addition, both *snx*A and *snx*B are being mapped to their specific chromosomes to facilitate cloning using a chromosome-specific cosmid library.

9:15 MUTATIONS IN THE FRAGILE HISTIDINE TRIAD GENE TRANSCRIPT OF BREAST AND COLON CARCINOMAS

C.S. Ringelberg, S.T. Case, and M. Kaelbling*, University of Mississippi Medical Center, Jackson, MS 39216

The Fragile Histidine Triad gene (FHIT) is a putative tumor suppressor gene (TSG) that spans the fragile chromosomal site 3pl4.2. To elucidate the role of this TSG in tumorigenesis, the transcripts of 60 primary neoplasias and 10 leiomyoma uteri (benign tumors) were compared to those of constitutive tissue of the same patients. Total RNA was extracted from all samples and reverse-transcribed into cDNA. Exons 3–10 including the translated exons 5–9 were PCR-amplified. The transcripts of each turnor/constitutive panel were first analyzed in agarose gels for size differences of > 50 bp. Two of the 70 tumor samples and two normal samples, all of different panels, yielded not transcripts. The transcripts were next compared by restriction endonuclease fingerprinting; this modified SSCP technique will detect any nucleic acid change. Single samples were compared to other samples of the same tumor type. Samples that revealed mutations were sequenced. Of 46 panels analyzed, 38 contained mutations. Mutations were found in five of five breast cancer panels analyzed (5/5), 9/9 colon cancers, 2/3 endometnial cancers, 4/5 kidney cancers, 1/1 liver cancer, 3/3 lung cancers, 3/3 ovarian cancers, 3/4 skin cancers, 4/4 stomach cancers, 1/1 Wilms' tumor, and in 4/7 benign leiomyoma uteri. The results suggest that FHIT is nonrandomly mutated in many tumor types. Emphasis will be placed on the comparison of breast and colon cancer panels.

9:30 CLONING OF Na^+/K^+ ATPASE AND OTHER OSMOREGULATION RELATED cDNA IN THE SHEEPSHEAD MINNOW *CYPRINODON VARIEGATUS*

Zhining Xu* and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

The sheepshead minnow, *Cyprinodon variegatus*, lives in habitats that range widely in salinity and those raised at 15 parts per thousand (ppt) seawater in the laboratory are able to tolerate rapid salinity increases up to at least 60 ppt. To study mechanisms of osmoregulation at the molecular level in fish, the technique of differential display was employed to isolate cDNAs whose expression may play a role in the ability of *C. variegatus* to tolerate high salinity. In addition, because Na^+/K^+ ATPase is known to play an important role in

osmoregulation, its expression at the transcription level was also examined. Using differential display, three cDNAs, encoding 16S ribosomal RNA, ribosomal protein L41 and ribosomal protein L18, were cloned and sequenced. For Na^+/K^+ ATPase, degenerate primers were designed from the Na^+/K^+ ATPase sequence of eel, sea urchin and mouse and were used to successfully amplify cDNA from *C. variegatus*. The cDNA was cloned, sequenced and verified to be that of Na^+/K^+ ATPase. Northern experiments demonstrated increased transcription of each of the four genes in the gills of *C. variegatus* exposed to hypersaline seawater. The present study provides preliminary data for studying the molecular basis of salinity tolerance in *C. variegatus*.

9:45 Break

10:00 Divisional Poster Session

ENDOCYTOSIS OF TRIGGERS INTRACELLULAR CALCIUM INCREASES IN BRONCHIOALVEOLAR LAVAGE CELLS

Hai Hua Chen* and Jerry M. Farley, University of Mississippi Medical Center, Jackson, MS 39216

Bronchioalveolar lavage cells are predominately macrophages that are present in the lumen of the airways in the lung. They are obtained by lavage of the airways with saline. The cells form part of the defense mechanism in the lung, engulfing particulates (particulates, dust, etc.). The process of endocytosis initiates signals within the cells. Bronchial alveolar macrophages obtained by lavage of lungs from swine, endocytose fluorescent 1 µm microbeads. Each cell may take up 1–3 particles in 0.5 hour. In order to measure intracellular calcium ($[Ca]_i$), cells were loaded with Oregon green (a calcium sensitive fluorescent dye). $[Ca]_i$ was estimated by measuring changes in fluorescence of individual cells with a confocal microscope in real time after exposure to solution containing 1 mg/ml zymosan (cell wall particulates from yeast. Binding to the cell or endocytosis of these ~1 µm particles results in an initial transient increase in $[Ca]_i$ that in most cells is followed by further transient increases in $[Ca]_i$ after the removal of particulates. These changes in calcium last for thirty minutes in some cells after the initial exposure to zymosan. An activator of protein kinase C (phorbol 12-myristate 13-acetate) also causes transient increases in calcium in these cells. We suggest that these changes in $[Ca]_i$ may be further involved in the cytotoxic action of these cells. (Supported by HL55547)

CHARACTERIZATION OF A POLYCLONAL ANTIBODY TO THE *ASPERGILLUS NIDULANS* PALB PROTEIN, A COMPONENT OF THE AMBIENT PH SIGNAL TRANSDUCTION PATHWAY

David Hull* and Steven H. Denison, Mississippi College, Clinton MS 39058

The product of the *palB* gene of *Aspergillus nidulans* is a component of the ambient pH signal transduction pathway. This pathway responds to changes in ambient (extracellular) pH to ensure production of alkaline-specific extracellular enzymes (alkaline phosphatase, for example) in alkaline environments and acid-specific enzymes in acidic environments. We have shown previously that the *palB* protein, PALB, is a cysteine protease with similarity to the catalytic domain of the calpain family of calcium-activated cysteine proteases. It is not known what the substrate(s) of PALB is. In order to further characterize the role of PALB in signaling ambient pH, we produced a polyclonal antibody to a synthetic peptide corresponding to PALB sequence. In Western blotting experiments with *A. nidulans* protein extract, the antibody recognizes a band of the correct size (based on sequence analysis), 94 kDa. We are also using the antibody to determine the cellular location of PALB in immunofluorescence microscopy experiments. Based on these studies, PALB is present in greater abundance in the cytosol than in the nuclei in Aspergillus when cells are grown at pH 6.5, a pH at which the signalling pathway is activated. This suggests that the target for the PALB protease is present in the cytosol. This work was supported by NSF grant MCB-9722744 to S.H.D. and HHMI Undergraduate Biological Sciences Education Program (71195-538901) to Mississippi College.

ISOLATION OF EXTRAGENIC SUPPRESSOR MUTATIONS OF THE *PALI*30 MUTATION OF *ASPERGILLUS NIDULANS*

Daphne Smith[1]*, Bruce Dawson[2], Valerie Alexander[2], and Steven H. Denison[1], [1]Mississippi College, Clinton, MS 39058, and [2]Brandon High School, Brandon, MS

The product of the *palI* gene of the filamentous Ascomycete fungus *Aspergillis nidulans* is a component of the ambient pH signal transduction pathway. This pathway responds to changes in ambient (extracellular) pH to ensure production of alkaline-specific extracellular enzymes (such as alkaline phosphatase) in alkaline environments and acid-specific enzymes in acidic environments. *PaIL*30 mutant strains mimic (Growth in acidic conditions, showing (at pH 6.5) increased production of extracellular acid phosphatase, decreased production of extracellular alkaline phosphatase and increased sensitivity to molybdate in the growth medium. In order to identify new components of this signaling pathway, we isolated extragenic suppressor mutations of the *palI*30 mutation. Following 4-NQO mutagenesis of spores, colonies were selected initially for growth on 17 mM sodium molybdate and secondarily for patterns of acid and alkaline phosphatase staining more like wild type. Selected strains were then outcrossed to determine if the suppressor mutations were

intragenic or extragenic and if the suppression for growth on molybdate and for phosphatase staining were due to a single mutation. As truncation mutations in the well-characterized *pacC* gene lead to suppression of *palI* 30, suppressed strains were crossed to a *glrA*1 mutant strain (*glrA* being closely linked to *pacC*) to determine if the suppressor mutations were in *pacC* or in a new gene. To date we have isolated four extragenic suppressor mutations not in *pacC*. This work was supported by NSF grant MCB-9722744 to S.H.D. and HHMI Undergraduate Biological Sciences Education Program (71195-538901) to Mississippi College.

EXPRESSION AND REGULATION OF THE COTTON FIBER GENE *Ltp3* ENCODING A LIPID TRANSFER PROTEIN

Hsi-Chou Liu[1]*, Din-Pow Ma[1], Roy G. Creech[1], and Johnie N. Jenkins[2], [1]Mississippi State University, Mississippi State, MS 39762, and [2]USDA/ARS Crop Science Research Laboratory, Mississippi State, MS 39762

A cotton (*Gossypium hirsutum* L. cv DES 119) fiber cDNA library was constructed in lambda gt l0 using a PCR-based method. Through differential screening, one full-length cDNA clone (GH3) was isolated and subsequently sequenced. The nucleotide and derived amino acid sequences indicated that GH3 encodes a lipid transfer protein (LTP3) of 120 amino acids. Southern analysis of cotton genomic DNA suggested that *Ltp3* is a member of a small multigene family. Two homologous genes (*Ltp6* and *Ltp12*) were retrieved from a cotton genomic library using ^{32}P-labeled GH3 as a hybridization probe. All three *Ltp* genes were found to be expressed in fiber cells as detected by RT-PCRs. Northern analysis, however, indicated that the transcript level of *Ltp3* is much higher than those of *Ltp6* and *Ltp12*. LTP3 was expressed in *E. coli* as a maltose binding protein (MBP)-fused construct, and the fusion protein was purified for raising anti MBP-LTP3 serum used in the immunodetection of the LTP3 protein level during fiber development. The 5' and 3' flanking regions of *Ltp3* were cloned with a genomic DNA walking method. The *Ltp3* promoter was systematically analyzed by *Agrobacterium*-mediated tobacco transformation employing the GUS gene as a reporter. GUS expression assays on the tobacco transformants suggested that cis-elements which confer the fiber/trichome specific activity of *Ltp3* promoter are located within a 315-bp DNA fragment (-614~-300 bp relative to the translational start codon ATG of *Ltp3*). The characterized *Ltp* genes and their promoter/regulatory elements will be valuable in genetic engineering for fiber modification.

EFFECTS OF PHYTOCHEMICALS ON MCF-7 CELL GROWTH AND ESTROGEN RECEPTOR BINDING

N.E. Hopkins[1]*, P.L. Scott[2], G. Nikov[2], M. Eshese[2], L. Mosley[3], and W.L. Alworth[2], [1]Millsaps College, Jackson, MS 39210;[2]Tulane University, New Orleans, LA 70118; and [3]Mississippi University for Women, Columbus, MS 39701

Recent attention has focused on the isoflavanoids in soya and the flavanoids in tea as possible mediators of carcinogenesis. In this study, we measured the binding properties of three isoflavanoid compounds found in soya-genistein, daidzein and coumestrol, and two flavanoid compounds found in tea-catechin and epicatechin as well as effects of these phytochemicals on the cell proliferation of estrogen-responsive MCF-7 breast cancer cells. Receptor binding to human estrogen receptor (ER) was measured with a Beacon 2000 fluorescence polarization system (PanVera, Inc, Madison, WI). Expressed, purified ER (PanVera, Inc, Madison, WI) was preincubated for 30 min with an optimal concentration of a fluorescent estrogen analog (EF, PanVera, Inc, Madison, WI) and then the test compound (10^{-9} to 10^{-4} M) were added to the ER-EF complex. Binding of the phytochemicals was measured as a decrease in polarized fluorescence after 2 hrs. MCF-7 cell proliferation was determined by seeding 10^4 cells into 24 well plates and exposing the cells to varying concentrations of the test compounds in the presence and absence of estradiol for 5 days. On the sixth day, the cells were fixed and cell growth effects determined by measuring total protein in the cells as compared to the protein in cells incubated with 10^{-10} M estradiol or with vehicle alone. Genistein and coumestrol displaced EF from ER in the range of 10 µM while catechin and epicatechin displaced EF from ER in the range of 100 µM. Coumestrol stimulated MCF-7 cell growth at concentration 10 nM and genistein stimulated MCF-7 cell growth at concentration 100 nM, but both catechin and epicatechin strongly inhibited the growth of MCF-7 cells at all concentrations tested (10^{-10} M to 10^{-5} M). The effects of these phytochemicals on the growth of estrogen-responsive MCF-7 breast cancer cell, therefore, do not correlate with their competitive binding to the human ER.

THE EFFECT OF HEAT ON THE HEAT SHOCK RESPONSE OF INDUCED WOUNDS IN RATS

April Watson*, Leroy Johnson*, and Alice Powell, Alcorn State University, Lorman, MS 39096

This study was to determine the effect of heat stress on the healing rate of induced wounds in rats. All wounds were superficial with uniformed lengths and depth. The expected outcomes of this study was to show an increased wound healing rate and a higher quality of wound heal. Animal studies (Riberro, et al., 1995) have shown that the response is attributable to the elicitation of the “housekeeping” heat shock proteins. This research was an effort to examine the possible change in the total protein profiles using SDS-PAGE in heat treated animals. The increased or sudden appearance of new bands indicated possible “heat shock protein” response

to the particular stress. Rat tissues were minced with sterile surgical blades and incubated in lysis buffer for 30 minutes on ice. The protein solution was homogenized using a mortar and pestle and centrifuged. The isolated proteins were stored at -20°C and used as needed. After the isolation of total proteins and analyses by SDS-PAGE, no individual bands were resolved in the gels from the heat treated animals.

ISOLATION OF DIAZOTROPHIC ORGANISMS FORM THE ENVIRONMENT WHICH HAVE MOLYBDENUM-INDEPENDENT NITROGENASE SYSTEMS

Ketia Shumaker[1]*, Alice Powell[1], Paul Bishop[2], and Royden Saah[2], [1]Alcorn State University, Lorman, MS, and [2]North Carolina State University, Raleigh, NC

Biological nitrogen fixation is the reduction of atmospheric nitrogen to ammonium, a process carried out by nitrogen fixing bacteria (diazotrophs). The enzyme complex that carries out this reduction is called nitrogenase, a complex made up of two components. There are three different nitrogenases; the well-studied molybdenum (Mo)-containing nitrogenase (nitrogenase-1), a vanadium (V)-containing nitrogenase (nitrogenase-2), and a nitrogenase (nitrogenase-3) that does not contain either Mo or V and is an iron-only nitrogenase. Nitrogenases -2 and -3 are sometimes referred to as Mo-independent nitrogenases. Studies show that a rather diverse group of diazotrophs are able to use Mo-independent nitrogenases under Mo-deficient conditions. To gain more knowledge about the distribution of these nitrogenase systems, bacteria were isolated under aerobic conditions from a local pond, a mulch pile, and from the Neuse Waste Water Treatment Plant. Wild-type strain CA of *Azotobacter vinelandii* was used as a positive control for the presence of Mo-independent nitrogenase systems. The samples were enriched for bacteria able to grow diazotrophically under Mo-deficient conditions by adding phosphate buffer and sucrose which had been extracted previously with 8-hydroxyquinoline to remove contamination Mo. After several passages through liquid nitrogen free Mo-deficient medium, the bacteria were isolated on agar plates containing nitrogen free Mo-deficient medium. All the isolates probably contain a gene (vnfD/anfD) that encodes the alpha subunit of a Mo-independent nitrogenase. The waste water treatment plant (wwtp) bacterial isolate had a generation time of 2.3 hours in liquid nitrogen free, Mo-deficient medium and the isolates from the pond and mulch pile had generation times which averaged 5 hours. The control, *A. vinelandii* CA, had a generation time of 4.8 hours under the same conditions. The wwtp isolate was able to grow at a pH of 4.5 while the other isolates were unable to grow at a pH below 6.2. Additional information must be gathered before these microorganisms can be identified.

MICROBIAL AND GAS HYDRATES

Sarah Barnes*, Ron Pittman, Robin Felder, Lewis R. Brown, and Rudy Rogers, Mississippi State University, Mississippi State, MS 39762

There are enormous reserves of natural gas (methane) buried in the ocean floor, particularly off the coast of California. Intriguingly, gas hydrates have been blamed for the loss of ships in the Bermuda Triangle. [If gas is suddenly released in sufficient quantities from the ocean floor, the density of the overlying water lessens and the ships sink.] This project is designed to investigate the role of microorganisms in the formation of gas hydrates from the standpoint of producing the gases involved and in the production of surfactant which are thought to accelerate formation of the hydrates. Experiments are being conducted in a specially constructed device that allows for visual observation of hydrate formation. This interdisciplinary project is being performed by a team of scientists from the Chemical Engineering Department and the Department of Biological Sciences.

EFFECT OF THREE CHLORINATED HYDROCARBONS ON THE INDUCTION OF MICRONUCLEI IN MOUSE BONE MARROW

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The major concern for the halogenated compounds is their widespread distribution, in addition to occupational exposures. Several chlorinated alkanes and alkenes were found to induce genotoxic effects (Tafazoli and Kirsch-Volders, 1996). In the present study the effect of 1,1-dichloroethane, 1,1,1-trichloroethane and 1,1,2,2-tetrachloroethane on the micronuclei count was observed in mice bone marrow cells. Five different concentrations of each chemical were tested. Femoral bone marrow from the sacrificed mice was extracted in a mixture of fetal calf serum and Hanks balanced salt solution. The mixture was then passed through a column made with microcrystalline cellulose and α-cellulose. After centrifugation the pellet was re-suspended in the fetal calf serum and EDTA. Slides were passed through series of staining solutions. One thousand cells were counted for each treatment. Results indicated a significant increase in the number of cells with micronuclei in the treated bone marrow cells when compared with control. The test chemicals produced micronuclei as the function of their concentrations.

INDUCTION OF APOPTOSIS IN RESPONSE TO WHITE SPOT SYNDROME VIRUS IN THE PACIFIC WHITE SHRIMP, *PENAEUS VANNAMEI*

Tammie Henderson* and Kenneth Stuck, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Apoptosis constitutes a systematic means of cell

suicide and plays an important role in defense against viral infections, particularly in animals lacking an antibody-mediated immune response. There is currently no published information on the induction of apoptosis in response to a viral infection in cultured shrimp. Therefore, a study was initiated to determine if apoptosis occurred in cultured Pacific white shrimp, *Penaeus vannamei*, infected with the baculoviruses associated with white spot syndrome (WSSV). Paraffin embedded tissue sections were obtained from shrimp experimentally infected with WSSV and from the corresponding uninfected controls. These sections were stained with hematoxylin and eosin for pathological assessment, and an *in situ* procedure, Apoptosis Detection System, from Promega, was modified and used to detect the formation of apoptotic cells in WSSV-infected shrimp tissues. The hypertrophied nuclei characteristic of WSSV infections and apoptotic cells were observed in the epithelial lining of the cuticle, foregut, appendages and the gills of infected shrimp. The uninfected control showed no signs of WSSV infection. The heaviest infections and highest incidence of apoptosis were observed in the epithelial lining of the foregut. This study demonstrated that WSSV infection induces an apoptotic response in penaeid shrimp. However, additional work is needed to improve reliability and consistency of the *in situ* detection of apoptotic cells and to determine the role of apoptosis in the development of tolerance to viral infections.

FRIDAY AFTERNOON

Room 3

1:30 PROTECTION BY NATURAL IgM ANTIBODIES AGAINST GROUP B STREPTOCOCCAL INFECTION IN RAG1-DEFICIENT MUTANT MICE

Peter Butko[1]*, Russell R. Reid[2], Michael C. Carroll[2], and Michael R. Wessels[2], [1]University of Southern Mississippi, Hattiesburg, MS 39406, and [2]Harvard Medical School, Boston, MA 02115

Mice deficient in recombination-activating genes RAG1 or RAG2, the genes essential for B and T lymphocyte development and antibody production, are shown to be extremely sensitive to infection by group B *Streptococcus* (*Streptococcus agalactiae*, GBS): the 50% lethal dose (LD50) is only 60 colony-forming units (cfu) in the mutant mice, compared with that of 22,000 cfu in the wild-type control mice. The infection in the RAG-deficient mice can be prevented by intravenous administration of normal mouse serum. The protective humoral factor, present in normal mouse serum, is identified as natural IgM. The data indicate that IgM antibodies play an important role in natural immunity to GBS in mice. This finding may open a new avenue of investigation into a possible role of natural IgM in human immunity to GBS infection.

1:45 QUANTITATIVE COMPETITIVE PCR OF THE *ESCHERICHIA COLI* O157:H7 SLT II GENE USING A CLOSELY HOMOLOGOUS COMPETITIVE TEMPLATE

Jonathan Anderson*, J.A. Evans, N.C. Fawcett, and K.G. Harvey, University of Southern Mississippi, Hattiesburg, MS 39406

The Shiga-Like Toxin (SLT) of *Escherichia coli* has been called the “third most dangerous bacterial toxin known, after tetanus and botulism” (Kolata, 1998). In the United States alone, the bacterium infects up to 20,000 people annually, with 500 cases resulting in death. It ranks as the leading cause of kidney failure among children, with 1,000 cases annually with three-to-five percent of those resulting in death; in older people it may also cause encephalitis-like symptoms. There is a demand not only for an assay for rapid detection of the pathogen, but for enumeration of it as well. Our goal is to develop a competitive polymerase chain reaction (PCR) assay in which the competitive template is constructed from the SLT II gene and differs only by an insertion large enough to distinguish it from the actual amplified gene region. Because of the homology, the same set of primers bind both the competitor and target sequences with equal affinity. Both sequences are amplified in the same PCR reaction so that any factors influencing the amplification of the target sequence will affect the amplification sequence in the same fashion, allowing for equal amplification rates of both sequences. Because the initial and final amounts of the competitor sequence and the final amount of the target sequence will be known, the initial amount of the target sequence can be easily calculated. Quantification will initially be by incorporation of [(α-32P] dCTP; our final goal is to be able to quantify the products on a piezoelectric quartz crystal microbalance thus eliminating the use of radioactivity.

2:00 USE OF A QUARTZ CRYSTAL TO DETECT PCR PRODUCTS OF THE *E. COLI* O157:H7 SLT-II GENE

Tara Hurt*, R.D. Craven, K.G. Harvey, P. Zhang, E. Price, N.C. Fawcett, and J.A. Evans, University of Southern Mississippi, Hattiesburg, MS 39406-5043

It is estimated that *Escherichia coli* O157:H7 is responsible for over 20,000 infections and almost 500 deaths each year. Early identification could prevent serious complications caused by serotype O157:H7. We are developing a rapid detection method for foodborne pathogens by use of a piezoelectric quartz crystal microbalance (QCM). The QCM responds to a mass increase on the crystal’s surface by a decrease in frequency. In testing our method, a DNA probe

specific for a portion of the Shiga-like toxin (SLT) gene was attached to the crystal. We used asymmetric polymerase chain reaction (PCR) to produce single-stranded target DNA by amplifying a region of the SLT-II gene from *E. coli* O157:H7. Asymmetric PCR eliminated the competing strand of DNA formed by regular PCR and thus increased the target's ability to bind the crystal bound probe. The amplified target was captured by the crystal bound probe which resulted in a mass increase on the crystal. The quartz crystal responded to this mass increase by a decrease in its frequency, signaling that SLT II DNA was in the amplified sample. We used asymmetric PCR to generate single strands of both the + and - strands which were active in hybridization to their complements. This procedure should be beneficial for detecting *E. coli* O157:H7 and other pathogens.

2:15 HIGHLY SELECTIVE BUTYRYLCHOLINESTERASE INHIBITORS IMPROVE MEMORY IN RATS: IMPLICATIONS FOR ALZHEIMER'S DISEASE

Suzanne E. Wahrle[1]*, Robert C. Meyer[2], Nigel Greig[2], Q. Yu[2], Sue Boyer[2], and Donald K. Ingram[2], [1]Millsaps College, Jackson, MS 39210, and [2]National Institute on Aging, Baltimore, MD 21224

Deficits in brain acetylcholine may be partially responsible for the memory dysfunction associated with Alzheimer's Disease (AD). The only drugs that are currently FDA-approved for treatment of AD indirectly increase brain acetylcholine levels by inhibiting the enzymes (cholinesterases) that hydrolyze acetylcholine. Although two cholinesterases, acetylcholinesterase (AChE) and butyrylcholinesterase (BChE), are found in the brain, the memory enhancing effects of cholinesterase inhibitors have been attributed solely to AChE inhibition. To determine whether brain BChE is involved in memory our laboratory synthesized highly selective BChE inhibitors that are brain targeted. The BChE inhibitors were tested on old rats and also on young rats with scopolamine-induced memory impairments. A computerized 14-unit Stone T-maze was used to evaluate the cognitive abilities of the rats. Preliminary results indicate that BChE inhibitors enhance memory in old rats and attenuate scopolamine-induced memory impairments in young rats. These findings have significant implications for future development of AD treatments.

2:30 EVALUATION OF DEVELOPMENTAL EXPOSURE TO POTENTIAL ENDOCRINE DISRUPTING CHEMICALS, POLYCHLORINATED BIPHENYLS AND METHOXYCHLOR, ON MALE REPRODUCTIVE PARAMETERS

C.E. Stokes*, D.S. Respess, Jr., A.B. Moore, and N.M. Cox, Mississippi State University, Mississippi State, MS 39762

Exposure to polychlorinated biphenyls (PCB's), which were once used as electrical insulators, causes reproductive toxicity when passed on to offspring via placental or mammary gland transfer. PCB's are metabolized by mammals to form compounds that are estrogenic. Developmental exposure to PCB's causes accelerated sexual development in females and lowered testis weight in males. Methoxychlor (MXC), a widely used insecticide, is metabolized to its dihydroxy metabolite, 2, 2 bis (4-hydroxyphenyl)-1,1,1-trichloroethane (HPTE). HPTE successfully binds with the estrogen receptor causing estrogenic effects. MXC exposure during development causes decreased testis weights, lowered sperm counts, and decreased fertility. In this study, pregnant female Sprague-Dawley rats were fed the PCB's mixture Aroclor 1254 with a dosage of 4 mg/kg/day from gestation day 6 until postpartum day 22. The pups from these dams were injected with MXC from postnatal days (PND) 10 to 14 with the dosages of 0, 0.3, 3, and 300 mg/kg/day. Male pups were sacrificed on PND 15, 23, 31, and 70. Testis were removed and weighed each day. Testis weight at PND 15 ($P<.009$), 23 ($P<.004$), and 31 ($P<.001$) exhibited a PCB's by MXC interaction. At all ages, testis weight was lowest at 300 mg/kg/day level of MXC but was elevated by PCB's exposure. MXC had little or no effect on testis weight of males sacrificed at sexually maturity. The interaction of the two chemicals, PCB's and MXC, seem to mitigate the effects of MXC exposure alone.

2:45 SURFACE INTERACTION AND BINDING PROPERTIES OF PROTEIN G AND Δ6 PROTEIN G

Cederick Deon Cistrunk* and Joanna R. Long, University of Mississippi, University, MS 38677, and University of Washington, Seattle, WA 98195

There is little known at the molecular level of structural and functional relationships which govern how proteins bind and interact with certain surfaces. Such surface interactions and binding properties can either inhibit or promote the recognition of a substance and elicit a response such as crystallization or biomineralization. By using enzyme-linked immunosorbent assays, the structural and functional relationships of proteins binding to other substances or materials can be derived in a quantitative manner. The main objective of this experiment is to determine whether specifically and non-specifically bound proteins affect the binding of other molecules to it. Keywords: protein binding, enzyme-linked immunosorbent assay, surface interaction

3:00 EFFECTS OF PHYTOCHEMICALS ON MCF-7 CELL GROWTH AND ESTROGEN RECEPTOR BINDING

L. Mosley[1]*, W.L. Alworth[2], and N.E. Hopkins[3], [1]Mississippi

University for Women, Columbus, MS 39701;[2]Tulane University, New Orleans, LA 70118; and [3]Millsaps College, Jackson, MS 39216

A study of the binding capacity of isoflavonoids in soya and flavonoids in tea was done to determine if carcinogenesis was mediated. Human estrogen receptor (ER) was dissolved into a stock solution and measured with a Beacon 2000 Fluorescence Polarization System (PanVera, Inc, Madison, WI). The ER (PanVera, Inc, Madison, WI) was preincubated for 30 minutes with optimal concentration of a fluorescent estrogen analog (EF, PanVera, Inc, Madison, WI) along with a buffer. Three isoflavonoids (genistein, daidzein, and cournestrol) and two flavonoids (catechin and epicatechin) were used for measuring the binding capacity with the estrogen. Solutions were incubated. Analysis determined that genistein and cournestrol displaced EF from ER over a range of 10 µM; moreover, catechin and epicatechin were in a range of 100 µM. Regarding phytochemical behavior in MCF-7 cell growth, no relation coexists with the competitive binding of human ER.

3:15 Divisional Business Meeting followed by presentation of graduate and undergraduate student awards

CHEMISTRY AND CHEMICAL ENGINEERING
Chair: Edward J. Valente, Mississippi College
Vicechair: Ken S. Lee, Jackson State University

THURSDAY MORNING

Room 1

9:00 EVALUATION OF NATURAL AND COMMERCIAL ADDITIVES LEACHING POTENTIAL OF OIL CONTAMINATED SOIL

Christy Pearson[1]*, Hamid Borazjani[2], and Susan Diehl[2], [1]Mississippi University for Women, Columbus, MS 39701, and [2]Mississippi State University. Starkville, MS 39762

The goal of this experiment was to evaluate the effect of various soil additives on the leaching potential of oil contaminated soils. This was done using continuous flow seawater basin with simulated tides. Natural and commercial additives were used to test their absorbance ability. The soil support consisted of sand-oil mixture as a control and sand-oil mixture plus various additives. Seawater was added each day simulating the tide. The leachate was collected and analyses were completed on the soil and leachate for oil content. According to water analyses, peat was the most effective in preventing leaching into the water ahead of several commercially available additives. The soil analyses, however, indicated that kenaf retained the highest oil concentration due to its high absorption qualities. Further research could show more about these additives' usefulness in oil contaminated soil.

9:15 EXPERIMENTAL FRONTAL POLYMERIZATION IN TWO DIMENSIONAL MEDIA

James R. Warren* and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Frontal polymerization is a mode of converting monomer into polymer by a localized hot reaction zone which moves much like a liquid flame. The problem with frontal polymerization is that it contains large temperature gradients that cause the reaction to be driven by convection. This study was performed to observe frontal polymerization in two dimensional media. Frontal polymerization has been studied in two types of media: velveteen and sealants. The two solutions primarily used to observe frontal polymerization were benzyl peroxide in 1, 6-hexanediol diacrylate and acrylamide with sodium persulfate. The first solution BPO/HDDA was used in the velveteen where it was observed that Snells law could be measured by taking two different concentrations and applying them to either side of the velveteen. The problem with velveteen was that fronts did not move evenly due to air flow and convective forces. Sealants were chosen to eliminate the problem with air flow and convective forces. Acrylamide and sodium persulfate were used in silicone and plastic roof cement. The sealants were chosen because they are more viscous than cloth and would not allow air flow and convective forces to plague front travel. The front propagation in sealants is more even than in the velveteen but does not travel in a completely uniform pattern. Dispersion of the solution seems to have a greater effect on front travel.

9:30 SURFACE TENSION-INDUCED CONVECTION IN CHEMICAL REACTION

John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Most of us are familiar with buoyancy-driven convection-fluid flow caused by the interaction of gravity with differences in density in a fluid—but are less familiar with fluid motion causes by gradients if surface tension. At the interface between immiscible fluid fluids, a surface tension exists that is a function of temperature and concentration. If a temperature gradient exists in either fluid, then fluid motion can occur. Such fluid motion is very important in microgravity where buoyancy-driven convection is greatly reduced. We will consider how such convection can affect chemical reactions,

especially polymerization and polymer processing.

9:45 IN SITU SYNTHESIS OF IONIC LIQUID-POLYMER ELECTROLYTE COMPOSITES BY FRONTAL POLYMERIZATION

Jonathan Masere*, Yuri A. Chekanov, and John A. Pojman, University of Southern Mississippi, MS 39406

High-conductivity composites of polymers and ionic liquids were synthesized in situ by frontal polymerization. By employing frontal polymerization instead of the traditional batch polymerization, polymer composites with high salt percentages were synthesized while precluding macroscopic phase separation. The ionic liquid salts were used in place of organic plasticizers for acrylate polymer matrices. Using a solution of ammonium persulfate in dimethyl sulfoxide as an initiator, self-sustaining polymerization fronts were realized at high salt:monomer/polymer ratios. The resultant polymers had high electrical conductivities, between 10^{-3}–10^{-2} S cm^{-1}. DSC studies show that unlike composites of polyethers and chloroaluminates, the acrylate matrices exhibit a decrease in the crystallinity of the polymer-salt composites as the composition of the salt additives increases and, consequently, an increase in electrical conductivity is observed.

10:00 AN EXPERIMENTAL INVESTIGATION OF THE MECHANISM BEHIND ISOTHERMAL FRONTAL POLYMERIZATION: LIMITS OF EXPANSION

L. Lee Lewis*, Jennifer Coleman, and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Isothermal Frontal Polyermization (IFP) is a method of converting monomer into polymer through a localized propagating reaction zone. The proposed mechanism of IFP involves a polymer seed, i.e. a small piece of polymer, which is swollen by the diffusion of a solution of monomer and a thermal initiator. The current explanation for the propagating front involves the Trommsdorff effect, which is an acceleration of the overall rate of polymerization in a gel. While IFP is used industrially to manufacture Gradient Refractive INdex materials (GRINs), it is not certain whether the resulting polymer occurs through a mechanism involving solely diffusion or through a mechanism involving the Trommsdorff effect. We will discuss how a polymer is limited in the amount that it can swell and will discuss how various monomer/initiator/inhibitor systems have exceeded this limit of swelling. Ivanov et. al. have calculated a limit of swelling of 0.5 cm for a polymer/monomer system of poly(methyl methacrylate)/methyl methacrylate in a 70°C waterbath. Monomer/initiator/inhibitor systems that have been examined in our lab are methyl methacrylate/lauroyl peroxide/poly-4-vinyl phenol and methyl methacrylate/perkadox 30/poly-4-vinyl phenol. These systems have exceeded the limits of swelling by as much as 3.0 cm and 4.5 cm, respectively.

10:15 Break

10:30 THE AUTONOMOUS CHEMISTRY REFERENCE STATION

Curtis P. Colson III*, Jody Kirk, and Ron Marcy, Mississippi Gulf Coast Community College-Jefferson Davis Campus, Gulfport, MS 39507, and Mississippi Space Grant Consortium, University, MS 38677

The autonomous chemistry reference station is a multimedia reference station introduced into the chemistry laboratory. Students are able to supplement written materials with audio, video, color photography, and instructions via computer. The software illustrates techniques that aid in specific course work at Mississippi Gulf Coast Community College. The project is unique to physical science laboratories because it is not based on computer data acquisitions, and does not replace traditional equipment, but acts as a reference tool to students performing laboratory techniques. Students acting on scholarships act as the software developers. Initial usage and evaluation of a six-experiment station will begin in the spring semester of 1999.

10:45 COPOLYMER ADSORPTION ONTO MONT-MORMLONITE CLAY

Amy Marks*, Cheri McConnell Boykin, and Robert Y. Lochhead, University of Southern Mississippi, Hattiesburg, MS 39406

The goal of this project is to explore the factors that control ionic copolymer adsorption onto zwitterionic clay particles. To achieve this goal adsorption isotherms and phase diagrams have been constructed to determine the quantity of polymer adsorbed and the stabilization behavior. The variables of this study include pH (3, 7, 10), ionic character of the polymer, and clay and polymer concentrations. The 5 mol% cationic copolymer is poly(acrylamide-co-[3-(methacryloylamino)propyl]trimethyl ammonium chloride) (PAmMaap Quat) and the 12 mol% nonionic/anionic copolymer is poly(acrylamide-co-acrylic acid) (PAmAA). Adsorption of the PAmMaap Quat onto the clay occurred over all the pH's studied, while stabilization was observed at intermediate clay and polymer concentrations at pH 3 and 10. Alternatively, at pH 7, stabilization was observed at high clay and polymer concentrations. PAmAA was adsorbed to the clay only at pH 3 when the polymer is nonionic. No adsorption was observed at pH 7 and 10 when the polymer and clay are both negatively charged. At pH 3 stabilization was observed at high polymer concentrations and low clay concentrations, while at pH 7 and 10 the opposite occurred; stabilization at low polymer concentrations and low clay concentrations. In conclusion, only adsorption of the cationic and nonionic copolymers occurred. The amount adsorbed and the regions of stabilization were influenced by changes in pH, the ionic

character of the polymer, polymer concentration, and clay concentration.

11:00 INTERFACIAL SURFACE TENSION ACTIVITY AND EMULSION STABILITY OF HYDROPHOBICALLY MODIFIED DEXTRAN AND GLYCOGEN

D.R. Dorman, J.B. Shuman, and Robert Y. Lochhead*, University of Southern Mississippi, Hattiesburg, MS 39406

Glycogen and two molecular weights of dextran (282,000 molecular weight and 77,000 molecular weight) were hydrophobically modified using homogeneous conditions with DMF/LiCl or DMAC/LiCi as the solvent system and stearyl isocyanate as the hydrophobe. The reaction was conducted at 60°C and catalyzed with dibutyltin dilaurate. The percent substitution for each polymer system was varied with 1.6% substitution being the highest. This was confirmed through NMR Spectroscopy techniques. Phase diagrams were constructed with varying polymer concentration and weight percent of tetradecane. Both HM dextrans and HM glycogen formed creamed emulsions. The hydrophobically modified high MW dextran was the most effective emulsifier maintaining creamed systems over the majority of the concentrations and wt. percents. The modified glycogen was a less effective emulsifying agent at higher percents of tetradecane over time. The modified polysaccharides showed interfacial activity of 30 mN/M or less as measured with a Krüss DeNouy Ring Tensiometer. HM glycogen showed slightly more interfacial activity than the dextran systems. Glycogen was found to have an interfacial activity of 23 mN/M. A time phenomenon was seen in the interfacial activity of the more concentrated solutions, which was attributed to fortified networks of the hydrophobic groups.

11:15 X-RAY ANALYSIS OF SOLVENT-TREATED COALS: NON-PLANAR SOLVENT EFFECTS ON THE SWELLING OF BEULAH ZAP LIGNITE

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

Wide Angle X-ray Scattering (WAXRS) has been used to study the effective swelling of coals that have been treated with non-planar solvents. Beulah Zap lignite samples were exposed to various liquids, capped, and allowed to reach equilibrium over the course of one week. Solvents employed were hexane, chlorohexane, triethylamine, and ethanol. X-ray scattering patterns of the coal samples were obtained both before and after solvent-induced swelling had taken place. By examination of the scattering pattern taken from each sample, phase interference curves were produced. Fourier transforms of the phase interference curves were then conducted in order to obtain radial distribution and structural functions. These structural functions show the degree of swelling that a coal sample has undergone. Preliminary results indicate that some of the more polar solvents induce swelling even though they are lacking in planarity. It is concluded that the polar compounds swell the coal via interactions with polar sites located on the coal layers themselves.

11:30 MODELING GROWTH OF HETEROGENEOUS TUMOR

Wei-Yin Chen[1], Phanidhar Annamreddy[1]*, and L.T. Fan[2], [1]University of Mississippi, University, MS 38677, and [2]Kansas State University, Manhattan, KS 66506

It has long been recognized that the growth of tumor population depends on the initial age distribution and the age-dependent cellular birth rate. To take into account the effects of the resultant cell heterogeneity, deterministic dual-cell models have been available for sometime. Nevertheless, these models ignore various important variables of the growth process, some characterizing the cells' inherent properties, and others, environmental factors. This gives rise to uncertainties, or fluctuations, when the growth is simulated based on the models. Such fluctuations are the focus of the current stochastic analysis. Two types of cells are visualized to proliferate separately and to transform mutually during the process. The master equations of the system have been formulated through probabilistic population balance around a particular state by considering all mutually exclusive events. The governing equations for the means, variances and covariance of the random variables have been derived through the system-size expansion of the master equations. The stochastic pathways of the two different types of cells have been numerically simulated independently by the algorithm derived from the master equations as well as by an event-driven Monte Carlo algorithm. These algorithms have yielded results which are in excellent agreement.

11:45 Divisional Business Meeting

THURSDAY AFTERNOON

Room 1

2:00 A COLORIMETRIC INVESTIGATION OF THE ERICHROME BLACK T END POINT IN WATER HARDNESS DETERMINATIONS

Davida Edwards* and William C. Mahone, Mississippi Valley State University, Itta Bena, MS 38941

The determination of water hardness can be done titrimetrically using EDTA and an indicator usually calgamite or erichrome black T. The normal course of such a titration requires distinguishing between light blue and light wine red. Preliminary studies of the spectral signature of complexed and non-complexed indicate that the wavelength of maximum difference lies at 470 nm. In this study we correlate the

difference in spectral signatures to the end point of the water hardness titration.

2:15 FEMTOSECOND PUMP-PROBE EXPERIMENT ON THE EQUILIBRATED AQUEOUS SOLVATED ELECTRON

Kazushige Yokoyama[1]*, D-H. Song[2], C. Silva[2], P.K. Walhout[2], and P.F. Barbara[2], [1]Jackson State University, Jackson, MS 39217, and [2]University of Minnesota, Minneapolis, MN 55455

We have performed detailed femtosecond pump-probe measurements on the equilibrated hydrated electron over a broad probe wavelength range and with sufficient time resolution to observe inertial solvation dynamics. Rapid spectral evolution (on a 30–80 fs timescale) is observed, followed by evolution on slower timescales (~200–300 fs, ~1 ps). Pump-pulse intensity dependence studies reveal that the observed complex spectral evolution is due to a one-photon excitation regime at low pump intensity and a two-photon excitation regime at high pump intensities. Furthermore, the data is in agreement with the MD simulations that predict small isotope effects on the p-state lifetime.

2:30 STUDIES OF SOME TETRACYCLINE-METAL ION COMPLEXES

Wedad R. Hussein* and Christopher G. Walker, Jackson State University, Jackson, MS 39217

The tetracyclines, a group of broad-spectrum antibiotics are effective against aerobic and anaerobic, Gram positive and Gram negative bacteria. Tetracycline, although not the first to be discovered, is considered the parent of the group for nomenclature purposes. Tetracyclines share the common ³perhydronaphthacene² skeleton in which 4-acidic protons can be identified. It has been suggested that metal chelation plays a role in the tetracycline antibiotic action. Three models have been suggested for the metal ion-tetracycline complex based on the potential coordination site. From computational calculations, we found that one of the three models is the most likely complex to be formed. Proton transfer equilibrium constants were determined potentiometrically. Changes in the UV-visible spectra as the shift in absorbance at two wavelengths, lmsx = 276 and 355 nm as a function of pH in the presence and absence of Ca^+ were also determined.

2:45 SYNTHESIS AND CHARACTERIZATION OF $[CU_2(O_2C(CH)_2)_2COCH_3)_4(OP(C_6H_5)_3)_2]$

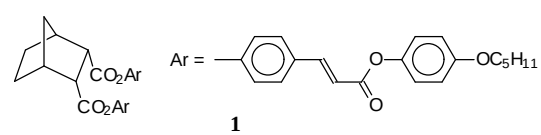
K. Thomas[1], Jeffery D. Zubkowski[1]*, and Edward J. Valente[2], [1]Jackson State University, Jackson, MS 39217, and [2]Mississippi College, Clinton, MS 39058

The reaction of copper(II) levulinate, $[CU_2(O_2C(CH)_2)_2COCH_3)_4]\cdot(O_2C(CH)_2)_2COCH_3$ = lev), with triphenylphosphine under different conditions has been investigated. The product of the reaction at room temperature produces $[CU_2(lev)_4\{\mu\text{-}(lev)Cu(P(C_6H_5)_3)_2\}_2]$. When the reaction is performed in refluxing ethanol $[CU_2(lev)_4(OP(C_6H_5)_3)_2]$ is produced. The copper has a square pyramidal coordination arrangement with bonds to four bridging carboxylates and an oxygen from a triphenylphosphine oxide. Green, elongated crystals were studied which showed the complex to be monoclinic in the P2(1)/c space group having the unit cell dimensions of a = 17.431(6), b = 17.820(5), c = 117.650(6) Å, while ß = 91.22(3)° and Z = 4. The structure is compared to similar complexes. The compounds are discussed with respect to correlations of their molecular structure with spectroscopic and electronic data.

3:00 SYNTHESIS OF INTRAMOLECULAR MODELS FOR INTERMOLECULAR AGGREGATES OF ARYL CINNAMATE CHROMOPHORES

Rabih O. Al-Kaysi* and David Creed, University of Southern Mississippi, Hattiesburg, MS 39406-5043

Chromophore aggregates are important to the photochemistry of liquid crystalline polymers. By attaching two aryl cinnamate chromophores to a rigid norbornane skeleton, we obtained an oriented intramolecular model, **1,** for a random intermolecular aggregate. The Diels-Alder adduct of maleic anhydride and cyclopentadiene, was esterified with 4-(benzyloxy)phenol using 1,3-dicyclohexylcarbodiimide and 4-dimethylaminopyridine. Catalytic hydrogenation over palladium on activated carbon produced a phenol to which a functionalized cinnamic acid derivative was added *in situ* using trifluoroacetic anhydride as the coupling agent. The structure was confirmed using ^1H and ^{13}C nuclear magnetic resonance spectroscopy.



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3:15 LIQUID CRYSTAL ELASTOMERS—A MOLECULAR ENGINEERING APROACH TO AUXETIC POLYMERS

Chad J. Booth*, Chaobin He, and Anselm C. Griffin, University of Southern Mississippi, Hattiesburg, MS 39406

Contrary to almost all known materials, “auxetic” materials are those that expand laterally when stretched (a negative Poisson’s ratio). While there are examples of materials which exhibit auxetic behavior most of these are mechanistically based on a macroscopic structure. The systems discussed here are both microscopic in structure and lightly crosslinked. These should afford a higher degree of mechanical integrity. The auxetic behavior is accomplished by

incorporating both terminally and laterally attached mesogens (rods) into the polymer backbone. In the relaxed state, the laterally attached rods should be forced by the nematic director to align parallel to terminally attached rods. When the system is streched, these laterally attached rods should reorient causing an increase in the interchain distance. This increase in interchain distance should cause the auxetic effect. This study will discuss the LC behavior of these polymers as well as the early mechanical data obtained. Data thus far shows that the addition of both laterally attached rods as well as crosslinking does not destroy the LC properties of the polymer. In addition, the crosslinking enhances both the mechanical properties as well as the LC character of the polymers. We wish to thank the NSF (DMR-9420843) for support of this research and the NSF (DMR-9512506) for the acquisition of thermal instrumentation facilities.

3:30 ELECTROCHEMICAL STUDIES OF THE TETRANUCLEAR (μ_4-O){N,N-diethylnicotinamide}$_4$Cu$_{4\alpha}${Ni(H_2O)}$_x$Cl$_6$} (x =0 - 4) COMPLEXES

Bizuneh Workie, Jackson State University, Jackson, MS 39211

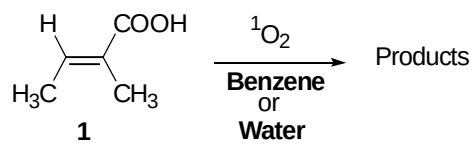
Electrochemical studies of the tetranuclear Cu/Ni heteropolymetallic complexes (μ_4-O)(denc)$_4$Cu$_{4\alpha}$(Ni(H_2O))$_x$Cl$_6$ (denc = N,N-diethytnicotinamide and x = 0 - 4) in 0.20 M tetrabutylammonium hexafluorophosphate/dimethyl sulfoxide have shown that the complexes are electrochemically active. At higher cathodic potential, electroreduction of the complexes leads to deposition of Cu/Ni alloy with codeposition of Cu(I) oxide, Ni(II) oxide and Ni(II) hydroxide, and display a complicated set of cyclic voltammograms. In the initial potential range, 0.250 to 0.450 V vs. Ag-AgPF$_6$(0.0l M)-CH_3CN, cyclic voltammetric studies have shown that all the completes accept Ni$_4$ exhibit quasi-reversible bchavior. In this initial range, voltammetric results indicate that electron transfer takes place at some of the copper center of the complexes and forms a charge transfer intermediate in which the coordination core structure remain intact. Electrochemical studies have shown the number of electrons (n) transferred in this initial reduction potential region of the complexes depend on the metal composition of the camplexes, and were 3.1, 2.1, 1.8 and 0.57 for the Cu$_4$, Cu$_3$Ni, Cu$_2$Ni$_2$, and CuNi$_3$ complexes, respectively. The diffusion coefficient for all compexes was 2.2 (± 0.1) x 10^{-6} cm^2s^{-1}. As the number of Cu atoms decrease in the heteropolymetallic complexes, the cathodic peak current, i_{pc}, and anodic peak current, i_{pa}, in the initial redox potential region decrease proportionally and tile peak potentials shift anodically. The electronic spectrum of the Cu$_4$ complex taken after exhaustive electrolysis show that one quarter of the Cu atoms remain in the Cu(II) form and that the Cu(I) complex remains stable. Since only a single CV peak results for all the complexes, the electron transfer is wost likely consecutive with very closely spaced E° potentials. A model based on statistically determined electron transfer to Cu(II) in particular faces is also proposed.

3:45 Divisional Poster Session

REACTION OF TIGLIC ACID WITH SINGLET OXYGEN IN AN AQUEOUS MEDIUM

Brian G. Means* and Kristina L. Stensaas, Millsaps College, Jackson, MS 39210-0001

A comparison of the "ene" reaction of tiglic acid **1** with singlet oxygen ($^1O_2$) utilizing either benzene or water as the solvent will be described. These photooxidations were carried out in an NMR tube and the products were monitored using ^{1}H NMR. The results indicate that the great difference in solvent polarity affects the products formed in each reaction.



CONCENTRATION OF INORGANIC POLLUTANTS IN THE WATER AND BED SEDIMENT OF THE RIVER PADMA

F. Zereen[1]*, F. Islam[1], D.A. Begum[1], and M.S. Zaman[2]*, [1]Rajshahi University, Rajshahi 1205, Bangladesh, and [2]Alcorn State University, Alcorn State, MS 39096

The pollution status of the Padma river water and bed sediment was determined by analysis of representative for selected metals and ions. Water and bed sediment samples were collected at a T-dam, Rajshahi, Bangladesh, for a seven month period. Sample metal content analysis was performed using an Atomic Absorption Spectrophotometer. The occurrence of Na, K, Ca was in the normal range (US EPA Permissible Limit), but the levels of Cr in water was much higher than the permissible limit. The SO_4 ion content was much below the pollution level. The concentration of Pb in the bed sediment was within the permissible limit for the standard IAEA soil-5a but the concentration of Cr in the bed sediment was significantly higher than the permissible limit for the standard IAEA soil-5a. Thus, the Padma river water was polluted with respect to Cr. The occurrence of some ions showed a monthly variation.

THE AUTONOMOUS CHEMISTRY REFERENCE STATION

Jody Kirk*, Curtis P. Colson III, and Ron Marcy, Mississippi Gulf Coast Community College-Jefferson Davis Campus, Gulfport, MS 39507, and Mississippi Space Grant Consortium, University, MS 38677

The autonomous chemistry reference station is a multimedia reference station introduced into the chemistry

laboratory. Students are able to supplement written materials with audio, video, color photography, and instructions via computer. The software illustrates techniques that aid in specific course work at Mississippi Gulf Coast Community College. The project is unique to physical science laboratories because it is not based on computer data acquisitions, and does not replace traditional equipment, but acts as a reference tool to students performing laboratory techniques. Students acting on scholarships act as the software developers. Initial usage and evaluation of a six-experiment station will begin in the spring semester of 1999.

MODELING THE α-CHLOROTHIOETHERS: POTENTIAL APPLICATIONS IN THE SYNTHESIS OF NOVEL α-AMINO ACIDS

Daniel A. Osborne*, David H. Magers, and Anthony B. Dribben. Mississippi College, Clinton, MS 39058

The geminal substitution pattern of α-chlorothioethers (or α-chlorosulfides) provides a functionality with several attractive features for chemical synthesis. α-Chlorothioethers are particularly useful as aldehyde or ketone equivalents, as reactive electrophiles which can react with the appropriate nucleophile in a variety of sulfur-mediated reactions to produce compounds which are difficult to produce by other methods. This paper presents the potential use of α-chlorothioethers derived from L-methionine as reactive intermediates in the synthesis of novel α-amino acids. In order to assess the feasibility of this process, we present a systematic exploration of the basic structural features of α-chlorothioethers through molecular modeling and semiempirical techniques. Analysis of the electrostatic potential and hyperpolarizabilities of these molecules offer some insight into the electrophilic character and reaction possibilities they possess. Future synthetic applications will also be presented.

THE ROLE OF TEMPERATURE AND TIME ON THE FERMENTATION PROCESS OF MILK

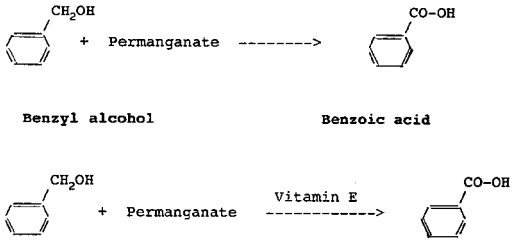
Stacy R. Smith*, Mudlagiri B. Goli, and Abigail Newsome, Mississippi Valley State University, Itta Bena, MS 38941

The white color and good taste of the yogurt seems critical in consumer acceptance of yogurt products. Our aim was to study the parameters, which can give us insight into the fermentation process of the nonfat and whole milk. The sourness (the acidity), is definitely one of the deciding factor in like or dislike of yogurt products. We have seen that the temperature and time of fermentation have a major role in deciding the pH and lactic acid composition of the prepared yogurts. We have also studied the pH and lactic acid composition of the popular brands of plain yogurts. These and other results will be presented.

VITAMIN E: AN ANTI-OXIDANT AND A RADICAL SCAVENGER

Lovell E. Agwaramgbo, Candra S. Smith, and Corey B. Wilder*, Tougaloo College, Tougaloo, MS 39174

Radical pathway has been implicated in the on-set of cancer, hypertension, aging, and lipid peroxidation processes. Many studies have reported that some compounds tend to slow down some of these processes. Our probe focuses on understanding if vitamin E can inhibit oxidation reaction or scavenge a radical. Oxidation and radical initiated reactions were carried out in the presence and absence of vitamin E. The preliminary results suggest that non of the expected products were observed in the reactions with vitamin E. Acknowledgment: We thank NIH-MARC Grant, and Ramgbo Innovative Research Concepts for their financial support of this project. We also wish to thank Dr. John Pojman of USM for his help and suggestions.



CONVERTING WOMBAT WASTE TO FERTILIZER

Stacy A. Booth* and David L. Wertz, University of Southern Mississippi, MS 39406

A waste product of the WOMBAT process is nitric acid. The objective of this study is to determine the number of cycles for which the nitric acid may be used to chemically attack scrap tires and to determine the use of the waste nitric acid after it has been sufficiently depleted. After recycling the nitric acid through the WOMBAT, the nitric acid was reacted with ammonium carbonate or ammonium hydroxide in the hood. This reaction used enough ammonium carbonate or ammonium hydroxide to neutralize the pH of the nitric acid. Having neutralized the pH of the solution of nitric acid and ammonium carbonate or ammonium hydroxide, the solution was left in the hood to dry. The product of this procedure contained needlelike crystals and was yellow to brown in color. Research supported by Mississippi Department of Environmental Quality.

SYNTHESIS, SPECTROSCOPY AND STRUCTURE OF AQUO-*O*-PHENANTHROLINE-L-PROLINATO-COPPER(II)NITRATE MONOHYDRATE

Kiwana T. Johnson[1], Rainaiyer Venkatranian[1]*, Jeffrey D. Zubkowski[1], and Edward J. Valente[2], [1]Jackson State

University, Jackson, MS 39217, and [2]Mississippi College, Clinton, MS 39058

Complexation of copper (II) nitrate hydrate with L-Proline in the presence of an equivalent of *o*-phenanthroline produces aquo-*o*-phenanthroline-L-prolinato(N,O)copper (II) nitrate as a monohydrate. The monoclinic crystals have two independent complex cations in which coppers have a square pyramid coordination geometry with apical water and differing in orientation of bidentate proline. In one, L-proline α-CH and NH lie on the same side as coordinated water and the Cu-OH_2 distance [2.382(3)Å] is longer than in the other complex [2.234(4)Å] in which α-CH and NE are oriented below the pyramid base. The difference is linked to the coordination of copper by a carboxyl oxygen from a neighboring inequivalent complex, which weakly coordinates *trans* to the water, with the longer C-O-Cu distance [3.390(4)Å] opposite to the shorter Cu-OH_2, and the shorter C=O-Cu distance [3.102(4)Å] opposite to the longer Cu-OH_2.

PHOTODEGRADATION OF PHENOLPHTHALEIN CATALYZED BY TiO_2

Tywanda D. Jefferson* and Ken S. Lee, Jackson State University, Jackson, MS 39217

Photodegradation of phenolphthalein in a basic aqueous solution was monitored by measuring the UV absorption of the compound from the mixture. Phenolphthalein was mixed with titanium dioxide in basic aqueous solution and it was irradiated by Ultraviolet Visible (UV) light. A small portion of solution was withdrew every 10 minutes and the UV absorption of each sample was measured at a range from 400 to 700 nm. The solution gave a peak at 552 nm and the absorption was gradually decreased as irradiation continued. Titanium dioxide catalyzes the photodegradation of phenolphthalein anion. We also have found that as the concentration of TiO_2 was increased so did the rate constant. As a result to this, the rate law of reaction is first order for the concentration of the phenolphthalein anion. The rate law and the possible degradation pathway will be discussed in detail.

PHOTODEGRADATION OF METHYL ORANGE CATALYZED BY TiO_2

Regina Thomas*, Cung-Tuong N. Nguyen, and Ken S. Lee, Jackson State University, Jackson, MS 39217

Photodegradation of methyl orange in aqueous solution was monitored by measuring the UV absorption of the compound from the mixture. Methyl orange was mixed with titanium dioxide in aqueous solution and it was irradiated by Ultraviolet Visible (UV) light. A small portion of solution was withdrew every 10 minutes and the UV absorption of each sample was measured at a range from 300 to 600 nm. The solution gave a peak at 463 nm and the absorption was gradually decreased as irradiation continued. Titanium dioxide catalyzes the photodegradation of methyl orange. The rate law of reaction is first order for the concentration of the methyl orange. The irradiate aqueous solution was analyzed by HPLC to detect the decomposed product of reaction. The rate law and the possible degradation pathway will be discussed in detail.

SEARCHES ON THE POTENTIAL ENERGY SURFACES OF BPH_2 AND $AlNH_2$

Chris Benton* and David H. Magers, Mississippi College, Clinton, MS 39058

Optimum geometries are computed at both the SCF level of theory and the level of second-order perturbation theory for several isomers on the potential hypersurfaces of BPH_2 and $AlNH_2$. Several starting geometries are investigated including linear structures, *trans*-bent structures, methylenecarbene-like structures, and mono-bridged and double-bridged structures. In addition, harmonic vibrational frequencies are computed for the optimized structures to characterize them as local minima or transition states. Infrared intensities within the double harmonic approximation are also determined. Two basis sets, both of triple-zeta quality on valence electrons, are employed for all computations. One set contains one *d* polarization function on all heavy atoms and one *p* function on all hydrogens; the other includes two *d* and one *f* polarization function on all heavy atoms and two *p* functions and one *d* fuction on hydrogen. Previous investigations of ours indicate that large basis sets such as those employed in this study can in part compensate for the lack of a more advanced treatment of electron-correlation. We gratefully acknowledge support from NSF EPSCoR (OSR-9452857).

DIASTEREOMERIC DISCRIMINATION: DEOXYEPHEDRINE FLUOROMANDELATES

Marcus E. Harris* and Edward J. Valente, Mississippi College, Clinton, MS 39058

Reaction of (-)-deoxyephedrine with racemic o-, m-, and p-fluoromandelic acids in equimolar quantities produces diastereomeric salts which do not differentiate by solubility from 95% ethanol. These salts have an imbalance between the numbers of donor and acceptor salt-bridge interacting groups, which, in the parent (unsubstituted) mandelates led to fairly large nondiscriminatory solubilities in 95% ethanol and similar heats of fusion and fusion points between diastereomers. Directed synthesis was required to produce pure deoxyephedrinium fluoromandelate diastereomers. (+)-Pseudoephedrine was used to separate and purify the optically pure o-fluoromandelic acids; (-)-ephedrine was used for the m- and p-fluoromandelic acids. The fusion points, heats of fusion, and solubilities of the diastereomeric deoxyephedrinium fluoromandelates have been determined. We acknowledge

instrumental support from NSF (DUE#9650316, #9250769).

FLUORIMETRIC ANALYSIS OF HYDROXYCOUMARINS AND THEIR HYDROLYTIC INSTABILITY

J. Mark Eubanks* and Edward J. Valente, Mississippi College, Clinton, MS 39058

Derivatives of 4-hydroxycoumarin, including the oral anticoagulant drug warfarin are moderately fluorescent. Their solublility is quite low in neutral and acidic media, but increases for enolizable derivatives in alkaline media. 4,5-Dihydroxycoumarin is considerably more fluorescent than 4-hydroxycoumarin, but this property decreases over time in alkaline aqueous solution. Furthermore, all compounds in this class experience time dependent loss of fluorescence. The rate is dependent on pH, and is consistent with a alkaline hydrolysis of the coumarin lactone ring. We acknowledge instrumental support from NSF (DUE#9650316, #9250769).

MOLECULAR AND ELECTRONIC STRUCTURE OF TYROSINE AND ITS RADICAL IN GAS PHASE AND IN SOLUTION. A POST HARTREE-FOCK QUANTUM MECHANICAL STUDY

Ramaiyer Venkatraman*, Ali Jabalameli, Andrzej Nowek, and Richard H. Sullivan, Jackson State University, Jackson, MS 39217

Molecular geometries of tyrosine and tyrosine radical were optimized at the second-order Moller-Plesset (MP2) and the Density Functional Theory (DFT) levels of theory using double-zeta quality basis sets augmented by sets of polarization functions. Influence of water on their molecular and electronic structures in solution was investigated using self-consistent reaction field (SCRF) method adopting polarized continuum model (PCM) of the solvent at the DFT level. Significant effects of water solvation processes (ΔF_{solv}~-12 kcal/mol) were established.

SEARCHES ON THE POTENTIAL ENERGY SURFACES OF BNH_2 AND $AIPH_2$

Jess Youngblood* and David H. Magers, Mississippi College, Clinton, MS 39058

Optimum geometries are computed at both the SCF level of theory and the level of second-order perturbation theory for several isomers on the potential hypersurfaces of BNH_2 and $AIPH_2$. Several starting geometries are investigated including linear structures, *trans*-bent structures, methylenecarbene-like structures, and mono-bridged and double-bridged structures. In addition, harmonic vibrational frequencies are computed for the optimized structures to characterize them as local minima or transition states. Infrared intensities within the double harmonic approximation are also determined. Two basis sets, both of triple-zeta quality on valence electrons, are employed for all computations. One set contains one *d* polarization function on all heavy atoms and one *p* function on all hydrogens; the other includes two *d* and one *f* polarization function on all heavy atoms and two *p* functions and one *d* fuction on hydrogen. Previous investigations of ours indicate that large basis sets such as those employed in this study can in part compensate for the lack of a more advanced treatment of electron-correlation. We gratefully acknowledge support from NSF EPSCoR (OSR-9452857).

FRACTIONATION OF THE ANTIINFECTIVE COMPONENTS OF *TRICHILIA HIRTA*

Ja'Wanda Grant, John S. Williamson, and Mitchell A. Avery*, University of Mississippi, University, MS 38677

The mahogany family (Meliaceae) is a family of woody tropical plants, characterized by its synthesis of tetranortriterpenoids, also known as limonoid compounds; the family's well-known bioactivity against insects is generally attributed to these compounds. As part of the National Center for the Development of Natural Products (NCDNP) program of isolation and screening of diverse plants, *Trichilia hirta* obtained by international collection, was routinely screened for a variety of activities. Potent activity against the causative agent of giardiasis, an intestinal disorder caused by the protozoa *Giardia intestinalis*, was demonstrated *in vitro* indicating that further fractionation for bioassay-directed isolation was warranted. Accordingly, several hundred grams of *T. hirta* leaves were pulverized and extracted with methanol-chloroform and the crude extract was studied by thin-layer chromatography. A suitable analytical system was developed and the material was submitted to silica gel chromatography. Ten fractions were collected and analyzed by TLC; a portion was transferred to the NCDNP for further screening. Future goals are to determine which fraction(s) contain the antigiardial activity, and to further fractionate them until a single agent can be purified. The pure material will then have its structure elucidated by modern techniques and the resulting structure will serve as a starting point for further drug development.

THE EFFECTS OF CARBON DIOXIDE ON POLYNUCLEAR AROMATIC HYDROCARBONS

Larry Arnold*, Todd French, and Lewis R. Brown, Mississippi State University, Mississippi State, MS 39762

Polynuclear aromatic hydrocarbons (PAHs) are used as precursors to many compounds and as preservatives. The preservative quality of the PAHs has been employed to extend the life of utility poles and the prevention of clothes destruction by moths. It is this quality which has lead to the persistence of PAHs in the environment. The longer PAHs persist in the environment the more likely humans will be exposed. In the human body, PAHs can be enzymatically

converted to a carcinogenic product. In order to minimize human exposure many remdiation technologies have been investigated. Biological remediation of PAH contaminated soils and sediments has been investigated by numerous scientist. Microbial degradation of PAHs has been well documented both *in situ* and *ex situ*. However, little is known as to the role carbon dioxide plays in the metabolism of PAHs. This study investigated the effect of 0.5% and 1.0% carbon dioxide on PAH metabolism using manometric techniques. This study showed that there were differences in PAH metabolism when carbon dioxide was present verses those samples where carbon dioxide was removed by a potassium hydroxide trap. The study showed that there was a difference in PAH metabolisms with the different concentrations of carbon dioxide. This study showed that it might be important to maintain carbon dioxide in the headspace when conducting *in situ* studies. As a result, the experimental design would simulate those conditions found in the environment more closely and the transition from the laboratory to the field would be less complicated.

OPTIMIZING THE WOMBAT PROCESS

Ashley Trahan* and David L. Wertz*, University of Southern Mississippi, Hattiesburg, MS 39406-5043

The conversion of scrap tires into their physical and chemical components through an environmentally safe chemical process is being carried out in a WOMBAT reactor by reacting tire with concentrated nitric acid (HNO_3). The optimum chemical conditions are being studied in a micro scale reactor called the "baby Bat." The miniature reactor is 1/50 the size of the WOMBAT reactor, which allows the reaction parameters to be studied at a low cost with little waste production. Each reaction produces steel belts, rope, reacted tire, un-reacted tire, and NO_2 gas, which is converted back into HNO_3. The ratio of HNO_3 to tire that yielded the best tire conversion and liquid recovery has been determined. The HNO_3 was also recycled through several reaction cycles to determine how long the acid remains strong enough to complete the conversion. A linear pattern in the volume of HNO_3 used in each cycle and in the percent recovery of the acid showed that 50 ml of acid was used per cycle for the complete conversion of tire to products. No trend existed in the recovered reacted or un-reacted tire, but the recovery of steel belts increased as the volume of HNO_3 decreased, indicating that the excess HNO_3 may corrode the steel belts. A new "twin Bat" reactor was built so that the HNO_3 could be transferred without releasing any gases produced into the atmosphere. Temperature and pressure are being measured. In the new reactor system the goal is to find a way to use a smaller volume of HNO_3 per kg tire.

A STUDY OF THE DYNAMIC ASPECTS OF POLYPROTIC ACID BASE REACTIONS

Solomon Green* and William C. Mahone, Mississippi Valley State University, Itta Bena, MS 38941

Amphoteric anions can function as either Bronsted acids or bases. They usually encountered as intermediates in polyprotic acid equilibration pathways. A slow addition of titrant process involves a minor displacement from equilibrium while a rapid addition of titrant involves a large displacement. PH versus time curves for various kinds of displacements provides insights into the kinetics of competing processes. To investigate these processes the recorder output of a standard pH meter was interfaced to a computerized data acquisition system. This system acquired data at the rate of one point per second, which was at a minimum five times faster than the instrument response.

A PHOTODEGRADATION STUDY OF ANTHRACENE AND 9-NITROANTHRACENE

Xiao-Chun Shi*, Huey-Min Hwang, Hongtao Yu, Sean Cook, Isi Ero, and Shiming Dong, Jackson State University, MS 39217

Polycyclic aromatic hydrocarbons (PAHs) occur ubiquitously in the environment. Understanding how these compounds are degraded in nature is very important because of their toxicity to marine fish and threat to human life. Time-course photodegradation of anthracene and 9-nitroanthracene was studied with spectrophotometry under outdoor sunlight. The main absorption peaks are 376 nm, 356 nm, 339 nm for anthracene and 382 nm, 364 nm, 348 nm for 9-nitroanthracene, respectively. The photodegradation rate of 9-nitroanthracene ($t_{½}$ = 18 min) is faster than that of anthracene ($t_{½}$ = 1.5 hrs), indicating more active photoreactivity for 9-nitroanthracene. Chromatographic analysis with HPLC (reverse phase C18 column, 80% acetonitrile : 20% water) indicated that photoproducts of 9-nitroanthracene (89.6µM) appeared after 20 minutes (retention time at 4.03 min), with corresponding decrease in the main peak of parent compound (retention time at 5.4 min). After 2.6 hrs of photolysis, the photoproduct was further degraded to near extinction. Sructure of the photoproduct will be identified by GC-MS and NMR.

DNA PHOTOCLEAVAGE BY ENVIRONMENTAL CARCINOGENS: POLYCYCLIC AROMATIC HYDROCARBONS

Shiming Dong*, Christopher Harrison, Laketa Holloway, Huey-min Hwang, and Hongtao Yu, Jackson State University, Jackson, MS 39217

Polycyclic aromatic hydrocarbons (PAH) are ubiquitous environmental carcinogens. They can cause cancer through a variety of pathways. Recently, PAHs are found to be photochemically active. Under laser light irradiation, benzo[a]pyrene diol epoxide, the metabolic intermediate of

benzo[a]pyrene that is considered to be the ultimate carcinogen, can cause DNA damage. Photodamage of DNA can be a source of genotoxicity of these compounds. In this research we examined three PAHs, 9-nitro-anthracene, 1,4-chrysene-quinone, and 3-nitro-fluoranthene, for their ability to photocleave plasmid FX-174 phage DNA. After the mixture of the PAH with DNA was irradiated with a 100 W UV lamp for two hours, the resulting DNA was examined using agarose gel electrophoresis. It showed that the native form I DNA was converted to form II DNA due to photocleavage. In contrast, no cleavage was seen when the mixture was kept in the dark or no PAH was present under light. The cleavage is PAH concentration dependent. When more PAH is present, more DNA cleavage is seen. The relative efficiency of the cleavage is compared in terms of the concentration of the PAHs that causes 50% of DNA cleavage. Other PAHs are also examined using this method.

FRIDAY MORNING

Room 1

9:00 INVESTIGATION OF THE MACROCYCLIC ANTIBIOTICS ENANTIOSELECTIVITY THROUGH STRUCTURAL MODIFICATION

W. Jason McManus* and Timothy J. Ward, Millsaps College, Jackson, MS 39210

Recently the macrocyclic antibiotics, in particular the glycopeptides, have been shown to be a powerful class of chiral selectors in capillary electrophoresis (CE). Numerous chiral compounds, such as dansyl amino acids, nonsteroidal anti-inflammatories, antineoplastics, and several carboxylic acid compounds, have been successfully resolved using vancomycin and ristocetin A. One problem that the glycopeptide antibiotics present in CE work is their strong absorbance in the UV region. To overcome UV interference, we have developed a novel approach that involves coating the capillary column wall to suppress electroosmotic flow and employing a countercurrent process between the chiral selector and racemic solute. We have also examined the contribution of various functional groups to enantioselectivity by varying experimental parameters such as pH. In addition to examining experimental parameters, we are modifying the structure of the chiral selector to determine the contribution of the sugar moieties of the macrocyclic antibiotics to chiral recognition. Using enzymes, we have attempted to cleave the pendant sugar moeities of vancomycin and study their contribution to enantiorecognition and gain insight into the mechanism of separation.

9:15 AN INVESTIGATION OF BUBBLE FORMATION IN HIGHLY VISCOUS FRONTAL POLYMERIZATION SYSTEMS

William L. Clarida*, Jonathan Masere, and John A. Pojman, University of Southern Mississippi Hattiesburg, MS 39406

The behavior of bubbles formed in a highly viscous self-propagating polymerization reaction was investigated. It is apparent that the final product is affected by the patterns of bubble dispersions. Bubble formation and the directional behavior of the bubbles can be used to investigate the dynamics of the reaction involved particularly at the reaction front. We will discuss attempts to predict and direct bubble dispersion patterns and the effects on the resulting polymeric material.

9:30 A NEW METHOD FOR MANUFACTURING OF POLYMER MATERIALS VIA FRONTAL POLYMERIZATION

Yuri A. Chekanov* and John A. Pojman, University of Southern Mississippi, MS 39406

A new method to produce gradients in polymeric materials based on thermal frontal polymerization has been developed. Frontal polymerization is a self-sustaining mode of converting monomer into polymer via a localized reaction zone that propagates through the coupling of the heat released by the reaction and thermal diffusion. The defining feature of thermal frontal polymerization is the sharp temperature gradient present in the front. The formation of polymer material was accomplished by ascending frontal polymerization in a cylindrical reactor. To realize this idea, liquid monomer was continuously fed on the top of the front, so there always was a thin layer of liquid monomer on the top of growing sample. The layer thickness, L, is an important parameter for this technique. To measure of temperature profiles and determine how L depends on feed speed was the main goal of this work. The process developed is very easy to control and it is very promising for formation of gradient materials, that is materials with gradient of properties, because composition of supplied monomer can be changed in desirable manner in course of formation of material. Polymeric materials with gradient of optical and mechanical properties have been produced by this technique in our laboratory.

9:45 POLYMERIC FOAM PRODUCTION IN FRONTAL POLYMERIZATION

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

Using frontal polymerization techniques, a new method of polymeric foam production has been developed. The addition of a low boiling point foaming agent to a monomer/initiator system results in the production of a thermoset foam. A polymerization front produces high temperatures due to the exothermic release of energy when the polymer is formed. The high temperature allows the foaming agent to boil ahead of the propagating front causing the formation of bubbles around which the solid polymer forms. This method offers several advantages over current polymeric foam production methods, most of which have been subject to criticism for hazardous waste production and pollution. With this method, there is a significantly smaller amount of pollution released because of the small amount of foaming agent needed for the foaming process. The polymerization reaction requires less initial energy than traditional methods because of the exothermic release of energy that is high enough to cause a self-sustaining free-radical polymerization front. This process is performed at normal atmospheric pressure so that bubble formation is not suppressed by increased pressure. This also gives the entire process a measure of simplicity that the other methods lack. The role of buoyancy will be explored by comparing lab experiments to those performed in microgravity.

10:00 ORIENTATION DEPENDENCE OF THE FRONT VELOCITY OF DESCENDING THERMAL FRONTS

Mervin Bazile, Jr.*, Archie Nichols, and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406, and Vital Volpert, Université Lyon I, Lyon, France

A descending thermal front of a reaction that produces a solid product from a liquid reactant can be affected by gravity through the convection produced under the front if the tube is not vertical. We studied the frontal polymerization of acrylamide/bisacrylamide in DMSO as a function of the tube angle. The closer the tube was to horizontal, the faster was the front. The effect of the initial viscosity and the intrinsic front velocity were studied. If the viscosity were very low, then the velocity would depend on 1/cos angle.

10:15 Break

10:30 A THERMAL INVESTIGATION OF THE COMPONENT MIXTURES OF THE LIQUID CRYSTAL E7

Nicole L. Gill*, Joe B. Whitehead, and Niekiletta Woullard, University of Southern Mississippi, Hattiesburg, MS 39406

Eutectic liquid crystal (LC) mixtures are used in the fabrication of LC devices because of their wide nematic temperature range and their large birefringence. The wide nematic temperature range of these eutectic LCs results from the suppression of the melting temperature when two or more components are mixed in specified mole fractions. The melting temperature of these mixtures is suppressed below the individual components. We are investigating the melting behavior of the binary component mixtures of the eutectic LC E7. The E7 components are K15 (4-pentyl-4'-cyanobiphenyl), K21 (4-heptyl-4'-cyanobiphenyl), M24 (4-hexyloxy-4'-cyanobiphenyl), and T15 (4-pentyl-4'-terphenyl). Experimentally, the E7 components are mixed in different combinations and mole fractions, and characterized using Optical Microscopy and Differential Scanning Calorimetry. The leChatelier-Schroder-van Laar equations are used to predict the melting temperatures. The experimental and theoretical melting temperatures are compared to determine which mixtures exhibit eutectic behavior. In addition, effective enthalpy values for the pure components will be determined from the experimental data and compared to the literature values.

10:45 VISCOSITY STUDIES OF SURFACTANTS ON HYDROPHOBICALLY MODIFIED POLY-ELECTROLYTE SOLUTIONS

David A. Presken*, Stacey V. Maggio, and Robert Y. Lochhead, University of Southern Mississippt Hattiesburg, MS 39406

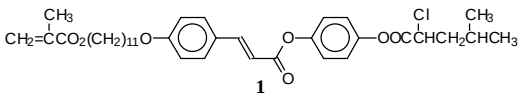
Polyelectrolyte-surfactant interactions are used in many industrial applications such as cosmetics, pharmaceuticals, and detergents because of the unique properties they impart to these products. These interactions are due to a fine balance of hydrophobic, hydrophilic and ionic interactions. It is believed that changing the hydrophobic and ionic character of the system, will enable us to coutrol the desired liquid crystalline phase behavior of these systems. This project deals with changing the charge density and hydrophobic content of a polyclectrolyte, poly(vinylamine) (PVAm). This polymer is used because the polyelectrolytes' charge density is easily adjusted by changing the pH of the sample and the amine monomer units facilitate hydrophobic modification. The surfactant used is dodecyltrimethylammonium bromide (DTAB), because the head groups are similar to the amine groups on the polymer backbone. To gain insight into the polyelectrolyte/surfactant interactions the viscosity of solutions of varying concentrations was measured. The aqueous solution viscosity of unmodified PVAm and DTAB showed that as the concentration of the polymer was held constant and the surfactant concentration was increased the viscosity decreased. When the polymer concentration was increased so did the viscosity and when the pH was decreased the viscosity

increased. We expect to see a dramatic increase in viscosity for the hydrophobically modified PVAm/DTAB solutions to occur near the critical micelle concentration of the surfactant.

11:00 PHOTOCHEMICAL AND PHOTOPHYSICAL STUDIES OF SIDE CHAIN POLYMERS WITH A CHIRAL TAIL

S.N. Shah* and David Creed, University of Southern Mississippi, Hattiesburg, MS 39406-5043

We have synthesized a liquid crystalline side chain polymer by the method reported by Messner and Finkelmann. The polymer has methylacrylate monomeric units which are attached to the mesogenic moiety, a chiral cinnamic acid 2S -(-)4-(2-Chloro-4-methylpentanoyloxy) phenyl ester, by a flexible spacer of eleven CH_2 group. Both the polymer and monomer, **1**, have smectic C* phases. Tilting of the chromophores in this mesophase may affect the polymer UV-Vis spectrum and photochemistry.



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11:15 TEMPERATURE AND PHASE DEPENDENCE OF THE PHOTOPHYSICS AND PHOTOCHEMISTRY OF A LIQUID CRYSTALLINE STILBENE POLYMER

A.M. Peeler*, David Creed, and C.E. Hoyle, University of Southern Mississippi, Hattiesburg, MS 39406

Chromophore aggregates are observed by UV-Vis and fluorescence spectroscopy using spin cast thin films of a main chain liquid crystalline stilbene polymer. In UV-Vis spectroscopy, the H or K type aggregation is identified by a decrease in the intensity and a blue shift of the l_{max}, while in fluorescence spectroscopy a red-shifted 'excimer-like' emission is seen. Both UV-Vis and fluorescence spectra of films are temperature dependent. 'Excimer-like' fluorescence diminishes reversibly with increasing temperature. In contrast to the behavior of excimers in solution, the 'excimer-like' emission decreases with increasing temperature without an increase in the monomer fluorescence. This effect may be due to a competing photochemical reaction that is enhanced at increased temperature.

11:30 SYNTHESIS AND CHARACTERIZATION OF LIQUID CRYSTALLINE POLYMERS CONTAINING TRANSVERSE RODS: TOWARD AUXETIC MATERIALS

Puwei Liu*, Chaobin He, and Anselm C. Griffin, University of Southern Mississippi, Hattiesburg, MS 39406

Normal materials become thinner when stretched. To the contrary, auxetic materials expand laterally as they are stretched. To date there are no molecularly designed materials which exhibit this response. We design and synthesize liquid crystalline polymers containing different lengths of and various compositions of rigid transverse rods in order to create this behavior. Thermal study of these polymers shows they are all nematic LC polymers and upon introduction of the transverse rods into main chain, the LC polymer remains liquid crystalline. It also shows that an increase in the length of the transverse rods does not destabilize the mesophase as one may expect. In addition, an increase in the composition of transverse rods lowers the clearing temperatures of these polymers. X-ray study of one of these polymers indicates the interchain distance increases upon stretching, while that of polymer without the transverse rod, decreases. The authors wish to thank the Air Force Office of Scientific Research (F49620-98-1-0078) for financial support this research as well as National Science Foundation (DMR-9512506) for acquisition of the thermal instrumentation.

GEOLOGY AND GEOGRAPHY

Chair: David Patrick, University of Southern Mississippi

Vicechair: James Harris, Millsaps College

THURSDAY MORNING

Room 606

8:30 CREATION OF THE MISSISSIPPI GEOLOGICAL SURVEY IN 1850

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

The Mississippi Geological Survey was created by the Legislature in 1850, after years of effort by several groups. In 1838 the Jefferson College and Washington Lyceum petitioned the Legislature for a survey. This effort was maintained by other agricultural societies and in the late 1840s by a state geological society. The visit of the prominent British geologist Charles Lyell in 1846 and the creation of the Geological Survey of Alabama in 1848 may have prompted action in Mississippi. At the 1849 AAAS meeting, several prominent scientists and Mississippi Governor Matthews signed a petition suggesting states establish geological surveys. A mechanism for establishing a geological survey came with the founding of the University of Mississippi in 1848. John Millington, Professor of Chemistry and Natural Philosophy, was one of the university's first four faculty members and perhaps the first recognized scientist on the state payroll. In 1850 the Legislature passed "An act to further endow the

University of Mississippi." It provided funds for "the purchasing of books and apparatus, and the payment of the salary of a Professor and Assistant Professor of Agricultural and Geological sciences." This professor was to make "a general Geological and Agricultural survey of the State." When the act went into effect in June, Dr. Millington moved into that position and became Mississippi's first State Geologist. The Mississippi Geological Survey will celebrate its sesquicentennial in the year 2000.

8:45 ARE WE LOOKING AT THE SAME THING? TWO GEOLOGISTS, TWO POINTS OF VIEW

Jack Moody, Mississippi Office of Geology, Jackson, MS 39289

In the winter of 1997–1998, an engineer at agency X asked me to review the report of another geologist from agency Y regarding a construction related sediment delta in a residential lake. The construction had caused sediment to form a delta and both agencies wanted the sediment cleaned out and everyone go their separate ways. I requested the field data from the agency Y geologist and proceeded to map the delta based on the supplied field notes and limited understanding of the study methods. I felt very good about my interpretation based on the supplied information. The results of this review and interpretation put both the agencies and the lake resident association at odds over the amount of sediment to be removed; there was a significant difference. After several heated meetings, we were asked to make the long trip to see for ourselves. Upon arrival, I remarked that this was nothing like what I thought I'd find. After taking about 10 of our own cores, we thought we had an understanding of the real situation. It was quite different than was supposed when relying on someone else's field notes and information. Different geologists have different perspectives, methods, and interpretations. This example illustrates how different the results can be even when studying the same small area.

9:00 LITHOFACIES OF THE TUPELO TONGUE OF THE COFFEE SAND

Ernest E. Russell and Darrel W. Schmitz*, Mississippi State University, Mississippi State, MS 39762

When Lloyd Stephenson first proposed the use of the term "Tongue" for the Tupelo Tongue of the Coffee Sand at its type locality in Lee County, during the 1930s, he did not establish either the nature of the facies nor the architecture of the unit. Moreover, little new data concerning the unit were added during subsequent mapping projects involving the Upper Cretaceous units in Mississippi by Watson Monroe in the 1930s and the mineral resources of Lee County by Franklin Vestal in the 1940s. Recent field mapping by the authors shows that the Tupelo Tongue consists of distinct units that may be interpreted as comprising lower and upper shoreface marine sands which grade in all directions into lower shoreface, massively bedded, calcareous, fossiliferous marine sands. The lower shoreface sands grade laterally and vertically into calcareous shelf muds of the Mooreville Formation, below, and Demopolis Formation, above. Russell has mapped two persistent and locally fossiliferous tongues of the Coffee Sand which extend northward for a distance of nearly eighty kilometers into Alcorn County, Mississippi. The upper surface of the Coffee Sand is distinctive and consists locally of what appear to have been barrier sands, based upon their lithology and mapped geometry. The beds at the contact with the overlying chalky marls characteristically are highly fossiliferous and have been mapped by Russell northward into central western Tennessee.

9:15 ANOMALOUS LEFT-LATERAL OFFSETS IN GEOLOGIC UNITS OF NORTHWEST MISSISSIPPI AND EAST CENTRAL ARKANSAS

Stephen L. Ingram, Sr.[1]*., Danny W. Harrelson[2], and Charles Swann[3], [1]Mississippi Office of Geology, Jackson, MS 39289;[2]U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS 39180; and [3]Mississippi Mineral Resources Institute, University, MS 38677

Anomalous, oblique structural offsets have been identified in the Tallahatta Formation outcrops in Northwest Mississippi. Two left-lateral offsets are present. The primary offset, roughly seven miles occurs in southwest Lafayette County, generally coinciding with Oxley's Jacksonville Transfer Fault (Oxley, 1991). A second left-lateral offset of about five miles occurs further south in northeast Yalobusha County, possibly related to an adjustment fault located between the Jacksonville and Livingston transfer fault zones. Further northwest in Arkansas, the Chesapeake Tectonic Zone (Cox, personal communication, 1996), the northwestern extension of the Jacksonville Fault Zone, also offsets the Wilcox outcrop there by approximately ten to twelve miles in a left-lateral relation. In addition, the southern tip of Crowley's Ridge and the Mississippi Delta Bluff-line appears to imply alignment along the Chesapeake-Jacksonville tectonic zone, further indicating left lateral movement along this northwest trending basement fault zone. River and stream valleys along the major offset in Lafayette County generally displays rectangular and parallel alignments, again indicating possible structural relations associated with this deep-seated fault zone. These geologic and geomorphic features may well suggest that the Chesapeake-Jacksonville-Livingston tectonic zone is related to the left offsetting structural relations identified in the Tertiary-age outcrops in northwest Mississippi and east-central Arkansea. The river and stream patterns expressed in the area may also imply more recent tectonism associated not only with this fault zone, but with tectonics within the New Madrid Reelfoot Rift.

9:30 A REVIEW OF LOWER CRETACEOUS JAMES LIME OIL AND GAS PRODUCTION IN SOUTHERN MISSISSIPPI

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

The Lower Cretaceous James Limestone has been productive of oil and gas in Mississippi since its discovery in March of 1981 at Sandy Hook Field in Marion County, south Mississippi. Although not a primary target for oil and gas explorationists the James Lime has been found to be productive at nine different fields in southern Mississippi. Three of the productive James Lime reservoirs have been classified as oil pools and the remaining six as gas pools. James Lime production is located primarily in Marion County with producing fields also located in Lawrence, Walthal, Pearl River and Jefferson Davis counties, all in southern Mississippi. Cumulative production for the James Lime in Mississippi as of 12/31/97 is 560,939 barrels of oil and 75,968,779,000 cubic feet of gas. Producing depths are below 14,000 feet. Studies of the James Lime at several of these fields indicate the reservoirs were deposited in a shallow water shoaling environment that produced complicated lateral and vertical facies changes. Additionally, it appears that paleostructure had a strong influence on the deposition of the James Lime lithofacies. With the announcement in press releases in April of 1998 by Chevron USA that they have discovered a string of five new James Lime gas fields in federal waters off the coast of Mississippi, it appears that a large area of southern Mississippi and Mississippi State waters have the potential for new oil and or gas discoveries.

9:45 A SIGNIFICANT LATE SANTONIAN (UPPER CRETACEOUS) VERTEBRATE FOSSIL SITE IN LOWNDES CO., MISSISSIPPI

George Phillips* and Eric Loftis*, Mississippi State University, Mississippi State, MS 39762, and 705 North St., Columbus, MS 39702

A vertebrate fossil locality of Late Cretaceous age located in northeast Mississippi is currently being investigated for its significant concentration of bones and teeth, particularly those of dinosaurs. The site is a fossiliferous horizon of the Tombigbee Sand resting immediately on top of the lower unnamed member of the Eutaw Formation (Santonian). The stratum is locally very pebbly and fossiliferous, at least with respect to vertebrate species. The approximately 30 cm-thick layer of clastic material is composed of abundant vertebrate bones, teeth, and coprolites, a variety of indurated/phosphatized clay pebbles, rounded pieces of petrified wood, fragments of lignitized wood (some with amber), and charcoal on occasion. The basal part of the unit contains impressions of various gastropod and bivalve species and fragments of branching colonial coral. Fish identified to date include at least three actinopterygian fish species (*Enchodus petrosus*, *Anomoeodus phaseolus*, and *Xiphactinus audax*), occurring in modest quantity; lepisosteid gar (*Lepisosteus* and *Atractosteus*), comprising a much larger quantity of total bony fish remains; four shark species (*Scapanorhynchus texanus*, *Cretolamna appendiculata*, *Squalicorax* sp. aff. *S. kaupi*, and *Hybodus* sp.); and five members of the ray-sawfish group (*Ptychodus mortoni*, *Pseudohypolophus mcnultyi*, *Ischyrhiza mira*, and as many as two other unidentified sclerorhynchid sawfish, one closely allied with *Ptychotrygon*). Reptiles are represented by marine turtle, freshwater turtle, lizard,. mosasaur, crocodile, and plesiosaur. The smaller vertebrate coprolites belong to elasmobranchs (sharks, skates, and rays), and many of the larger fossil feces may be crocodilian in origin. The dinosaur content is perhaps the most significant element of the fauna. Dinosaurs have been reported from other Mississippi locales, but this assemblage is richer in total individual remains than any previously recorded site in the state and possesses a diversity at least equaling that of other Mississippi sites. One ornithopod species and two theropod species are included among the dinosaur fossils recovered to date. The fossil content is chronologically and ecologically mixed, which is typical of transgressive lag deposits. Two allochthonous sources contribute to the fossil concentration (reworked and syndepositional), and several groups of ecologically associated organisms may be discerned among the mix (*e.g.*, terrestrial, riverine, paralic, and pelagic marine faunas).

10:00 Break

10:15 GEOLOGIC MAPPING AND CONTROLS ON WETLAND LANDFORMS, CAMP SHELBY TRAINING SITE, MISSISSIPPI

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

The structural, stratigraphic, and geomorphic framework controls the occurrence, distribution, and character of wetland surfaces at Camp Shelby where a broad, asymmetrical, south-sloping and arcuate cuesta defines the outcrop pattern of the exposed stratigraphic units. A geologic map was prepared which consisted of four map units: Undifferentiated Quaternary Colluvium and Floodplain, Undifferentiated Quaternary Alluvium and Terrace, Upland Complex (Citronelle), and Hattiesburg Formation. Generally, the crest of the cuesta is capped by coarse clastics of the Upland Complex, and the flanks are composed of fine clastics of the Hattiesburg Formation and its equivalents. This general outcrop pattern changes abruptly along the eastern side of the cuesta directly above Cypress Creek Dome where there is a widening and broadening of the Hattiesburg outcrop pattern. Over the dome, fine grained sediments perch the watertable

well above the floodplain. Therefore, wetlands at Camp Shelby are not limited to a bottomland geomorphic setting. Colluvial deposits accumulate along streams draining the crest of the cuesta resulting in the formation of broad bayheads. Near the Hattiesburg/Upland Complex contact, the nature of wetlands change to a thin fringe that occurs along small scale terraces that are incised into Hattiesburg Formation sediments. Wetlands within sediments of the Upland Complex are limited to backswamp environments where plinthic horizons perch the watertable. Wetlands within the sediments of the Hattiesburg Formation form as ravines along the north face of the cuesta, and as pine flatwoods above Cypress Creek Dome.

10:30 QUANTATATIVE ANALYSIS AND CORRELATION OF ELEMENT LOADING BETWEEN WETLAND SEDIMENT CORES AND BALDCYPRESS (*TAXODIUM DISTICHUM*) INCREMENT CORES

Stanley J. Galicki*, Gregg R. Davidson, and Stephen T. Threlkeld, University of Mississippi, University, MS 38677

This research integrates dendrochronology, dendrochemistry, and ^{210}Pb and ^{137}CS isotopic dating techniques with standard sedimentologic techniques to model elemental migration within the sedirnent-baldcypress system. The study area along the northern edge of Sky Lake in Humphreys County Mississippi drains approximately 4600 acres of agricultural land. A dendrochronology for Sky Lake was constructed by cross correlating 60 baldcypress cores. Elemental analyses on tree cores were performed using Induced Neutron Activation Analysis (INAA) and Inductively Coupled Plasma Spectrophotometry (ICP). Sediment cores from 4 sites in the lake were dated using both ^{210}Pb and ^{137}CS techniques. Samples from the same intervals were also analyzed by INAA/ICP. Eh and pH measurements were made on 10 cm centers in cores taken adjacent to those used for dating and elemental analysis. ^{210}Pb and ^{137}CS activities indicate that sedimentation rates in the lake range from 0.4 cm/yr in the eastern area of the lake to greater than 1 cm/yr in the central area. The central area is influenced by agricultural runoff. Sedimentation rates were used to date the sediment column which enabled correlation with tree ring increments. The results were variable. Some elements, such as Cu displayed little correlation between the sediment profile and tree, while elements such as As appear to peak from 1930 to 1950 during the heaviest use of inorganic agricultural chemicals. This research is supported in part by a grant from the Geological Society of America.

10:45 GEOMORPHIC EXPRESSION OF EROSION ON THE MISSISSIPPI GULF COAST ISLANDS CAUSED BY HURRICANE GEORGES

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

The impacts of Hurricane Georges on the Mississippi Gulf Coast islands are evident in field visits, digital shoreline position mosaics, and remotely sensed images. Erosional features and land loss patterns suggest that several mechanisms interacted in varying degrees to modify the islands. Areas associated with low-angle wave attack and high tides created expansive wave terraces with marked dune erosion. Peat banks and exposed stumps typify stretches with extensive erosion, possibly from higher longshore currents. Ends of islands that were subjected to high flood and/or ebb tidal flow are characterized by the formation of sand shoals. On the four islands (Petit Bois, Horn Island, E. and W. Ship) with sand shoals, small “relict” headlands remained at or near the previous terminus of the island. This characteristic feature, along with the formation of large seaward moving mega-ripples and antidunes indicates that ebb flow played a major role in modifying these islands in the short term. The longer-term recovery and westward migration of the four islands may ultimately be linked to a seaward source (ebb delta) of sediment. Cat Island, the westernmost barrier island, does not exhibit sand shoal formation. Cat Island displays a nearly continuous offshore bar on the SE-facing shoreline and appears to have been affected mainly by ebb flow and lower angle wave attack.

11:00 HURRICANE GEORGES AND A WINTER COLD FRONT: DIFFERENT STORM SYSTEMS CAUSE SIMILAR DAMAGE TO WEST BELLE FONTAINE BEACH, MISSISSIPPI

Jennifer D. Lana* and Phillip E. Lana, Mississippi Office of Geology, Jackson, MS 39289, and National Weather Network, Jackson, MS 39202

Belle Fontaine, located in southern Jackson County, Mississippi, has been affected recently by two major storm systems that caused extensive erosion and property damage. On February 15–16, 1998, a wintertime cold front passed over the area, creating a six-fold increase in predicted tidal levels. On September 27–28, 1998, Hurricane Georges made landfall on the Mississippi coast only a few miles to the west of Belle Fontaine. The hurricane was a strong category 2 storm on the Saffir-Simpson Scale, with wind gusts recorded over 160 mph, and was the first one to directly hit the Mississippi coastline since Elena in 1985. In both storm events, tidal levels and wave action contributed to severe structural damage to houses, bulkheads and piers in the area, and geologic changes to the beach itself. Hurricanes are expected to cause major damage to coastal areas, but more concentration needs to be placed on studying winter cold fronts because they cause extensive damage and occur more frequently. Comparing weather data and shoreline change data from both events proved to be very useful for the residents of the and those scientists evaluating

future protection measures.

11:15 EAST BELLE FONTAINE BEACH, JACKSON COUNTY, MS—INTERPLAY BETWEEN NATURAL AND HUMAN FACTORS IN BEACH ELIMINATION AND REGENERATION

Khanh-Nhi (Jennifer) Truong[1]*, Wade E. Howat[2], and Ervin G. Otvos[2], [1]Mississippi Gulf Coast Community College–Jackson County Campus, Gautier, MS 39553, and [2]Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564

Until quite recently, the narrow East Belle Fontaine Beach, was the last relatively untouched beach on Mississippi's mainland coast. Backed by a Pleistocene bluff of maximum 3 m height, both beach and bluff have been undergoing steady erosion and landward shift. Maximum shore retreat between 1850–1986 equaled nearly one-third of a mile (548 ft). Wave erosion by tropical and spring storms and rain-related erosion through surface runoff and ground water flow are the main natural agents. The 1969 "superhurricane" caused ca. 10 m bluff retreat. Bluffs during recent Hurricane Georges (Category 2 Storm; landfall: Sep. 27–28, 1998) retreated by a maximum 4.5 to 7.5 m. Localized shore protection structures, including one short seawall, groins, concrete and timber/metal bulkheads of highly uneven sizes, types, and quality were intended to protect the bluffline. Cut off from its sand supply and encroached by a variety of bulkheads, the beach further narrowed since the mid-1990s. Paradoxically, Georges' landfall in the east Biloxi-Ocean Springs area resulted in appreciable beach accretion. Zones from which bluff deposits and man-made fill were eroded and washed out from behind bulkheads locally reached a width of 17.4 m. Sand supply from bluff erosion and the removal of man-made backfill, probably also influenced by landward-driven offshore sands, have temporarily renourished the beach.Vertical beach accretion (aggradation) locally amounted to ca. 50–60 cm. The foreshore in certain areas widened by as much as 3 to 7 m. A related study compares roundness values from East Belle Fontaine dunes and eolian SE Louisiana floodplain dunes.

11:30 HEADCUTTING AND KNICKPOINT MIGRATION, CAMP SHELBY TRAINING SITE, MISSISSIPPI

Amanda L. Roberts* and David M. Patrick, University of Southern Mississippi, Hattiesburg, MS 39406

Local channel erosion is occurring on several streams within portions of Black Creek drainage basin on Camp Shelby in Perry County. There are three major erosional features that are associated with this process-Bank failure is evident along a number of main channels and tributaries, headcutting is occurring due to upstream-migrating knickpoints, and gullying occurs in some of the headwater reaches. Knickpoints having as much as 8 feet of relief migrate upstream as large blocks of well-lithified, lutite overlying less resistant lutite in the underlying Hattiesburg Formation (Miocene) are undercut. The causes of these processes are unknown; however, we speculate that they may have been initiated originally by salt tectonics associated with Cypress Creek salt dome, advanced by Pleistocene sea-level changes, and further affected by land use practices in the DeSoto National Forest, on Camp Shelby, and upstream within the Black Creek basin. As reaches of Black Creek, downstream from Camp Shelby are also experiencing some erosion, we may further speculate that these processes on Camp Shelby may have been exacerbated by processes occurring much further downstream beyond Camp Shelby.

11:45 ORIGINS AND CAUSES OF POST-SETTLEMENT ALLUVIUM AT CAMP SHELBY TRAINING SITE, FORREST AND PERRY COUNTIES, MISSISSIPPI

Joel B. Goff, University of Southern Mississippi, Hattiesburg, MS 39406

Post settlement alluvium, or PSA, is sediment which has been deposited as a result of human activities. The purpose of this study, located in the eastern half of Camp Shelby, is to determine the areas; the sources, and the primary causes of PSA deposition. This includes erosional features related to the PSA sites. There are three phases to this project. The first phase is reconnaissance, the second phase is monitoring and testing, and the third phase is comparative analysis. The purpose of the first phase, which is completed, is to determine likely sites, environments and conditions for PSA deposition. The monitoring phase is mainly completed and its purpose is to determine relative deposition rates and grain-size distributions. The analysis phase will consist of comparing PSA deposition to various land use and silva culture activities. A drainage below an area to be cleared for a timber harvest has been checked at random points for soil type using a soil probe. After the area has been cut, it will be re-evaluated for PSA deposition. Reconnaissance has revealed that PSA deposits are located primarily in and along first-order streams. The sources and nature of these deposits are varied; however, there seems to be two major causes of PSA. These include road maintenance and construction, and mass vegetation removal, such as timber harvesting and training area preparation. Sites associated with road construction and maintenance seem to be larger and more common than those associated with logging and training.

THURSDAY AFTERNOON

Room 606

1:30 Divisional Poster Session

LOCATING EXPANDING BENTONITIC CLAYS USING WIRELINE LOG TO CORE CALIBRATION: A GUIDE TO PLANNING NEW CONSTRUCTION IN NORTHEAST MISSISSIPPI

McCullough Moyse, University of Mississippi, University, MS 38677

Tertiary and Cretaceous units of northeast Mississippi are being investigated to determine the presence of certain geologic and geotechnical characteristics that may be of importance to land use planning, such as swelling potential. Increased urbanization and local clay mining activities make knowledge of such characteristics particularly relevant. The necessary data include a stratigraphic test well drilled to a total depth of 510 feet, downhole geophysical logs, and existing geologic maps of the study area. The lithologic and geophysical data from the stratigraphic test well will be compared to establish a core-to-log calibration and will form a standard subsurface data set, which will be used as a comparison model to establish a subsurface stratigraphic framework. These data will be combined to produce a new set of geologic and geotechnical data that can be used by city/regional planners. The formations of northern Mississippi were deposited on the eastern limb of the Mississippi Embayment, a regional southward plunging syncline. Dips are typically 20–30 feet/mile to the west. The primary formations included in the study are the Cretaceous Ripley and Owl Creek Formations, and the Teritary Clayton, Porters Creek, Naheola, and Meridian Sand Formations. The Porters Creek Formation is of special interest because it contains expansive bentonitic clays, which commonly result in foundation problems in structures and paved roadways. These clays are also mined and utilized as industrial clays.

MISSISSIPPI BARRIER ISLAND EROSION DUE TO HURRICANE GEORGES

Barbara E. Yassin, Mississippi Office of Geology, Jackson, MS 39289

Hurricane Georges smashed into the Mississippi coastline on September 27–28, 1998, forever altering the barrier islands that serve to protect the mainland from major damage. A week later Mississippi Office of Geology, Coastal Geology section personnel walked the islands, mapping the high tide line using Global positioning System (GPS). As a result of storm surge and overwash, Petit Bois Island, Horn Island, East Ship Island, and West Ship Island were cut. East Ship Island went from 4.2 miles long in 1997 to 1.9 miles. When Round Island's southwest corner was eroded back 40 meters, the historic 1830s lighthouse crumbled into the water. On Petit Bois Island's southeast shoreline, 72 meters of sand were eroded. The post-hurricane islands are compared to 1997 and 1996 GPS data and mapped for display.

TECTONIC IMPLICATIONS OF VELOCITY ANOMALIES ALONG THE MIDDLE AMERICA TRENCH, GUATEMALA BASIN

Brad M. Battista* and Allen Lowrie, University of Southern Mississippi, MS 39529, and non-university affiliate, MS 39529

Cocos Plate subduction beneath the Caribbean Plate between the Cocos and Tehuantepec Ridges has previously been studied but fine-order subduction processes in the region remain poorly quantified. Interpretation of sparse data is based on comparison to nearby well-studied areas, such as the Nicoya Complex. Such comparisons are inadequate, recent literature reveals tectonically different segments perpendicular to the trench axis. Seismic data for one particular segment, the Guatemala Basin, consists of 2-D data interpreted by the University of Texas, Austin during the late 1970's. Velocity analysis shows numerous acoustic anomalies between 1–2 km below the sediment surface that have not been previously cited. Shallow high velocity pockets have been described as slivers of Cretaceous ocean crust uplifted during the Paleocene or early Eocene. Velocity analysis indicates that these high velocity slivers of oceanic crust may have been uplifted within the accretionary prism up to 2 km above the trench floor deforming the continental slope. However, deformation varies along the oceanic crust, trench floor, trench wall, and continental shelf provinces, not only between each physiographic/geologic province but also within each province. Compression of the foot of the trench wall appears to be replaced by extension along the middle and upper wall. Pockets of low velocity may represent free gas, raising the question of emplacement mechanism and duration given such an active, deformed environment.

1:45 Oral Presentations Resume

1:45 CORRELATION OF TERTIARY UNITS FROM BOLIVAR COUNTY TO CALHOUN COUNTY

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

The well-known Tertiary stratigraphy of central Mississippi was correlated using oil-exploration geophysical logs from Hinds County, through Yazoo and Holmes counties, and to Rosedale in Bolivar County near the axis of the Mississippi Embayment. Additional oil-exploration logs were used to correlate Tertiary units from the top of the Cretaceous chalk to the surface along a west-east line from Rosedale to northwestern Calhoun County. With the exception of the Tallahatta Formation, units thinned northward to Rosedale and then eastward to their outcrop belts. The total thickness of the Midway and Wilcox groups thinned from 3,350 feet in

northwestern Hinds County to 2,250 feet in northern Humphreys County and to 1,750 feet at Rosedale in Bolivar County. From Rosedale the Midway/Wilcox section thinned to 970 feet in central Yalobusha County before its truncation at the outcrop belt. In contrast, the Winona/Tallahatta/Meridian section of the lower Claiborne Group increased northward along the same line of section from 600 feet in Hinds and Humphreys counties to 730 feet in Bolivar County, with the increase coming from the Tallahatta section. This interval then thinned eastward from the embayment axis to 630 feet in Tallahatchie County. The most reliable correlation points above the chalk were found to be the base of the Wilcox sands, the base and top of the Meridian Sand, and the base and top of the Zilpha Clay.

2:00 KOSCIUSKO FORMATION OUTCROP IN YALOBUSHA COUNTY, MISSISSIPPI, REINTERPRETED AS TALLAHATTA FORMATION, NESHOBA SAND MEMBER

Stephen L. Ingram, Sr., Mississippi Office of Geology, Jackson, MS 39289

Recent geologic investigation in Yalobusha County, Mississippi, has determined that outcrops previously mapped as sands belonging to the Kosciusko Formation are sands of the Neshoba Sand Member of the Tallahatta Formation. Surface mapping activities for the 1998 STATEMAP grant initially identified these outcrops as Tallahatta deposits, but subsequent drilling and coring of the Mississippi Office of Geology #1 State Site 22YA822 test hole confirmed this interpretation. State Site 22YA822, as designated in the test hole title, is an important archeological site where Indian stone artifacts were previously interpreted to be sourced from "Kosciusko" quartzite found at that location, based on the geologic map published in the Yalobusha County geologic bulletin, 1952. This test hole served two purposes: 1) to provide scientific data for correlation and reinterpretation of the aforementioned units, and 2) to provide that data to archeologists who are working to determine if and which quartzite source-rocks are identifiable in Mississippi's Indian artifacts. U.S. Forest Service archeologists David Fant and Evan Peacock and State Archeologist Sam McGahey were involved with consultations for the drilling activities at the site. These findings will likely initiate further investigation of artifact source materials in an attempt to determine any characteristics for differentiating those quartzites found in Kosciusko, Tallahatta, and Wilcox units across the state.

2:15 PETROGENESIS OF OPAL-CT IN THE TALLAHATTA FORMATION OF MISSI

Sohail Kabir and Terry Panhorst*, University of Mississippi, University, MS 38677

Origin of claystone within the Eocene Tallahatta Formation has been attributed to either biogenic or volcanic activity. The Basic City Shale Member of the Tallahatta Formation in the vicinity of Meridian, Mississippi was examined to resolve debate between these two theories as to the source of the silica. Lithologic characterization of 577 outcrop and core samples indicates 80 percent of this unit consists of opal-CT and the zeolite clinoptilolite, with the remaining material being smectite-group clays, quartz, glauconite and muscovite. Siliceous microfossils are rarely present. The abundance of clinoptilolite decreases eastward to Alabama and Georgia. No significant change in silica content is evident from Mississippi to South Carolina. Burial depth for the Tallahatta Formation is interpreted to be less than 100 meters, insufficient to develop the temperatures required for the formation of opal-CT from diatoms. The mineral assemblage opal-CT, clinoptilolite and smectite is common in marine rocks of volcanic origin. The relative abundance of clinoptilolite and smectite, along with the lack of diatoms and no detectable opal-A suggests the primary source of silica for the development of opal-CT in the Tallahatta Formation is volcanic in origin. Possible volcanic source areas are in the Caribbean region.

2:30 GEORADAR INVESTIGATION OF THE NEW HARMONY, MAUNIE, AND HERALD-PHILLIPSTOWN FAULTS IN THE WABASH VALLEY SEISMIC ZONE

Ellen A. Ferrell*, John L. Sexton, Subramanya Ananthnarayan, Robert M. Bodziak, and Adam LeGrande, Southern Illinois University, Carbondale, IL 62901

The study area for this project is located in the Wabash Valley Seismic Zone of southeastern Illinois and southwestern Indiana. Georadar survey lines are located across the Maunie and Herald-Phillipstown Faults in White County, Illinois, and the New Harmony Fault in Posey County, Indiana. Along the three respective survey lines, high-resolution seismic reflection data with a record time of one second are available from July 1997 field work done by personnel in the Geophysics Program of Southern Illinois University. Based on findings from the seismic reflection data, the georadar data collected during this project images what are interpreted as shallow subsurface features of neotectonic origin. Correlation of the georadar and high-resolution seismic reflection data show disturbances in the radar data that we interpret as faulting or fault related features. These shallow disturbances directly overlie faulting observed on the seismic profiles and may affect or offset Quaternary age sediments.

2:45 ACQUISITION, PROCESSING AND INTERPRETATION OF A SHALLOW SEISMIC PROFILE ACROSS THE MAUNIE FAULT IN THE WABASH VALLEY SEISMIC ZONE

Robert M. Bodziak*, John L. Sexton, Subramanya Ananthnarayan, Adam LeGrande, and Ellen A. Ferrell, Southern Illinois University-Carbondale, Carbondale, IL 62901

The Wabash Valley Seismic Zone (WVSZ) is located northeast of the New Madrid Seismic Zone (NMSZ) in southeastern Illinois and southwestern Indiana. Previous seismic reflection studies within the Wabash Valley have revealed the existence of a Cambrian-aged Grayville Graben. The Grayville Graben is bounded by normal basement faults that appear to extend into the overlying Paleozoic sediment. This upward extension strongly suggests that basement faults in the Wabash Valley have been reactivated in post-Pennsylvanian times. In addition to these reactivated faults, liquefaction features in the Wabash Valley have been dated within the last 3500–7000 years. These findings have prompted a high resolution, seismic reflection study of the upper few hundred feet of Quaternary sediment in the Wabash Valley. Interpretation of the new high resolution seismic data suggests that reactivation of basement faults has offset Quaternary-aged sediments.

3:00 APPLICATION OF MARINE GEOPHYSICAL AND GEOTECHNICAL TECHNIQUES TO ENVIRONMENTAL STUDIES ON INLAND WATER BODIES

Robin C. Buchannon, Cathy A. Grace*, and Thomas M. McGee, Mississippi Mineral Resources Institute, University, MS 38677

The Mississippi Mineral Resources Institute (MMRI) is a state agency whose mission is to provide the public and private sectors with the expertise necessary for making responsible decisions and actions regarding Mississippi's mineral resources and environmental well-being. The Marine Minerals Technology Center (MMTC) is a federally funded national research center of the MMRI whose mission is to promote the development and transfer of technology for the exploration, mining, and processing of non-fuel marine mineral resources. The MMRI and MMTC have been designing subbottom sampling systems for specific applications for many years. Systems have been designed, modified and then redesigned to accommodate explicit needs in specific environments. Likewise, geophysical systems must be selected based on water depth and the degree of desired resolution. Research vessels also must be selected and sometimes adapted to fit the environment as well as the selected sampling system. In 1997 the MMRI/MMTC initiated a series of environmental studies of north Mississippi lakes. The two agencies are working toward extending traditional marine geotechnical and geophysical sampling capabilities to the study of inland waters. In an effort to achieve this goal, the MMRI/MMTC are configuring drill and seismic systems and vessels unique to shallow water deployment. This presentation will demonstrate a variety of techniques which have or are being adapted to be used on inland water bodies.

3:15 SHALLOW SEISMIC REFLECTION PROFILING OVER SURFACE FAULTS IN THE SOUTHERN MISSISSIPPI EMBAYMENT

William C. Beard* and James B. Harris, Millsaps College, Jackson, MS 39210

Determining the style and extent of surface/near-surface structural deformation is important in evaluating earthquake hazards in the Mississippi embayment. Recent geologic studies have identified surface faults (Quaternary?) 300–350 km south of the dense zone of microseismicity centered around New Madrid, Missouri (the most seismically active area in the central and eastern United States). A shallow shear-wave seismic reflection profile was acquired across a recently discovered fault zone near Monticello, Arkansas. Part of the profile is coincident with a paleoseismologic trench excavated during the summer of 1997 by Dr. R. T. Cox of Arkansas State University. The processed section (210 m long) shows coherent reflection energy to depths in excess of 150 m. The most coherent reflection is approximately 110 m deep and, based on correlation with local borehole data, is interpreted to represent the top of the Eocene Cockfield formation. The reflections are disrupted by two south-dipping normal faults that correlate updip with faults mapped in the paleoseismologic trench. Folding identified in the trench and imaged on the deeper part of the seismic profile suggests that the fault zone may have experienced a previous period of transpressional deformation. In the most recent phase of our ongoing research targeting surface deformation in the Mississippi embayment, a seismic reflection data set was acquired over a zone of surface faulting in the vicinity of Kilmichael Dome (central Mississippi), a structurally complex area with an undetermined geologic history.

3:30 Break

3:45 SEASONAL GEOCHEMICAL RECONNAISSANCE OF SODA BUTTE HOT SPRINGS IN YELLOWSTONE NATIONAL PARK

Keri E. Walker * and Ed L. Schrader, Millsaps College, Jackson, MS 39210

During the fall of 1997 and the first 3/4 of 1998, sampling was accomplished at the site of Soda Butte Hot Springs in northeastern Yellowstone National Park. Water samples were taken directly from the hot spring vent on the travertine mound named "Soda Butte" as well as from several springs surrounding the travertine deposit. The chemistry of this system is of interest since its effluent flows directly into Soda Butte Creek, a tributary of the Lamar-Yellowstone River complex and is also relevant for describing the relatively

unstudied geothermal activity in this area, the most northeasterly in the park. The geochemical signature for the hot spring is one of elevated chloride content, reducing oxidation-reduction conditions, very low dissolved oxygen and slightly acidic pH values. Springs in the adjacent marsh and flowing or seeping from the travertine/iron oxide cemented bank have varying geochemical affinities, ranging from a group very similar to the hot spring to others that are essentially indistinguishable from the waters of proximal creeks. The overall chemistry of this geothermal system is consistent with that of Mammoth Hot Springs currently active about 45 miles to the west and significantly divergent from the Norris Geyser Basin and Old Faithful systems to the southeast. Significant amounts of alkali ions and dissolved ferrous metals are added to the stream system from this geothermal field; however, no evidence of toxic levels of copper or other base metals were discovered during any of the sample periods throughout the 12 months of study.

4:00 PRELIMINARY GEOCHEMICAL STUDY OF SODA BUTTE CREEK IN YELLOWSTONE NATIONAL PARK

Nicole M. Badon* and Ed L. Schrader, Millsaps College, Jackson, MS 39210

The purpose of the current study is to develop baseline data to support ongoing ecosystem studies and to initiate studies of the chemical environment of Soda Butte and tributary creeks. The methods used in gathering geochemical data for this study include taking water and sediment samples from Soda Butte and tributary creeks. Sediment samples were taken from eddy drop zones, as they are the places where sediments collect; some sediment cores were also taken. Water was sampled from the center of the stream and filtered, and some on site analyses were accomplished including; temperature readings, pH, redox potential, conductivity, total dissolved solids, and dissolved oxygen. The water samples were then bottled and buffered to a pH of 2 for geochemical analysis. Results obtained thus far indicate that an abundance of certain elements such as copper, iron, zinc, and manganese increases as the distance from the mine tailings pile, at the head of Soda Butte Creek, decreases. Thus the mine tailings pile is contributing to the abundance of elements in Soda Butte Creek. Also, certain elements seem to be contributed by hot springs and appear to provide a means for incursion of metal-containing geothermal waters
into the fluvial systems.

4:15 Divisional Business Meeting

FRIDAY MORNING

Room 606

8:30 MULTICOMPONENT SEISMIC TESTS IN YELLOWSTONE NATIONAL PARK

Amy L. Osborn* and James B. Harris, Millsaps College, Jackson, MS 39210

With improvements in seismic acquisition instrumentation and methods of data analysis, multicomponent seismic methods have become increasingly more common in identifying the mechanical and hydrological characteristics of near-surface materials. A four-component (2X2 data matrix) shear wave (S-wave) seismic test was performed adjacent to Soda Butte Creek in the northeastern part of Yellowstone National Park. The purpose of this investigation was to evaluate data acquisition parameters for future seismic profiling in support of a hydrology/geomorphology/geochemistry study that is currently being undertaken by students in the Department of Geology. Analysis of S-wave seismic refraction data indicates a high velocity layer at an approximate depth of 13 m (possibly related to glacial material that fills the valley). A time delay between the principle components (XX and YY) of the data matrix for the refracted arrival indicates the possibility of an azimuthally anisotropic near surface. There is also evidence of an S-wave reflection from this boundary. In addition, significant conversion of S-wave to P-wave (compressional) energy has been identified and modeled. Detailed analysis of this data set, and a similar multicomponent seismic test near the Soda Butte hydrothermal feature, will provide a more complete geophysical understanding of the Soda Butte Creek alluvial valley and allow us to choose appropriate acquisition and processing parameters for future seismic investigations in the area.

8:45 CURRENT STATUS ON RESEARCH AT KILMICHAEL DOME

Darrel W. Schmitz[1]*, Terry Everett[1], and Stephen L. Ingram, Sr.[2], [1]Mississippi State University, Mississippi State, MS 39762, and [2]Mississippi Office of Geology, Jackson, MS 39289

The geology of Kilmichael, in Montgomery County, Mississippi, has been a source of interest to geologists since 1931. Seismic profiles and stratigraphic test holes show the strata of the area to be deformed and out of place, providing evidence of some type of geologic event resulting in a domal feature. Theories that have been put forth to explain the feature are salt diapirism, volcanism, tectonic uplift, and meteorite impact. Salt diapirism and volcanism have been disregarded due to lack of evidence of salt or igneous presence. In an attempt to determine which of the remaining theories explains its formation, a reinvestigation of the Kilmichael feature was undertaken in 1996 by the Mississippi Office of Geology in cooperation with Kilmichael enthusiast Mark Butler and other interested parties including the Department

of Geosciences at Mississippi State University. Initial surface mapping and drilling activities have been completed. A meeting was conducted in December 1997 to inspect the core and discuss preliminary interpretations. Several specialists have been involved in additional investigations of the origin of "Kilmichael Dome." Investigations are currently being conducted on the regional tectonics, related igneous petrology, and biostratigraphy (palynological and foraminiferal studies). Additional investigations include analyses of quartzites for impact shocking. Mississippi State University's investigation of quartzite samples has been completed and showed no shocked quartz. This has been collaborated by NASA's Lunar and Planetary Institute.

9:00 REGIONAL TECTONICS AS AN EXPLANATION FOR THE KILMICHAEL STRUCTURE

Danny W. Harrelson* and Stephen L. Ingram, Sr., U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS 38180, and Mississippi Office of Geology, Jackson, MS 39289

The Kilmichael structural area is a roughly circular feature about 8 to 10 miles in diameter. Regionally, it is located northeast of the Central Mississippi Ridge near the eastern edge of the buried Ouachita Tectonic Belt. The Black Warrior Basin lies just to the northeast of Kilmichael and the junction of the Ouachita-Appalachian tectonic belts is to the southeast. The structure was first described in 1931, and confirmed in 1940 with the drilling of the Gulf # 1 Parker. The Kilmichael structural area has been variously interpreted as a cryptovolcanic feature, meteorite impact location or a horst-graben sequence. Collectively, all investigations agree that Kilmichael is an area of chaotic terrane because located within the feature are zones of intense faulting, dip reversals and a central area where highly faulted formations occur. The Kilmichael feature is known to be located near the junction of two major features; the Ouachita and Appalachian Tectonic Belts. Tectonic and igneous activity associated with these two features has been documented to have occurred in early Precambrian time and continued at least into late Cretaceous time. Therefore, in view of a lack of supporting evidence for meteorite impact, faulting and subsequent soft sediment deformation are proposed to account for the Kilmichael structural area. It is postulated that the mechanism for faulting associated with the Kilmichael structure resulted from deep-seated basement movement occurring in an area known to be a regional tectonic boundary and site of major igneous activity.

9:15 SURFACE MAPPING RECOGNIZES THE NAHEOLA FORMATION IN NORTH MISSISSIPPI

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

The current Geologic Map of Mississippi (1969) includes a rather anomalous outcrop pattern for the Naheola Formation of the Midway Group. Upon its emergence into Mississippi northwesterly from Alabama, the formation outcrop abruptly ends in northern Kemper County. Further north, the outcrop pattern resumes in Choctaw, Webster, and Calhoun counties, only to terminate again. Previous mapping along the southernmost outcrop region in Mississippi has recognized a direct correlation between the Coal Bluff Member of the Naheola Formation and the Fearn Springs Sand Member of the Ackerman Formation. Also, the upper laminated phase of the Porters Creek was found to be equivalent to the Oak Hill Member of the Naheola Formation. Recent coreholes drilled in north Mississippi have allowed for similar correlations to be made and a recognition of Naheola beds. This northern Mississippi extension of the formation can also be subdivided into two units, the Coal Bluff and Oak Hill. The Coal Bluff Member contains occasionally glauconitic, often micaceous, very fine- to very coarse-grained to pebbly sand, silty to plastic clay, kaolinitic to bauxitic clay, and lignite. The Oak Hill Member is typically dark gray clay interbedded to interlaminated with glauconitic, micaceous, fine to very fine-sand, often grading laterally into channel sequences of sand, gray clay, and lignite. This assignment of Naheola beds in northern Mississippi is supported by a consistent stratigraphic and lithologic framework and will allow for an uninterrupted outcrop pattern on the state geologic map.

HEALTH SCIENCES

Chair: John Piletz, University of Mississippi Medical Center

Vicechair: Zelma Cason, University of Mississippi Medical Center

THURSDAY MORNING

Room 2

8:30 Opening Remarks

8:40 ROLE OF FRUCTOSE 1,6 DI-PHOSPHATE DP IN VASCULAR WOUND HEALING

Marshall Walker*, Hari H.P. Cohly, James W. Stephens, Michael F. Angel, Jimmy Johnson, and Angel K. Markov, University of Mississippi Medical Center, Jackson, MS 39216

In vascular wound healing smooth muscle cells (SMC) and endothelial cells (EC) play an important role. To elucidate the role of fructose l,6 diphosphate (FDP), cell proliferation was performed with huEC and rat SMC in

(1:10,1:5 and 1:1) concentrations, mimicking large, mid and capillary sized blood vessels. Cell migration was studied with FBS starved cells. For cell proliferation assay, cells were plated at 30–50% confluency and then starved. The cells were then incubated for 48 hrs with 10 mg/ml, l mg/ml, 500 µg/ml, 250 µg/ml, 100 µg/ml, 10 µg/ml of FDP. The cells were pulsed with ^{3}H-thymidine and then incubated with 1N NaOH for 30 mins at room temperature, then harvested and counted. For migration assay, confluent cells were starved, wounded, and incubated for 24 hrs with 10 mg/ml, l mg/ml, 500 µg/ml, 250 µg/ml, 100 µg/ml, 10 µg/ml of FDP. The cells were fixed and counted. SMC proliferation is inhibited at l0 mg/ml FDP. In the xenograft models of (1 :10) rat SMC: human EC respectively, FDP inhibited at 10 mg/ml; at (1:5) FDP inhibited at 10 mg/ml; at (1:1) FDP inhibited at 10 mg/ml. In migration studies 10 mg/ml FDP was inhibitory to rat SMC and human EC. In large, mid and capillary-sized blood vessels, FDP shows an inhibitory effect on both SMC and EC at 10 mg/ml. At the individual cell level FDP is non-stimulatory to proliferation of EC while inhibiting migration, and it acts on SMC by inhibiting proliferation and migration.

8:50 CHANGES IN VASCULAR CONTRACTILITY OF THE RENAL ARTERY IN HOMOCYSTEINEMIA

Gretl Zimmermann[1]*, Lane Smiley[2], Debora Mann[1], and Suresh C. Tyagi[2], [1]Millsaps College, Jackson, MS 39210, and [2]University of Mississippi Medical Center, Jackson, MS 39216

Homocysteinemia has emerged as an important risk factor for end stage heart failure and renal disease. Endothelium controls vascular smooth muscle cell contractile function. We have demonstrated that acutely, homocysteine induces vasocontraction in de-endothelialized vessels. This raises the possibility that a direct effect of homocysteine on smooth muscle was in part inhibited by endothelium. We hypothesis that chronic homocysteine damages endothelium and raises vascular reactivity and at a later time point it induces smooth muscle cells and collagen expression. To test this hypothesis we isolated renal arteries (60 microns) and organ cultured in serum containing physiological salt solution (PSS) in the presence and absence of 30mM homocysteine. The contractile function was measured at various time points using the isometric myobath. The results suggest that the vessel maintain functional integrity under serum conditions. However, vessels cultured in homocysteine decrease vascular reactivity to KCl in 30 min, and 3 hours and return to control value in 24 hours. These time points coincide with the expression of collagen in vascular smooth muscle cells. Collectively, these observations suggest that acute homocysteine damages vascular endothelium and decreases vasoreactivity to KCl. But chronic endothelium injury leads to proliferation of vascular smooth muscle cells and collagen expression.

9:00 CHARACTERISTICS OF AN ENVIRONMENTALLY-INDUCED REVERSIBLE RESISTANCE TO ENDOTOXIN IN A MURINE MACROPHAGE

William Campbell*, Keneth Ndebele, James W. Stephens, Michael F. Angel, Barbara P. Rogers, Hari H.P. Cohly, and John Jenkins, University of Mississippi Medical Center, Jackson, MS 39216

Monocytes in vessels and macrophages in tissues are primarily responsible for the inflammatory response. Lipopolysaccharide (LPS) has profound effects on these cells including, but not limited to, production of reactive oxygen species and proinflammatory cytokines, enhanced phagocytosis and differentiation. Herein we describe a variant of the J774.I murine macrophage line that is reversibly resistant to all the effects of endotoxin when cultured in different types of cultured media. J774.I cells (ATCC, TIB-67) are adherent when cultured in DMEM. When cultured in RPMI 1640, the cells are rounded. Different types of tissue culture plates, sera and media supplements were not responsible for the changes observed. In addition, Coomassie staining of total cellular lysates electrophoresed on a polyacrylamide gel showed noticeable differences. We first examined LPS-induced reactive nitrogen species. J774A.1 cells cultured in RPMI exhibit a 4-fold increase in total nitrates in culture supernatants as measured by the Griess reagent after LPS stimulation whereas those in DMEM do not. RT-PCR for inducible nitric oxide synthase demonstrated inducibility in cells cultured in RPMI but not DMEM. Next LPS-induced cytokine gene expression was studied by RT-PCR. LPS induced TNF-a, lL-1a, IL-1b and IL-iRa in cells cultured in RPMI but not those cultured in DMEM. This report shows that environmental factors contained in the culture medium can alter the phenotype of monocytes.

9:10 ENDOCARDIAL ENDOTHELIUM CONTROLS CARDIAC FUNCTION AND DYSFUNCTION IN HYPERTENSION

Lane Smiley* and Suresh C. Tyagi, University of Mississippi Medical Center, Jackson, MS 39216

Hypertensive heart disease is one of the leading causes of cardiovascular related morbidity and mortality. Genetic model of spontaneously hypertensive rats (SHR) develops endothelial dysfunction, LV hypertrophy and fibrosis at the age of thirty-two weeks. However, Wiskal Kyoto (WKY) rats remain normal. The role of endocardial endothelium in cardiac function and hypertension is not known. This is in part due to the unavailability of the methods to study endocardial function. We develop new method to study endocardial endothelium and hypothesize that in hypertension endocardial endothelial is dysfunction. To test this hypothesis we prepared endocardial rings from SHR and WKY of thirty-two weeks old and measure the effect of acetylcholine and nitropruside on

cardiac ring contraction. Four groups were employed in this study consisting of two age groups, six weeks old male SHR and WKY rats and thirty-two weeks old male SHR and WKY rats. The contractility of left and right ventricular rings in response to acetylcholine(10^{-9}–10^{-6} µM), norepinephrine(10^{-9}–10^{-6} µM), and nitropruside (10^{-9}–10^{-6} µM) from SHR and WKY rats was measured by isometric tension myobath. In response to acetylcholine no difference was observed between the WKY six weeks, WKY thirty-two weeks, and SHR six-weeks. Moreover, SHR thirty-two weeks showed minimum response to cardio-relaxing agents. However, nitropruside, which is endothelial independent cardiotonic agent showed a greater contractile response in SHR than that of WKY. This response was corresponded with the elevated levels of endocardial fibrosis and collagen expression. The cardiac collagen levels in 32 weeks SHR (7.5 µg/mg) was twice that found in WKY (3.5 µg/mg). Collectively these results suggested that during hypertension endocardial endothelium is damaged and loses its reactive to acetylcholine, where as nitropruside showed significant cardiac relaxation. We suggest that in hypertension endocardaic endothelium is dysfunction leading to adverse ECM remodeling and cardiac function.

9:20 ROLE OF FRUCTOSE 1,6-DIPHOSPHATE ON I-NOS PRODUCTION FROM LPS ACTIVATED MACROPHAGES

Marshall Walker*, Hari H.P. Cohly, James W. Stephens, Michael F. Angel, Jimmy Johnson, and Angel K. Markov, University of Mississippi Medical Center, Jackson, MS 39216

Fructose 1,6-diphosphate (FDP) is a naturally occurring intracellular metabolite, which enhances the phagocytic function of the rat endothelial system by enhancing the basal level stimulation of rat liver iNOS. Studying interaction of LPS with macrophage can mimic response to injury model in the macrophage. We wanted to determine the role of FDP in LPS stimulated i-NOS production in macrophages. Methods: Monocytic cell lines J774A.1, P388 and spleen from murine and U937 from human sources were tested for i-nos production in lipopolysaccharide-activated macrophages. Cells were plated in 24-well plates to confluency and were then treated with 1 µg/ml of LPS in the presence of 10 mM L-Arginine. After 12, 24, 48 and 72 hrs 150 µl of supernatant was microfuged at 12,000 x g for 5 minutes and 100 µl of the supernatant was then mixed with equal volumes of Greiss reagent to determine the amounts of nitrates, an indirect measure of NOS production. LPS is non-stimulatory for i-NOS production in U937 or P388 cells, while maximally stimulates iNOS production in J774 and spleen cells. FDP inhibits I-NOS production even more than L-NAME at 1:5, 1:50 and 1:125 dilution of a 10% FDP solution. These results present evidence that FDP inhibits LPS activated I-NOS production in established macrophage cell-line and spleen cells.

9:30 3D-QSAR STUDIES OF MMP-1,3, AND 9 INHIBITORS

Maralea J. Gourley*, Mitchell A. Avery, and John S. Williamson, University of Mississippi, University, MS 38677

The matrix metalloproteinases (MMPs) are a family of zinc and calcium dependent metalloendopeptidases which are capable of degrading extracellular matrix components. MMPs have been implicated in tumor growth and metastasis and various disease states. The MMP inhibitors are broad spectrum and show activity against all classes of MMPs. Since certain tumors rely on particular MMPs for their invasive potential, attempts have been made to develop selective inhibitors of the MMPs. In this study a Quantitative Structure Activity Relationship (QSAR) analysis was performed using Comparative Molecular Field Analysis (CoMFA). The CoMFA models generated were used to develop selective inhibitors for synthesis and biological evaluation.

9:40 A COMPARISON OF TOOTH LOSS AND DENTAL CARIES BETWEEN PATIENTS IN THE DOMINICAN REPUBLIC AND MISSISSIPPI

David K. Parks*, Roger B. Johnson, Francis G. Serio, Steven M. Pollock, and Stephen L. Silberman, University of Mississippi Medical Center, Jackson, MS 39216

There is little information available concerning dental conditions in residents of the Dominican Republic (DR). The purpose of this study was to assess the extent of decayed, missing, and filled teeth (DMFT) in this population and to compare it to a Mississippi (MS) population. 270 patients were evaluated prior to restorative or surgical treatment during a mission trip to the DR; in addition, 100 patients were evaluated during screening procedures at the University of Mississippi School of Dentistry. Populations were compared by factorial analysis of variance and a post-hoc Tukey's test. There were no significant differences between DR & MS populations in regard to tooth loss; however, the DR population had significantly more caries and significantly fewer filled teeth than the MS population, while the MS population had a significantly higher DMFT score. The data suggest a lack of preventive dental care and home care, as well as a lack of access to care in the DR population. The MS population had 77% fewer caries experiences, which may be related to access to fluoridated water by the MS population, and/or differences in diet between the groups.

9:50 THE EFFECTS OF TETRACHLOROETHYLENE ON THE EARLY LIFE STAGES OF THE JAPANESE MEDAKA (*ORYZIAS LATIPES*)

Hattie B. Spencer* and Wedad R. Hussein, Jackson State

University, Jackson, MS 39217

Embryos of the Japanese medaka were exposed, under static renewal conditions, to as series of concentrations of the water-soluble extract of tetrachloroethylene. The 96h EC_{50} for eggs was 27 mg/litre. Hatching, survival and development abnormalities were recorded daily over a period of 10 days. Increasing concentrations reduced survival of medaka. Live embryos and histological stained embryos were observed microscopically to determine tetrachloroethylene toxicity. Abnormalities noted under these exposure conditions included abnormal circulatory system development, yolk-sac edema, pericardial edema, distorted axis, hemorrhaging, blood pooling and defects in heart morphology. Higher concentrations of tetrachloroethylenen produced several lesions. Concentrations of tetrachloroethylene as low as 1.5 mg/litre produced developmental abnormalities. This study was designed to determine the sensitivity of the medaka eggs to tetrachloroethylene and morphological abnormalities, hatching and certain physiological functions that may affect survival.

10:00 DIFFERENTIAL GENE EXPRESSION OF FIBROBLASTS: KELOID VERSUS NORMAL

Heath Scott*, Marshall Walker, Hari H.P. Cohly, Stephanie Warren, John Jenkins, and Michael F. Angel, University of Mississippi Medical Center, Jackson, MS 39216

Studies on Keloids have not clearly delineated the known gene products or actively searched for unique gene products associated with this state. This study attempts to determine which genes are up-regulated or down-regulated and if there are gene products unique to keloid dermal fibroblasts versus normal. **Methods:** For down/up-regulation, normal versus keloid was compared using Clontech's Atlasä Human cDNA expression Array. The system uses 588 human cDNAs spotted in duplicate on a positively charged nylon membrane. Poly A^+RNA from each sample was used to synthesize cDNA probes incorporated with [α-^{32}P]dATP. The probes were then hybridized to the membrane and analyzed by autoradiography. Unique gene products were studied using Clontech's Delta Ô RNA Fingerprinting Kit. Total RNA from each sample was converted to cDNA using oligo-dT primers. CDNA sequences were amplified in the presence of [α-^{33}P] dATP based on chance homology to 10 arbitrary P primers and 9 oligo (dT) T primers. The samples were resolved using polyacrylamide gel electrophoresis and compared for unique banding patterns using autoradiography. **Results:** The expression array revealed differentially expressed heat shock genes while the differential display showed 16 differentially expressed bands which are being determined.

10:10 GONORRHEA COLONY FORMING UNITS IN MALE URETHRAE AND CORRELATIONS WITH CLINICAL SYMPTOMS

M.J. Kilgore*, R.W. Finley, C. Langley, J. Cleary, and W.B. Lushbaugh, University of Mississippi Medical Center, Jackson, MS 39216

An intravaginal antimicrobial used prior to sex might protect women from STD pathogens, including *Neisseria gonorrhoeae*. However, the number of *N. gonorrhoeae* introduced during intercourse is unknown. We determined the number of *N. gonorrhoeae* in the male urethra and sought correlations with symptoms. Bacteria recovered from urethral swabs by vortexing in media were serially diluted, grown on MTM agar and the number of colony forming units (CFU) per ml of original diluent determined. Gram negative, oxidase positive diplococci were considered to be *N. gonorrhoeae*. Patient symptoms including dysuria and physical findings including urethral discharge were noted. Complete data was obtained for 34 gonorrhea patients: 13/34 patients had no dysuria and 15/34 patients had scant or no urethral discharge. *N. gonorrhoeae* CFU/ml of the 34 males ranged from $2x10^4$ to $9.4x10^6$ CFU/ml. 75% of patients had less than $2x10^6$ CFU/ml. There was no statistically significant difference in the titers of *N. gonorrhoeae* in patients with no dysuria and scant/no urethral discharge and those with clinical evidence of urethritis ($p=0.490$, Mann-Whitney Rank Sum Test). A urethral swab of males infected with *N. gonorrhoeae* revealed approximately 10^4 to 10^7 CFU/ml irrespective of symptoms of urethritis. These numbers represent a lower limit to the infectious inoculum that must be killed to prevent infection and also demonstrates the high likelihood of asymptomatic transmission.

10:20 INVOLVEMENT OF THE NUCLEUS PARAGIGANTOCELLULARIS (PGi) IN OPIOID WITHDRAWAL-LIKE BEHAVIOR

Niansen Liu*, Ing K. Ho, and Rob Rockhold*, University of Mississippi Medical Center, Jackson, MS 39216-4505

Glutamatergic projections from the PGi to the locus coeruleus (LC) may mediate withdrawal from opioid dependence. To test this, electrical stimulation of the PGi and LC microdialysis were performed in conscious rats. Behaviors (rearing, sniffing, exploration, teeth chattering, wet-dog shakes, scratching, abnormal posturing, escape attempts) occurred during PGi stimulation. The intensity correlated with anatomical location, voltage and with bilateral vs. unilateral stimulation. Unilateral PGi stimulation increased LC glutamate levels, which correlated with increases in behavior. PGi stimulation (15 min. trains of 1 V, 1 ms at 0.5 Hz), increased glutamate by 224 ± 24% above basal (5.15 ± 0.74 mM) and evoked a behavioral score of 4.8 ± 1.2. LC perfusion with kynurenic acid (0.1, 1 mM), a glutamate receptor antagonist, reduced stimulation-induced behaviors by roughly 50%, without effects on glutamate. LC perfusion with a

glutamate transporter inhibitor, l-trans-pyyrolidine dicarboxylic acid (1 mM) increased glutamate more than PGi stimulation/LC perfusion with vehicle alone, with no change in behavioral score. Pretreatment with intracerebroventricular (48 nmol/5 ml) injections of the opioid receptor antagonists, naloxone, b-funaltrexamine, and naltrindole, but not norbinaltorphimine, decreased stimulation-induced behavioral responses by 40–50%. Both a glutamatergic PGi-LC link and endogenous opioids, acting through m-, and d-, but not k-opioid receptors must participate in opioid withdrawal-like behaviors. (NIDA 05828).

10:30 A LIGHT AND ELECTRON MICROSCOPIC STUDY OF NEURAL PATHWAYS CONTROLLING VERTICAL EYELID MOVEMENTS IN THE CAT

Bing-Zhong Chen* and Paul J. May, University of Mississippi Medical Center, Jackson, MS 39216

The rostral interstitial nucleus of medial longitudinal fasciculus (riMLF) and interstitial nucleus of Cajal (InC) are premotor centers controlling saccadic eye movements in the vertical plane. Coordination of eye and eyelid movements during vertical gaze suggests these structures also control the levator palpebrae motoneurons. This was tested in cats. To define the possible sources of premotor input, WGA-HRP was injected into the oculomotor nucleus. Many more retrogradely labeled neurons were found in the caudal-medial riMLF following oculomotor injections involving levator motoneurons. Labeled neurons were also present in the InC. Based on these results, biotinylated dextran arnine (BDA) was injected into either the riMLF or the InC to anterogradely label their terminal fields. EM examination of BDA labeled axon tenninals showed that they contain either the spheroidal or pleiomorphic vesicles. However, labeled riMLF and InC axon terminals contacting the WGA-HRP labeled levator motoneurons contained mostly spheroidal vesicles and formed asymmetrical synapses. Our results strongly suggest that, in the cat, an excitatory projection originating in the caudal-medial portion of the riMLF directly contacts levator motoneurons. The segregation within the riMLF may allow the vertical gaze signal to be adjusted to suit eyelid movements. In addition, the InC supplies a monosynaptic input to the levator motoneurons to control vertical eyelid position in conjunction with vertical eye position. Supported by NIH Grant EY09762 (PJM).

10:40 Break

10:50 ANALYSIS OF PNEUMOCOCCAL CLINICAL ISOLATES BY DNA HYBRIDIZATION USING A FRAGMENT SPECIFIC FOR *pspA*

Edward Moore*, LaTonya B. Washington, and Larry S. McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

Streptococcus pneumoniae is an important human pathogen worldwide. PspA (pneumococcal surface protein A) has previously been reported to be required for full virulence of this extracellular bacterial pathogen. However, these results were based on studies of a single pneumococcal strain that is highly virulent for mice. The purpose of our study was to identify recent human clinical isolates that contain a specific fragment of the aene encoding, PspA. Once identified, it should be possible to introduce a mutation in the *pspA* gene of these isolates to further study the role of PspA in the ability of the pneumococcus to cause disease. We used a previously cloned fragment of *pspA*, from the plasmid pKSD300, which is specific for *pspA* and fails to hybridize to the closely related *pspC* pneumococcal gene. We isolated chromosomal DNA from more than 50 pneumococcal isolates collected in Mississippi, Alabama, or Sweden. The *pspA* fragment contained in pKSD300 hybridized to 15.5% of the isolates tested. There appeared to be no correlation between hybridization with this probe and the locale from which the isolate was obtained. We are currently attempting to carry out insertion duplication mutacrenesis in the positive isolates.

11:00 MECHANISMS AND SEQUENCE OF OXIDANT-INDUCED RENAL EPITHELIAL CELL INJURY

P. Patel*, H. Huang, Suresh C. Tyagi, and A.K. Salahudeen, University of Mississippi Medical Center, Jackson, MS 39216

Although reactive oxygen species (ROS), particularly H_2O_2, have been shown to mediate renal injury in several models, the exact mechanisms or the sequence of events by which oxidants cause cell injury remains poorly defined. We have previously demonstrated a critical role for lipid peroxidation in oxidant-induced *early* renal epithelial cell injury (Am J Physiol 268: F30–F38, 1995). Two recent studies confirm this observation, but in one, preliminary results were provided to suggest that additional targets or mechanisms might be involved in the *late* stage of H_20_2-induced cell injury (Am J Physiol 272: F729–35, 1997). We therefore examined the importance of lipid peroxidation in relation to oxidant-induced DNA damage and ATP depletion at 2-time points, *immediately* and *24 hours*, after a 135-min incubation of LLC-PK1 cells with 250 µM H_2O_2. 2-Methyl aminochroman (2-MAC), a potent lipid radical scavenger, and deferoxamine (DFO) a chelator of catalytically active iron were used in an attempt to delineate the relative roles of cellular targets and mechanisms. Cell injury (% LDH release) *immediately* after H_2O_2-incubation was associated with lipid peroxidation

(thiobarbituric acid method, nmoles/mg protein), ATP depletion (luciferin-luciferase method, nmoles/mg protein), and DNA damage (alkaline-unwinding assay, % residual double stranded DNA). 2-MAC suppressed LDH release along with inhibition of lipid peroxidation, but not DNA damage or ATP depletion. Suppression of LDH release with DFO was associated with inhibition of lipid peroxidation, DNA damage and ATP depletion. At *24 hours*, despite continued suppression of lipid peroxidation, only DFO, but not 2-MAC, maintained significant cytoprotection against H_2O_2. Furthermore, only DFO, but not 2-MAC, reduced DNA damage and maintained higher ATP levels. Our findings suggest that lipid peroxidation plays an important role in the early phase of oxidant-induced cell injury but in the later stage, alternate mechanisms may predominate.

11:10 EXTREME PHENOTYPIC CHANGES ASSOCIATED WITH THE STRUCTURE OF TRINUCLEOTIDE GAA REPEAT EXPANSIONS IN FRIEDREICH'S ATAXIA

Lydia Jemison*, S.H. Subramony, and D. Olga McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

Friedreich's ataxia (FA) is the most common autosomal recessive inherited ataxia which usually occurs within the 1st or 2nd decade of life. It is characterized with a GAA repeat expansion located in the first intron of the X 25 gene on chromosome 9. Hyperexpansion of the GAA repeats causes suppression in FA gene expression, consequentely loss of neuronal cell function and degeneration leading to muscle weakening and abnormality. Correlation between the size of expansion and phenotypic variability such as severity of disease and age of onset provides a differential diagnosis of FA. The aim here is to investigate if the structural differences in GAA repeat sequence correlated with extreme phenotypic diversity in the onset of FA. Patients at age 60 and up were the subjects of this study. Blood samples from patients were analyzed for presence of the GAA expansion and the level of X 25 mRNA transcript. These patients carried a minimal expansion of 120–130 GAA repeats, indicative of atypical FA. The GAA repeats were interrupted with a GAGGAA sequence demonstrated by using Mnl I restriction enzyme and by cloning and sequencing. The level of mRNA were somewhat reduced, and an inverse correlation was observed between the length of expansion and the level of gene expression. In conclusion, molecular diagnostic results in association with clinical presentation of the disease allows for a more accurate classification of FA.

11:20 MITOGEN-ACTIVATED PROTEIN KINASE IS INVOLVED IN HEMOLYSATE-INDUCED CONTRACTION IN RABBIT BASILAR ARTERY

Alexander Y. Zubkov*, Kotaro Ogihara, Phani Tumu, Anita Patlolla, Adam I. Lewis, Andrew D. Parent, and John Zhang, University of Mississippi Medical Center, Jackson, Mississippi, 39216

Object. Mitogen-activated protein kinase (MAPK) is an important signaling factor in the vascular proliferation and contraction, the two features of cerebral vasospasm following subarachnoid hemorrhage. We studied the possible involvement of MAPK in hemolysate-induced signal transduction and contraction in rabbit basilar artery. Methods. Isometric tension was used to record the contractile response of rabbit basilar artery to hemolysate. Western blots using antibodies for MAPK were conducted. (1) Hemolysate produced a concentration-dependent contraction of rabbit basilar artery. Pre-incubation of arteries with MAPK kinase inhibitor PD-98059 markedly reduced the contraction induced by hemolysate. PD-98059 also relaxed, in a concentration-dependent fashion, the sustained contraction induced by 10% hemolysate. (2) Janus tyrosine kinase (JAK2) inhibitor AG-490, pre-incubated with rings, reduced the contractile response to hemolysate but failed to relax the sustained contraction induced by hemolysate. Src-tyrosine kinase inhibitor Damnacanthal and phosphatidylinositol 3-kinase (PI 3K) inhibitor Wortmannin failed to reduce hemolysate-induced contraction. (3) Hemolysate produced a time-dependent elevation of MAPK phosphorylation in Western blot in rabbit basilar artery. MAPK was enhanced 1 min after hemolysate exposure and the effect reached maximum at 5 min. The phosphorylation of MAPK decayed slowly with time, but the level of MAPK was still higher than basal level even!! at two hours after exposure to hemolysate. (4) Pre-incubation of arteries with MAPK kinase inhibitor PD 98059 abolished the effect of hemolysate on MAPK phosphorylation. Conclusion. Hemolysate produced contraction of rabbit basilar artery possibly by activation of MAPK. MAPK inhibitors may be useful in the treatment of cerebral vasospasm.

11:30 IMPROVED SURVIVAL OF COLD-PRESERVED RENAL TUBULAR EPITHELIAL CELLS BY THE ADDITION OF ANTIOXIDANTS TO UNIVERSITY OF WISCONSIN STORAGE SOLUTION

H. Huang*, P. Patel, and A.K. Salahudeen, University Mississippi Medical Center, Jackson, MS 39216

Recent studies suggest that despite the presence of antioxidant glutathione in UW solution, free radicals-mediated cell injury continue to occur in kidneys cold preserved in UW solution. Therefore, in this study we tested whether inclusion of additional antioxidants reduces cold-induced cell injury.

Cold storage (4°C of LLC-PK1 (porcine proximal renal tubular) cells and primary human proximal tubular epithelial in University of Wisconsin (UW) solution were associated with a time-dependent (0–72 hr) increase in cell injury (%LDH release), lipid peroxidation (thiobarbituric acid method, nmoles/mg protein), ATP depletion (luciferin-luciferase method, nmoles/mg protein), and DNA damage (alkaline-unwinding assay, % residual double stranded DNA). These were effectively suppressed with the inclusion of antioxidant 2-methyl aminochroman (2-MAC, 1.56 µM) or deferroxamine (DFO, 2.5 mM). Cold storage of cells was also associated with a time-dependent reduction in glutathione and increase in catalase-inhibitable H_2O_2 production. These were also suppressed with antioxidant inclusion. To verify the functional significance of the antioxidant-afforded cytoprotection, cells cold stored for 48-hr in UW solution with or without the addition of antioxidants were plated, and the rate of cell proliferation by ^{3}H-thymidine incorporation was determined. Proliferation was markedly suppressed in cell stored without antioxidants compared to control cells, i.e., not subjected to cold storage (130±4 vs. 3287±113 DPM/hr, n = 4, m±SE, $p<0.0001$). Inclusion of 2-MAC and DFO significantly improved cell proliferation (2487±88 and 763±36, respectively, both $p<0.0001$ vs. 48-hr cold without antioxidants). Thus, we provide several lines of evidence to suggest that storage of renal epithelial cells in the cold is associated with free radical-induced damage, and that addition of antioxidants further enhances the storage potential of UW solution. Studies are required to determine the importance of our findings in the *in vivo* setting.

THURSDAY AFTERNOON

Room 2

1:15 Introduction, Dr. John Piletz and Ms Zelma Cason

1:20 **Mood Disorders**, Dr. Gregory Ordway, Associate Professor of Psychiatry and Pharmacology, UMC

1:50 Questions and Answers

1:55 **Schizophrenia**, Dr. Henry Nasrallah, Professor of Psychiatry and Neurology, UMC and Associate Chief of Staff, VAMC, Jackson

2:25 Questions and Answers

2:30 Break

2:40 **Dementias**, Dr. Garth Bissette, Professor of Psychiatry and Pharmacology, UMC

3:20 **Drug Abuse**, Dr. Bill Woolverton, Professor of Psychiatry and Pharmacology, UMC

3:50 Questions and Answers

3:55 **Overview of the Research Program in the Department of Psychiatry at UMC**, Dr. Angelos Halaris, Professor and Chairman, Department of Psychiatry and Human Behavior, UMC

4:25 Questions/Answers/Concluding Remarks/Evaluation

4:30 Adjourn

FRIDAY MORNING

Room 2

8:30 Divisional Poster Session

8:30 THE ROLE OF GLUCOCORTICOIDS ON THE PROLIFERATION RATE OF RAW CELLS MAINTAINED AT DIFFERENT CELL DENSITIES

Kim Cornelius*, Michelle Tucci, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

The specific objective of this study was to investigate the effect of the potent steroid hormones cortisol (C) on the viability and proliferation rate of RAW cells maintained in culture for 24, 48 and 120 hours. The cells utilized in this experiment were obtained from the American Type Culture Collection, and were placed in culture at a density of either 1.0 x 10^6 or 1.5 x 10^6 cells per ml. The steroid cortisol used in this experiment occurs naturally in the body, and it is unknown how this type of macrophage cell behaves in its presence. The cells were treated with either a low (20 mg) or high dose (50 mg) of cortisol. The cells were maintained in a sterile environment and cell viability and proliferation rates were calculated at different phases (24, 48 and 120 hours) using standard laboratory protocols. The results of this study showed that the cells with different densities that were treated with C showed marked differences in cell proliferation. There were changes in morphological appearance observed for all groups tested. However, cells treated with C displayed a decrease in cell numbers (16 and 31%) at 48 and (8 and 25%) at 120 hours for cells maintained at both densities as well as cortisol concentration. Data obtained from this investigation suggest that RAW cells are selectively responsive to steroid hormones and such a response was found to be cortisol dose and cell

density dependent.

8:35 THE USE OF TRICALCIUM PHOSPHATE LYSINE (TCPL) DRUG DELIVERY SYSTEM TO RELEASE VARIOUS MOLECULAR WEIGHTS PROTEINS

Krashod Byrd*, Hamed Benghuzzi, and Leon Anderson, University of Mississippi Medical Center, Jackson, MS 39216

Several studies reported from our laboratory have established that TCPL capsules are capable of delivering various organic compounds at a sustained manner for long duration. The specific objectives of this study were (1) to investigate the capability of TCPL capsules to deliver proteins (Pepsin (P) and Bovine Serum Albumin (BSA)) at a sustained level, and (2) to study the effect of molecular weights and isoelectric pH (pH_I) of the aforementioned proteins on the release profile. A total of six TCPL capsules were used for this project. TCPL were prepared by following standard laboratory procedure documented elsewhere. Group I capsules (n=3) were loaded with 10 mg of P (MW 34,620 D, pH_I 2.1). Group 2 capsules were loaded with 10mg of BSA (MW 66,430 D, pH_I 5.0) following standard procedures. The loaded capsules were suspended in serum bottles containing 100 ml, of PBS (pH 7.4) and l0 µL of anti-bacterium serum. The bottles were placed in a metabolic water bath kept at 37°C. Samples were withdrawn at various intervals staring at 15 minutes. The total protein released from each capsule was determined by standard laboratory method. The data was analyzed by means of analysis of variance (Jandel Statistical computer program). The data obtained from this study demonstrated that the physiochernical characteristic of the polypeptide chain is an important factor in the release profile. At the end of 120 hours, a total of 8.16 ± 0.933 (SD) mg was released from capsules loaded with P. In contrast, a total of 5.11 ± 0.873 (SD) mg was released from capsules loaded with BSA. In conclusion, data obtained from this study suggest that: (1) the TCPL capsules were able to deliver P and BSA at a sustained manner for 168 hours, and (2) the difference in the pH_I, as well as, the molecular weight could be the main reason for change in the release profiles.

8:40 THE EFFECT OF DOSAGE ON THE RATE OF BSA RELEASE FROM TRICALCIUM PHOSPHATE LYSINE CAPSULES

Elvin Burton*, Leon Anderson, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Calcium phosphate materials have been used as column supports for chromatology to isolate proteins by size. Tricalcium phosphate lysine (TCPL) ceramic capsules have been formulated as a drug delivery system and is capable of releasing, in sustained manner, proteins as well as other biologicals. However, the effect of the protein concentration on the rate of release has not been fully investigated. The objective of this study was to investigate the effect of dose on the release profiles of bovine serum albumin (BSA) from TCPL ceramic delivery systems. A total of nine TCPL capsules were fabricated using standard laboratory protocols. The density and physical properties of the capsules were evaluated and the capsules were divided randomly into three capsules per group. Capsules in group I were loaded with 10 mg of BSA (MW 66,430, isopH: 5.0), group II and group III capsules were loaded with 20 and 40 mg BSA, respectively. The capsules were then suspended in separate serum bottle each containing 100 ml of sterile phosphate buffered saline (PBS) and maintained at 37°C in a shaker water bath. Samples of 1 ml were removed at various time intervals and replaced with fresh sterile PBS. The total protein released was determined by using a standard protein determination method. The results show that the TCPL capsules are capable of releasing proteins at a sustained level. This phenomenon was found to be directly proportional to the dose loaded within the reservoir of the ceramic capsule. This initial release of BSA was observed at 30 minutes for all three groups. Initial release from capsules containing 10, 20, and 40 mg was found to be 0.198, 0.194 and 0.427 mg of BSA, respectively. These levels of release were sustained for 168 hours. Evaluation of the capsules revealed a slight degradation in all three groups. These observations suggest that the TCPL capsules can deliver polypeptides at sustained levels and due to the biodegradability nature of the system, there will be no surgical removal required in an *in vivo* environment.

8:45 AN ANALYSIS OF THE LONG TERM MAINTENANCE AND INFECTIVE CAPABILITIES OF IN VITRO CULTURED *TRYPANOSOMA LEWISI* IN SUPPLEMENTED GRACE'S INSECT TISSUE CULTURE MEDIUM AND SCHNEIDER'S *DROSOPHILA* MEDIUM

Brad Franklin*, Stacey Hardin, and Greg Stevens, Belhaven College Jackson MS 39202

Trypanosomes are the fifth leading cause of parasitic-induced death in developing countries. A major goal of trypanosome research is the improvement of *in vitro* culture methods. *Trypanosoma lewisi* is a flagellated blood parasite highly infective in rats, but non-pathogenic to humans. A live culture of *T. lewisi* was used to infect a healthy adult rat through interperitoneal injection. During the first peak of infection (6–8 days) blood was taken from the rat and used to inoculate the test media. Several supplemented variations of Grace's insect tissue culture medium and Schneider's *Drosophila* medium were used as the test media. Experimental variations included pH levels, addition of antibiotics, and the presence of foetal bovine serum in the media. After 36 hours of cultivation, live trypanosomes were found in Schneider's

*Drosophil*a medium supplemented with foetal bovine serum at pH 7.4 (Group 1) and in Schneider's *Drosophila* medium supplemented with tetracycline at pH 7.4 (Group 2). In order to test the infective capabilities of the *in vitro* cultured parasites, the trypanosomes found in Group 1 were used to successfully infect a rat after 36 hours in the medium. The trypanosome counts in the experimentally infected rat were highly comparable to the counts made in the control rats.

8:50 THE EFFECT OF SUSTAINED DELIVERY OF DEHYDROEPIANDROSTERONE INDEPENDENTLY OR IN COMBINATION WITH ESTROGEN ON THE REPRODUCTIVE AND VITAL ORGANS OF ADULT FEMALE RATS

Michael Nunnery*, Todd Zizzi, Michelle Tucci, Zelma Cason, Hamed Benghuzzi, and Barry England, University of Mississippi Medical Center, Jackson, MS 39216

Dehydroepiandrosterone (DHEA) is a hormone produced by the adrenals that serves as a precursor for numerous steroid hormones. Conventional modes of DHEA administration were limited to injections and oral routes, which presented several drawbacks. This mandates the desire for development of a different route of DHEA administration. Sustained delivery of DHEA by bioceramic capsules has not been fully explored. The purposes of this study were: (1) to deliver DHEA, and DHEA + estrogen in a sustained manner using tricalcium phosphate-lysi ne (TCPL) bioceramic capsules, and (2) to evaluate the morphological changes of reproductive and vital organs using female rats as a model. A total of nine adult female rats (220–250 g) were randomly divided into three equal groups. Rats in Group I were implanted with TCPL capsules containing 200 mg dosage of DHEA. Group 2 animals were implanted with one TCPL capsule containing 200 mg of DHEA and a second TCPL capsule containing 50 mg estrogen. Group 3 animals served as the control group. Aseptic surgical techniques were utilized during IP implantation of the capsules. After implantation, body weights were recorded and blood samples (2 ml) were obtained biweekly, while Pap smears were taken daily. At the end of 21 days, the animals were sacrificed using an overdose of halothane. The vital and reproductive organs were harvested, processed, embedded, sectioned and screened for cellular changes. Data obtained from this study revealed several structural changes such as slight hypertrophy of the heart and kidneys in steroid implanted rats. A significant increase was observed in the wet weights of the ovaries, tubules, cervix, vagina, and uterine tissues of steroid implanted rats compared to the control animals. Data obtained from this study suggests that: (1) the use of sustained delivery of DHEA as an antioxidant is compromised by several undesirable side effects, and (2) the addition of estrogen to DHEA did not compensate for the major modification induced by sustained delivery of DHEA. Overall, this study provides more insight regarding the physiological alteration induced by sustained delivery of DHEA in rodents.

8:55 EVALUATION OF MACROPHAGE CELLS IN RESPONSE TO RGD, RGE AND POLY-L-LYSINE EITHER FREELY IN SOLUTION OR COVALENTLY ATTACHED TO A SUPPORT

Allison Fuller*, Donna Newman, Michelle Tucci, Aaron Puckett, Audrey Tsao, James Hughes, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Cell surface adhesion receptors interact with a family of adhesion molecules known as integrins. It is assumed that the cells recognize and bind a specific amino acid sequence. It is likely that the host inflammatory response may be mediated via the recognition of the inflammatory cells with the specific integrin molecules. Peripheral macrophages were seeded at a density of 4×10^6 cells on supports coated with either amino-acid heteropolymers of RGE, RGD, or amino-acid homopolymer Poly-L-lysine. Cells were also seeded at the same density in 24 well plates and the wells were treated with RGD, RGE or Poly-L-lysine. The cells were examined morphologically and biochemically at 24, 48, 72 and 96 hours. The results showed cells growing on supports coated with RGD had significantly ($p<0.05$) higher numbers of cells adhering and remaining viable, in comparison to cells growing on Poly-L-lysine or RGE supports. Cells growing on supports coated with RGE appeared irregularly (elongated and spindle) shaped and unevenly spaced. The cells growing on Poly-L-lysine coated supports showed cellular disruption and lysis, whereas cells growing on the RGD appeared intact, regularly spaced and began fusing into giant cells. Lactate dehydrogenase activity was used as a measure of membrane integrity, and cells grown on coated supports with Poly-L-lysine showed a two-fold increase in activity over control and peptide treated groups. On the other hand, cells growing in media containing the free RGE, RGD and Poly-L-lysine showed no statistical differences in cell number, and did not show increased activity of LDH for the entire duration of the experiment. The data suggests that the RGD, RGE and Poly-L-lysine dissolved in solution are not harmful to the macrophages. However, when they are attached to a support they can affect cellular adherence as well as cellular activation.

9:00 EFFECTS OF NUTRITION AND BEHAVIORAL ACTIVITIES ON WEIGHT CHANGES IN MISSISSIPPI DELTA RESIDENTS

Bridgette S. Esters* and Joseph M. Wahome, Mississippi Valley State University, Itta Bena, MS 38941

Changes in body weight of 25 males and 25 females who reside in the Mississippi Delta was monitored for three months. Diet and behavioral activity data were analyzed and

compared with fluctuations in weight. Urban residents had a higher sugar intake than nonurban residents. Nonurban residents exercised more frequently than urban residents. Females fed on snacks more frequently than males, while males ate larger dinners. Males watched television longer and excercised less frequently than females. The mean average weight gain in males was greater in males. The impact of these findings on health is examined.

9:05 GROWTH OF MEGAKARYOBLASTOMA CELLS IN RESPONSE TO ADRENERGIC AND IMIDAZOLINE RECEPTOR AGENTS

Matthew Egerton*, Tenille Howard, M. Elise Lutrick, and John Piletz*, University of Mississippi Medical Center, Jackson, MS 39216-4505

Imidazoline agents modulate sympathetic nervous system outflow, apparently via one or more subtypes of non-catecholaminergic imidazoline receptors (IR). Nevertheless, even the most "selective" IR_1 drugs also possess affinities for α_2-adrenoceptors (ie., moxonidine; IR_1 agonist / weak α_2-agonist) or monoamine oxidases (ie., idazoxan; IR_2 agonist / strong α_2-antagonist). We identified an 85 kDa protein as candidate for IR in platelet-precursor cells, MEG-01, and this protein was up-regulated by treating cells with IR-sensitive compounds (agmatine, idazoxan and moxonidine) and norepinephrine (NE); not blocked by the α_2-selective antagonist, yohimbine. A peptide fragment of this protein is up-regulated on platelets of depressed patients. In the present study, MEG-01 cells were synchronized overnight in 0.5% fetal bovine serum (FBS) and allowed to enter exponential growth by returning to 10% FBS. Compounds (10 µM) were added for 24 hrs and cell number, viability, and differentiation into either floating cells or platelet-like particles were assessed. Only NE had an effect on cell number; inducing a 17% decrease in attached cells ($p = 0.006$) with a shift towards more floating cells. This effect was not blocked by yohimbine (ie., not α_2-mediated). Thus, the up-regulation of 85 kDa IR-like protein in MEG-01 cells in response to imidazoline agents cannot be explained indirectly by a change in cell number or differentiation. Supported: NIMH grant 65183.

9:10 THE BEHAVIOR OF RHESUS MONKEY KIDNEY CELLS TREATED WITH VARIOUS HORMONES

Stacy Hull*, Hamed Benghuzzi, Michelle Tucci, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Recently, several studies have indicated that the use of Rhesus Monkey Kidney epithelial cells (RMKEC) in culture could provide significant knowledge regarding the alteration or dysfunction of kidney tissues that often resulted into kidney failure. The interrelationship between various steroid hormones, as well as, growth-promoting hormone such as growth hormone (GH) and RMKEC has not been fully investigated. The specific objective of this study was to investigate the effects of cortisol (C), testosterone (T), dehydroepiandrsterone (DHEA), estradiol (E), and GH on the proliferation and viability of RMKEC in culture. The cell line was adapted to grow in Morgan, Morton, and Parker's medium 199 (with 1.68 g/L sodium bicarbonate) supplemented with 1% horse serum. A total of 24 wells were plated with RMKEC and divided into six equal groups. In-groups 1–5, each well (n=4) was treated with a physiological dose of C, T, DHEA, E, and GH, respectively. At the end of 96 hours the cells and supernatants were collected and stored for further analysis. The biochemical markers were assessed using lactate dehydrogenase (LDH), catalase, malinodeldehyde (MDA), and cytochrome c (cyt-c). Data obtained suggest that: (I) treatment of RMKEC with C and DHEA resulted in an increase in MDA levels compared to the control and other experimental groups, (II) no significant increase was observed in LDH levels in all treated wells compared to the control group, (III) an increase in catalase activity was observed in wells treated with C, GH, DHEA, and E compared to the control group, and (IV) higher proliferation rate was observed in cells treated with T and E compared to the control group. However, treatment with C showed suppression to the proliferation rate and no significant difference was observed between DHEA, GH and the control groups. In conclusion this study suggests that steroid hormones regardless of the source of secretion (gonads or adrenals) can influence the functional capacity of RMKEC in culture.

9:15 THE ROLE OF ALCOHOL IN THE PROGRESSION OF BREAST CANCER

Carolyn Howard and Shirhonda Thorn*, Jackson State University, Jackson, MS 39217

The goal of this project is to determine whether exposure to alcohol is a risk factor in the development of human breast cancer. With the use of Western blot analyses we are examining variations in expression of P450 and microsomal epoxide hydrolase (mEH). Preliminary data indicates that P450 isozymes are alternately regulated in breast tissue, and that P450 levels increase in combination with decreasing levels of mEH, and vice versa, in response to toxic exposures to alcohol. Our research strategy is to treat mice for two weeks, four weeks and three months and examine the P450 and mEH protein content form breast tissue. This research seeks to assess the hidden associations linking alcohol exposure to human breast cancer so the mouse system will be used since regulation of metabolic enzymes in mice is close to that in human. Such information may allow for the development of effective preventive approaches, early diagnosis and effective treatment. Identification of alcohol as risk factor which promotes metabolic enzyme modulation in

breast tissue will aid in explaining underlying mechanisms which place alcohol drinkers at higher risk of breast cancer development that others.

9:20 PRODUCTION OF 2-ADAMANTYLAMINES USING A NOVEL TITANIUM (IV) ISOPROPOXIDE AND SODIUM BOROHYDRIDE REDUCTIVE AMINATION METHODOLOGY

Peter Ross[1]*, Kurt A. Neldigh[1], Sukanta Bhattacharyya[2], and John S. Williamson[1], [1]University of Mississippi, University, MS 38677, and [2]Argonaut Technologies, San Carlos, CA 94070

The reductive amination of aldehydes and ketones is a useful method for the preparation of medicinally important amines. Our interest in the development of benign reagent systems has led to the development of a safe and efficient reductive methodology which utilizes the combination of titanium (IV) isopropoxide and sodium borohydride. We have now applied this methodology to the preparation of a series of 2-adamantylamine derivatives for biological testing since it has recently been reported that several 2-adamantylamines show antiviral activity equal to or greater than that of the clinically important 1-adamantylamines rimantadine and amantadine. Our compounds will undergo evaluation for antiviral and other potential biological activities in the near future.

9:25 EXPOSURE OF HUMAN MONOCYTES/ MACROPHAGES TO RETRIEVED TITANIUM, POLYETHYLENE, AND HYDROXYAPATITE

Sandra Carr*, William Johnston, Hamed Benghuzzi, Michelle Tucci, Aaron Puckett, Audrey Tsao, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Although tissue culture techniques are used extensively to explore the biocompatibility of various biomaterials used in orthopaedic, dental and pharmaceutical fields, the role of these materials towards the biochemical secretions of human monocytes/macrophages has not been fully elucidated. The specific objectives of this investigation were to determine the biochemical markers resulting from exposure of the human monocytes/macrophages to titanium (TI), large particle size polyethylene (LSP), submicron size polyethylene (SPE), and hydroxyapatite (HA), and (2) to morphologically evaluate the viability of the cells treated with the aforementioned biomaterials. Approximately 15 volunteers donated blood for each phase (24, 48, 72, and 96 hours) of the experiment. The monocytes were isolated by following established lab procedures (Histopaque 1077 and 1119). Aseptic techniques were followed throughout the experimentation. Each phase contained five groups (Control, TI, LSP, SPE and HA). Each group was comprised of six wells (4×10^6 cells/well). The total protein, catalase, lactate dehydrogenase (LDH), malion dialdehyde (MDA), cytochrome c and cell count were measured using established lab protocols. Data obtained suggests that: (I) regardless of the biornaterial being used all experimental groups experienced remarkable phagocytosis in the first two phases (24, 48 hours); (II) MDA and cytochrome c levels were significantly higher for TI treated cells at the end of 24 hours compared to the control and other experimental groups; (III) at 48 hours the MDA level increased in LPE treated cells; (IV) there were significant differences in LDH level in LPE and SPE at 24 and 48 hours compared to the control and other experimental groups; (V) at 72 hours all experimental wells showed significant increases of catalase activity compared to the control. Information obtained from this study demonstrated that structural and functional (metabolic) modifications of inflammatory cells are encountered in the following order: metabolic > polymer > bioceramic implantation devices in culture.

9:30 REDUCTIVE AMINATION OF SPIRAMYCIN

A. Meaghin Burke*, Maralea J. Gourley, and John S. Williamson, University of Mississippi, University, MS 38677

Spiramycins are sixteen membered macrolides produced by *Streptomyces ambofaciens*. They show antimicrobial activity against *Toxoplasma gondii* and *Cryptosporidium*, protozoal opportunistic infections associated with AIDS. The C-18 aldehyde site was subjected to reductive animation using the novel combination of titanium (IV) isopropoxide and sodium borohydride with various amines. The reductive amination product was used as a probe to investigate the structure activity relationship of the C-18 position.

9:35 COMPARATIVE STUDY BETWEEN TRANSFORMED AND NON-TRANSFORMED PHAGOCYTIC CELLS EXPOSED TO NOVEL POLYMERS IN CELL CULTURE

Angela Thrash*, Aaron Puckett, Michelle Tucci, Kim Read, Brad Roberts, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

The use of glass ionomers as dental implantable devices is currently being investigated. There is little information regarding their interactions with inflammatory macrophage cell types. The specific objective of this experiment was to investigate the possible interrelationship between RAW and human monocyte/macrophage cells at the biochemical and morphological level after being in contact with three novel ionomers (Fuji Duet, Fuji IX, and GC-Fuji-Ortho) for 72 hours. Transformed RAW macrophages were obtained from the American Type Culture Collection (ATCC), and the non-transformed human macrophages were obtained from the peripheral blood of 25 male and female volunteers. The cells were plated at a density of 4×10^6 cells/ml in

twenty-four well plates. Each plate was divided into four groups of six cells/group. Twenty-four hours after plating, the cells in groups I–III were incubated with Fuji Duet, Fuji IX, GC Ortho Fuji, respectively, and cells in Group IV were incubated with media alone to serve as controls. Immediately after addition of polymers cellular morphology was monitored in polymer-treated groups for both transformed and non-transformed cells. Cell number data revealed that normal non-transformed cells were similar in number to control cells in media alone. This suggests that the polymer treatment did minor modifications in cellular viability. On the other hand, RAW cell number was markedly reduced in cells treated with polymers in comparison to cells growing in media alone. The data suggest that RAW cells proliferate in culture that the polymer possibly reduced the proliferation rate of the cells. Biochemical analysis of cellular supernatants to determine cellular alterations at 72 hours revealed increased levels of lactate dehydrogenase activity in all ionomer-treated groups of RAW cells compared with media alone. Non-transformed macrophages treated with the same ionomers did not differ significantly from the control cells in media alone. However, when comparing the levels of lactate dehydrogenase activity between the transformed and non-transformed cells it was apparent that the normal cells exhibited statistically higher activity than the RAW transformed cells. The results of this study suggest that although the three ionomers tested were found to be highly biocompatible, the behavior of transformed and non-transformed phagocytic cells towards may not be similar under similar conditions.

9:40 MICROBIAL TRANSFORMATION OF DEOXOARTEMISININ BY *MUCOR RAMANNIANUS*

Anna R. Edwards*, Maralea J. Gourley, and John S. Williamson, University of Mississippi, University, MS 38677

Deoxoartemisinin is a semisynthetic derivative of artemisinin. Arternisinin and some of its derivatives are finding clinical uses in the treatment of multiple drug resistant malaria. Some microorganisms are well known to affect hydroxylation of the arternisinin nucleus producing active metabolites. *Mucor ramannianus* has been shown to produce 913, hydroxydeoxoartemisinin. Using this microbial transformation, the deoxoartemisinin analog can be produced in large quantities and further chemical modification can be made at this position to yield different analogs. These analogs can then be tested for antimalarial activity and to help generate a structure activity relationship.

9:45 HISTOPATHOLOGICAL EVALUATION OF KIDNEY TISSUES EXPOSED TO SUSTAINED DELIVERY OF STEROIDS IN ADULT MALE RATS

Susan Crook*, Michelle Tucci, Zelma Cason, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

The response of the kidney tissues to steroids, mainly Dehydroepiandrosterone (DHEA), Testosterone (T) and Dihydrotestosterone (DHT) has been used extensively to investigate the mechanisms of steroid action. The specific objective of this study was to investigate anatomical characteristics of kidney tissue after sustained delivery of DHEA, DHT or T at physiological or supraphysiological doses using adult male rats as a model. A total of twenty-one adult male Sprague Dawley rats were divided randomly into seven equal groups. Animals in groups I–VI were implanted intraperitoneally with a single tricalcium phosphate lysine delivery system (TCPL) loaded with T (physiological dose), T (supraphysiological dose), DHT (physiological dose), DHT (supraphysiological dose), DHEA (physiological dose), and DHEA (supraphysiological dose), respectively. Animals in Group VII were implanted with empty TCPL capsules and served as sham controls. At the end of 21 days post implantation, the animals in each group were sacrificed and the kidneys were harvested, processed, embedded, sectioned and screened for cellular changes. Data obtained from this study have shown that sustained delivery of DHEA resulted in maintenance of normal structural and functional kidney tissue. Histological evaluation of the organ (5 µm, H&E) have shown that there were nephrotic hypotrophy in all kidneys obtained from animals given supraphysiological doses of DHT or T in comparison to control animals.

9:50 FERMENTATION AND BIOSYNTHESIS OF THE ANTI-CANCER AGENTS, EPOTHILONES A AND B

Ginger P. Powe* and John S. Williamson, University of Mississippi, University, MS 38677

The epothilones A and B are 16-membered macrolide antibiotics produced by the myxobacterium *Sorangium cellulosum*. These compounds exhibit an anticancer, paclitaxel-like activity by inhibiting cancer cell replication through the stabilization of the microtubules and subsequent inhibition of the mitotic spindle assembly. The primary objective of our work is the successful growth of *S. cellulosum*, an analysis of kinetics of production of the epothilones, and the eventual identification of the biosynthetic pathway of the epothilones. Elucidation of the fermentation parameters and the biosynthesis of the epothilones is likely to provide a better understanding of how the biosynthetic pathways of *S. cellulosum* and related organisms might be exploited for the production of therapeutically useful products.

9:55 THE EFFECT OF SERUM OPSINS ON PHAGOCYTOSIS OF FITC LABELED BACTERIA

BY RAW MACROPHAGE CELL

Sylvia Yates*, Michelle Tucci, Zelma Cason, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Macrophages phagocytize microorganisms and particulate debris and degrade them inside the phagosome by the action of reactive oxygen intermediates and proteases. Macrophage function appears to be one of the most important host defense mechanisms. After a bacterial challenge the cells become activated and produce numerous acute inflammatory cytokines. Currently, it is unknown whether there is a threshold of bacteria that must be ingested before the cell becomes activated. The specific objective of this study was to determine if macrophages challenged with 1, 10, or 50 bacteria/cell either serum opsonized or unopsonized elicit the same type of inflammatory response. Bacteria were labeled with fluorescein isothyociate (FITC) and either opsonized in heat inactivated human serum for 30 minutes or left unopsonized. The macrophages were plated at a density of 4 x 10^6 cells/ml on glass coverslips in 12 well plates. An aliquot of 100 µl of bacteria diluted in media to the desired challenge were added to each well for 15 minutes at 37°C. After the incubation period, the wells were washed four times with phosphate buffered saline containing 1% bovine serum albumin to wash away unattached bacteria. The coverslips were mounted on 30 glass slides and viewed under a fluorescent microscope. To determine attached from ingested bacteria, 5 µl of crystal violet added to each cover slip and recounted. The results show that unopsonized and serum opsonized bacteria are taken up by RAW cells in a dose dependent manner. Phagocytosis of opsonized bacteria was statistically different at $p<0.05$ from unopsonized. A sandwich enzyme linked immunoadsorbent assay was used to determine the amount of cytokine released 24 hours after each challenge. The results show that opsonized bacteria triggered a greater release of acute inflammatory cytokines.

10:00 MECHANISTIC STUDIES ON METHIONINE SULFOXIMINE-INDUCED NEUROTOXICITY

M. Melo-Furtado*, and J. Matthews, University of Mississippi, University, MS 38677

Methionine Sulfoximine (MSO) is a powerful convulsant agent that inhibits glutamine synthetase (GS). However, the mechanism of toxicity of MSO is in question. We have measured and correlated the time-courses of the behavioral and biochemical effects of MSO in adult male Sprague-Dawley rats. We have also tested some compounds as potential antidotes for MSO-induced neurotoxicity. MSO 150 mg/kg i.p. produces acute behavioral toxic effects (ataxia, wobbly gait, involuntary movements, convulsions and morbidity) within the first 12 hours. Recovery from these effects occurred from 12 to 24 hours and was followed by cognitive deficits in passive avoidance behavior and the Morris water maze swim test that lasted up to 9 days after treatment. The time-course of these behavioral toxic effects correlated directly with GS inhibition. Co-treatments with a non-specific glutamate receptor antagonist, kynurenic acid (150 mg/kg i.p.) and antioxidant, glutathione (300 mg/kg i.p.) eliminated the toxic effects of MSO, indicating that over-stimulation of glutamate receptors and an associated increase in reactive oxygen species are important in the mechanism of MSO-induced neurotoxicity. The GABA receptor stimulant, chlordiazepoxide (10 mg/kg i.p.), also reduced the toxic effects of MSO, indicating a counteraction of excitatory excess. Calcium channel blockers (verapamil and nicardipine) were not found to be effective antidotes for MSO-induced neurotoxicity. These data suggest that MSO-induced neurotoxicity is due, at least in part, to inhibition of GS, resulting in accumulation of extracellular glutamate, which is responsible for the toxic effects of MSO.

10:05 THE EFFECT OF SUSTAINED DELIVERY OF DHEA AND DHEAS ON THE REPRODUCTIVE AND VITAL ORGANS OF MALE RATS

Todd Zizzi*, Michael Nunnery, Zelma Cason, Michelle Tucci, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Recent studies have documented that conventional administration (orally or injections) of DHEA (dehydroepiandrosterone) or DHEAS (dehydroepiandrosterone sulfate) have induced alteration in tissues of the reproductive track of male rats. However, the exact mechanism of this physiological response has not been extensively studied. In addition, the effect of route of administering DHEA or DHEAS has not been investigated. The specific objectives of this study were: (1) to deliver DHEA and DHEAS at a sustained level by means of TCPL delivery system and (2) to evaluate the ultrastructural changes associated with sustained delivery of DHEA and DHEAS at the reproductive and vital organs levels. A total of 12 adult male rats (BW 250–270 gm) were randomly divided into four equal groups. Groups 1–3 were implanted with TCPL ceramic capsules loaded with 200 mg DHEA, 600mg DHEA (high dose) and 200 mg DHEAS, respectively. Aseptic surgical techniques were performed throughout the experiment. Blood samples (2 ml) were collected every other day for biochemical analysis. The weights were recorded bi-weekly. At the end of 21 days post-implantation, all control and experimental animals were sacrificed following standard lab procedure (overdose of Halothane). The reproductive and vital organs were collected, weighed, fixed, embedded and sectioned (H&E) for histological evaluations. Data obtained from this investigation suggest the following: (1) there was no significant increase in body weights between the experimental (DHEA and DHEAS) and the control rats, (2) the physiological responses of DHEA

was found to be dose independent, (3) there was no significant change in weights of vital organs between the experimental and controls except of the kidneys (22% decrease), (4) there was some atrophy in the prostate of the experimental animals compared to the controls, and (5) there was occasional hyperatrophy at the spermatogonia in the treated rats compared to the control. Overall conclusion, this study suggests that, in male rats, the use of DHEA and DHEAS in a sustained level seem to show some physiological changes in the vital and reproductive organs.

10:10 QUANTITATIVE ANALYSIS OF THE CYTOLYTIC ACTIVITY OF HUMAN SERUM, HDLs, LDLs,AND LIPOPROTEIN DEFICIENT SERUM ON *TRYPANOSOMA LEWISI*

Frank J. Hux* and Chad Knecht, Belhaven College, Jackson, MS 39202

Trypanosoma lewisi is a common blood parasite of rats that occurs throughout the world. Although it is generally non-pathogenic in adult animals, it can cause lethal infections in suckling rats. *Trypanosoma lewisi* is non-pathogenic in humans because of the cytolytic activity of normal human serum. In order to study the cytolytic activity of human serum on *T. lewisi*, observations were made on the effects of human serum, HDLs, LDLs and lipoprotein deficient serum in *T. lewisi* infected rats. Comparison of the trypanolytic activity *in vivo* suggests that Human serum does in fact increase parasitemia in treated rats while lipoprotein deficient serum does not. Comparison of the trypanolytic activity *in vivo* of human HDLs and LDLs on *T. lewisi* suggests that HDL is the trypanolytic factor of human serum while LDL is not. Comparison of the lysis *in vitro* of *T. lewisi* by human serum, lipoprotein deficient serum, HDLs and LDLs suggest that HDL is the trypanolytic factor of human serum. This experimental evidence indicates that human serum and HDLs are strongly trypanolytic.

10:15 THE EFFECT OF RGD AND POLY-L-LYSINE INDIVIDUALLY AND IN COMBINATION ON THE BEHAVIOR OF TRANSFORMED RAW MACROPHAGE CELLS

Donna Newman*, Michelle Tucci, Aaron Puckett, Audrey Tsao, James Hughes, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

The use of homopolymers as coatings for biomaterials has received much attention in the last decade. However, the modifications and alterations induced by using such materials towards inflammatory cells have not been fully investigated. The specific objective of this study was to investigate the role of hetero- and homo-polymers of amino acids on cell proliferation, as well as, to determine cellular alteration biochemically. The RAW macrophage cell line was obtained from the American Type Culture Collection (Rockville, MD) and maintained in sterile RPMI supplemented with 10% fetal bovine serum and 1% antibiotics and antimycotics. The cells were plated at a density of 4 x 10^6 cells/ml onto 24 well plates. The plates were divided into four groups of six wells per group per phase. Cells in the first group were treated with RGD, cells in group 11 were treated with poly-L-lysine, group III cells were treated with RGD + poly-L-lysine, and cells in group IV were treated with media alone. Cell number as well as protein, MDA, lactate dehydrogenase (LDH), and cytochrome C (cyto C) were determined at the end of 24, 48, 72, and 96 hours. Cell numbers were similar for 48, 72, and 96 hours for all four groups; however, at 24 hours there were fewer cells in the poly-L-lysine treated wells. RGD and poly-L-lysine treatments did not cause changes in MDA or protein concentrations for the entire duration of the experiment. RGD at 48 and 72 hours caused a reduction in the LDH activity compared with control and poly-L-lysine treated groups. Differences in MDA concentration and cytochrome C reduction in the RGD+poly-L-lysine was observed at the 96 hours. Data obtained from this investigation could provide more insight regarding the design and development for safe and bioincompatible implantable devices.

10:20 THE MAMMOGRAPHIC PROPERTIES OF BREAST PROSTHESIS MATERIALS

Richard A. Geise, Jamila K. Alexander*, and Hui Wang, University of Minnesota, Minneapolis, MN 55455, and Jackson State University, Jackson, MS 39217

Saline solution and silicone gel, the materials being used most often for breast augmentation and reconstruction, can obscure the results of mammography and consequently interfere with the early detection of breast cancer. In order for future recipients of breast implants to be capable of having more effective mammograms, it is important to identify sufficiently radiolucent breast prostheses. The purpose of this study is to determine the mammographic suitability of several breast implant filler materials by comparing the optical density of their mammographic images to tha of breast-equivalent materials. This study also considers how implant thickness and x-ray energy can affect the imaging of breast implant materials. The materials tested in this study were 3%PVP hydrogel, 9%PVP hydrogel, saline solution, soy oil, Poly Implant Prostheis hydrogel, and honey. 2,3,4, and 5 cm phantoms having glandular tissue to fat ratios of 0/100, 30/70, 50/50, 70/30, and 100/0, were placed on the support of a mammography machine along with the sample to be tested. The materials were imaged with x-ray generator voltages of 24, 26, 28, and 30 kVp. The optical densities of the samples were compared to that of the breast-equivalent materials. The only material whose OD values were between those of the 100% fat and 100% glandular phantoms is 3% PVP hydrogel.

Soy oil was slightly more radiolucent than 100% fat, therefore it should have the best mammographic properties. The x-ray energy level and the thickness of the breast implant filler material do affect the imaging of the breast prostheses.

10:25 Break

10:45 EFFECT OF UHMWPE PARTICLE SIZES IN THE PROLIFERATION AND VIABILITY OF TRANSFORMED RAW CELLS IN CULTURE

William Johnston*, Sandra Carr, Hamed Benghuzzi, Michelle Tucci, Aaron Puckett, Audrey Tsao, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Ultra-high molecular weight Polyethylene (UHMWPE) is widely utilized in the development of orthopedic, dental, and drug delivery system implants. The objective of this study was to investigate the role of different particle sizes of UHMWPE on the proliferation and secretions of phagocytic cells such as transformed RAW cells. RAW transformed monocytes were obtained from the American Cell Culture Line. The cells were at 5–10 generations of reproduction, and were plated into 36 wells at a cell density of 4 million cells per well. The plated wells were divided into three equal groups of 18 wells each. Groups I and 11 were treated with sub-micron particles of UHMWPE and 50–150 micron particles, respectively. At the end of 24, 48 and 72 hours, a total of 6 wells per group were terminated and the cells and supernatants were collected and stored for biochemical markers analysis. Tests were performed after termination, including screening for cell number, cell protein levels, supernatant protein levels, lactate dehydrogenase (LDH), malondialdchyde bis (diethyl acetal) (MDA), catalase, and cytochrome c (C) by following standard lab protocols. The results obtained from this investigation determined the following: (1) at 24 hr phase, the rate of proliferation of RAW cells were slower than that of control group; (2) an increase in cell and supernatant protein levels in cells treated with mixed particles of UHMWPE compared to other groups; (3) an elevation of LDH activity in both experimental groups compared to controls; (4) initial cell membrane damage was observed in treated cells compared to control groups; (5) remarkable increase in catalase activity was observed in submicron UHMWPE treated cells compared to control group. In conclusion, the results of this investigation demonstrate that UHMWPE particle sizes have to be taken into consideration in developing an ideal safe implant.

10:50 INHIBITION OF PLD BY ADMINISTRATION OF ETHANOL IMPAIRS TRANSLOCATION OF NF-κB IN MACROPHAGE CELLS

Michelle Tucci*, Chaiu-Yu Chang, James Hughes, and Rodney Baker, University of Mississippi Medical Center, Jackson, MS 39216

The NF-κB plays a pivotal role in the development of immune response. Following various external stimuli, a cascade of intracellular events leads to the phosphorylation of IκB-α. Following phosphorylation, IκB-α is rapidly degraded and liberates the NF-κB transcription factor which can translocate to the nucleus and activate transcription of target genes. Identification of the signal transduction pathways involved in NF-κB activation has yet to be identified. Data from our laboratory demonstrates that the lipopolysaccharide (LPS) signal transduction pathway mediating NF-κB activation involves phospholipase D (PLD). Phospholipase D catalyzes the hydrolysis of phospholipids generating phosphatidic acid (PA); however, in the presence of ethanol, PLD catalyzes a unique transphosphatidylation reaction generating phosphatidylethanol (PEth). Our data suggest that inhibition of PA by acute ethanol treatments (20, 40 and 100 mM) prior to stimulation with LPS resulted in the accumulation of PEth and inhibition of proinflammatory cytokine (TNFα and IL-1β) production. Further investigation of the cytoplasmic and nuclear fractions of ethanol treated LPS stimulated macrophage cells revealed that ethanol treatment prevented the degradation and translocation of NF-κB for cytokine gene activation. The overall results demonstrate that ethanol may cause its immunomodulatory effects by inhibiting the production of PA via the PLD signaling pathway.

10:55 POTENTIAL APPLICATION AND BIOCIDAL EFFICACY OF THE SPARKER SYSTEM PLASMA ARC AS APPLIED TO WATER AND WASTEWATER

Marcuslene D. Harries*, Alfred T. Mikell, Jr., Robin C. Buchannon, James R. Woolsey, Jr., and James O. Peterman, University of Mississippi, University, MS 38677

Uncontrolled bacterial numbers represent a threat to public health and an industrial nuisance. Disinfectants such as chlorine and ozone are currently utilized for eradicating harmful bacteria and other microorganisms, however, they lack penetrating powers where particulate laden waste waters are concerned and the use of chlorine can result in carcinogenic byproducts. Alternative methods are required to safeguard potable waters and for the treatment of industrial and municipal waters and wastes. The sparker system plasma arc (SSPA) incorporates penetrating power derived from electrical discharges, ultraviolet irradiation, and sonication. To investigate the potential application of SSPA to reduce microbial numbers, SSPA was applied to known numbers of test organisms (nonpathogenic *Escherichia coli* or *Micrococcus luteus*) in well (University of Mississippi Biological Field Station) or tap water (Oxford, MS, Lafayette County). Treatment supplements included physical mixing and NaCl addition. Viable organisms were enumerated utilizing a

drop plate count method, while direct counts (AODC) were determined. The SSPA has proven to be effective in reducing microorganisms 98.5% with a decimal reduction time approximately 12 minutes for *E. coli* and 16 minutes for *M. luteus*. With increased concerns for a safer environment, the SSPA could be advantageous in microbial control strategies involving potable waters, biofouling, or concentrated industrial and municipal wastes.

11:00 HISTOPATHOLOGICAL EVALUATION OF THE CELLULAR COMPONENTS ASSOCIATED WITH THE INFLAMMATORY RESPONSE FOLLOWING SURGICAL IMPLANTATION OF THE ALCAP BIOCERAMICS INTO ADULT MALE RATS

Kenneth Butler*, Hamed Benghuzzi, and Aaron Puckett, University of Mississippi Medical Center, Jackson, Mississippi 39216

It has been demonstrated that ceramic materials used in drug delivery systems are highly compatible and non-immunogenic to host tissues. Recent studies in our laboratory have demonstrated the need for further study of these devices *in vivo* to further elucidate the mechanisms involved in biocompatibility. It has been suggested in the literature that ceramics of differing calcium-phosphate ratios evoke differing inflammatory responses from the host. The specific objective of this investigation was to study the cellular and non-cellular components of the fibrous tissue capsule surrounding the aluminum calcium phosphate (ALCAP) ceramic device. In this investigation, a total of 10 porous implants of ALCAP were implanted into 5 adult male rats subcutaneously (S/C) and intraperitoneally (I/P). At 90 days post-implantation, the animals were euthanized; and the ceramic devices, the fibrous tissue, and vital organs were harvested. Evaluation of routine stained sections (5 µm, Hematoxylin & Eosin) of the fibrous tissue capsule surrounding the ALCAP ceramic revealed the following: 1) the thickness of the fibrous tissue capsule varied and was dependent on the site of implantation (mean S/C thickness = 119.5 ± 40.2 µm, mean I/P thickness = 457.8 ± 41.8 µm), 2) the thickness of the fibrous tissue capsules around the subcutaneous devices differed markedly than those retrieved from the peritoneal cavity, and 3) there were statistically significant differences ($p < 0.05$) in the numbers of cells associated with the chronic inflammatory response with respect to implantation site. Macrophages, neutrophils, fibroblasts, and vascularity differed markedly when comparing the fibrous tissue dissected from the subcutaneous implant than that extracted from around the intraperitoneal implant. The presence of collagen in the fibrous tissue surrounding the ALCAP ceramic was found to be statistically insignificant ($p > 0.05$).

11:05 PATHOPHYSIOLOGICAL CHANGES ASSOCIATED WITH SUSTAINED DELIVERY OF ANDROGENS ON THE MYOCARDIAL TISSUE

M. Zavarella*, Michelle Tucci, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

The specific objective of this study is to investigate the effects of sustained delivery of androgens (testosterone, DHT, and danazol) individually and in combination on the ultrastructural of myocardial tissues using adult Sprague-Dawley male rat. A total of 45 adult male rats were randomly divided into nine equal groups. Groups I–VIII were implanted with TCPL devices loaded with T(40 mg), T(200 mg), DHT (40 mg), DHT (200 mg), D (40 mg), D (200 mg), T+DHT+D (40 mg), T+DHT+D (200 mg), respectively. Group IX animals were unimplanted and served as control group. At the end of 3 month postimplantation, experimental and control animals were sacrificed and blood, reproductive and vital organs were collected, weighed, processed for 5 um sections. The left ventricle and apex were selected for histopatho logical evaluation (H&E) using standard lab protocols. The results of this preliminary investigation showed that: (1) the physiological dose of androgens given alone or in combination did not induce significant injury at the myocardial tissue level, (2) the use of sustained delivery of androgens (D, DHT or T) at supraphysiological levels, resulted in an increase of the wet weight of heart tissues, and this observation was further evidenced by the presence of hypertrophied heart and occasional necrosis in 70% of the tissues, and (3) no significant differences was observed in the physiological response between the treatment groups ($p<0.05$). Observations obtained from this study suggest that the use of TCPL devices to deliver physiological level of androgens is a safe route in treating various hypogonadal conditions. In addition, utilization of such system could minimize or eliminate the side effects that encountered using the conventional methods of androgen administration.

11:10 THE UTILITY OF USING NEAR INFRARED SPECTROSCOPY TO CHARACTERIZE A DYNAMIC TABLET SURFACE

Ke Zhao*, Bonnie A. Avery, and Christy M. Wyandt, University of Mississippi, University, MS 38677

As the most widely used dosage form, tablets have been studied extensively with regards to drug content, hardness, moisture and coating levels in the static state. However, very few studies have been conducted with respect to the dynamic tablet surface. This study demonstrates the effectiveness of using a Fourier transform near infrared system to study both the concentration of analytes and the recrystalization of analyte at the tablet surface in a dynamic system. A model was developed using two sets of tablets, one set was made using a mixture of monohydrate and anhydrous glucose and the other set contained glucose and glutamine. A

fiber optic probe was positioned to collect data at the surface of the dry tablet and the tablet in a saturated glucose solution at specific time intervals. Near infrared spectra were collected, from a series of standards, and used to generate the unique calibration modules in both the solid state and in an aqueous media. Partial least squares regression analysis was used to generate bicomponent calibration modules from raw absorbence spectra obtained from the standard mixtures of the two analytes. The spectra collected were found to contain information concerning surface analyte content, as well as the recrystalization of glucose monohydrate at the surface of an anhydrous glucose tablet.

11:15 CHARACTERISTICS OF DRY CLEANING AGENT PERCHLOROETHYLENE (PCE)-INDUCED PRIMARY HUMAN RENAL PROXIMAL TUBULAR EPITHELIAL CELL (PRTEC) INJURY

H. Huang*, P. Patel, and A.K. Salahudeen, University of Mississippi Medical Center, Jackson, MS 39216

PCE is a synthetic halogenated hydrocarbon and is the primary dry-cleaning solvent in use today. It is toxic, and Federal Agencies regulate that long term exposure of PCE in the work atmosphere should not exceed more than 100 ppm. It is estimated that more than 650,000 U.S. workers may be exposed to it and a recent study demonstrates that dry-cleaners chronically exposed to PCE show clear evidence for progressive renal damage. The ability of PCE to cause renal injury is well established in animal models, but the characteristics or mechanisms of PCE-induced renal tubular damage have not yet been defined. In this study employing a cell culture model, we determined the characteristics of PCE-induced PRTEC injury. PRTEC were obtained from Clonetics®. PCE was dissolved in the cell culture medium by overnight stir resulting in a concentration of 180 ppm. Exposure of RPTEC to PCE dissolved-medium (90–180 ppm) caused a concentration- and time-dependent cell injury (% LDH release). RPTEC cells exposed 100 ppm of PCE demonstrated 75% ATP depletion (luciferin-luciferase) compared to control cells not exposed to PCE. Similarly, PCE exposure lead to 32.8% DNA damage (alkaline unwinding technique) compared to control cells. Thus, our current study in progress demonstrates a new cell culture model to study the PCE toxicity, suggests that at concentration allowable by the Federal agencies PCE can cause renal tubular damage in cell culture setting and that such injury is associated with ATP depletion and DNA damage. Further studies are required to elucidate the mechanisms of PCE-induced renal tubular toxicity.

11:20 MECHANISM OF HEMOLYSATE-INDUCED $[CA^{2+}]_i$ ELEVATION IN FIBROBLAST CELLS

Kazuya Aoki*, Rex B. Williams, Adam I. Lewis, and John Zhang, University of Mississippi Medical Center, Jackson, MS 39216

Erythrocyte components released from blood clot after subarachnoid hemorrhage are thought to be the cause of chronic cerebral vasospasm. The effect of hemolysate on smooth muscle cells and endothelium has been investigated extensively, however their effect on fibroblast cells remains unclear. We studied hemolysate-mediated calcium response in cultured human fetal dermal fibroblast cells by using Fura-2 microfluorimet T-Hemolysate produced a biphasic intracellular free calcium concentration ($[CA^{2+}]_i$) response. It produced a transient peak and plateau response in the presence of extracellular calcium. In the absence of extracellular calcium, it produced a similar transient peak without plateau. Voltage-de pendent calcium channel blocker nicardipine attenuated $[CA^{2+}]_i$ elevation induced by hemolysate. Voltage-independent calcium channel blocker econazole did not block the transient peak but reduced plateau response. Calcium pump inhibitor thapsigargine attenuated $[CA^{2+}]_i$ peak induced by hemolysate. Protein tyrosine kinases inhibitors genistein and tyrphostine A51 attenuated the effect of hemolysate. Hemolysate produced similar $[CA^{2+}]_i$ response in cultured canine cerebral fibroblast cells. We conclude that hemolysate elevates $[CA^{2+}]_i$ by releasing from internal store and promote Ca^{2+} entry, and this effect involves tyrosine kinases activity in fibroblast cells.

11:25 IDENTIFICATION OF PHYTOTOXIC PLANT EXTRACTS

Julie R. Mikell[1]*, Rita M. Moraes[1], James D. McChesney [1, 2], [1]University of Mississippi, University, MS 38677, and [2] NaPro BioTherapeutics, Inc., Boulder, CO 80301

A novel extraction protocol for the discovery of new active compounds from higher plants was developed to optimize detection of biologically active molecules present in plant extracts as well as the eventual isolation and identification of the active constituents. *Juglans nigra* and *Artemesia annita*, known plants to produce phytotoxins were among twelve species extracted employing a method which pre-wets the plant material with an aqueous methanol solution followed by extraction with a series of organic solvents of increasing polarities, (hexanes, 50% hexanes/ethyl acetate, ethyl acetate, and ethanol). The extracts were tested by a simple and reliable pre-emergence herbicide assay. The extraction procedure shortens the time for extraction and is effective in concentration of active compounds into specific extract fractions. This increases sensitivity of the procedure for identification of biologically active substances in plant extracts and provides guidance to the active compound type which enhances efficiency of studies for isolation and characterization of the active.

11:30 SEPARATION OF *PODOPHYLLUM* LIGNANS BY MECC

M. Ganzera*, Rita M. Moraes, N.P.D. Nanayakkara, and I.A. Khan, University of Mississippi, University, MS 38677

Podophyllum peltatum L. (May apple, mandrake) is native to Northern America, whereas *P. emodii* Royle (syn. *P. hexandrum*) descends from India; both belong to the Podophyllaceae family. They are perennial herbs with large, peltate leaves, and its rhizome and roots are used in folk medicine for over a century in the treatment of jaundice, cancer and general warts. Podophyllin, the ethanolic extract of *Podophyllum* is usually applied, containing highly cytotoxic lignanes. Since the widely used anti cancer drugs etoposide and teniposide are derived from the lignan podophyllotoxin, analytical methods for the determination of these compounds are of great interest. Several HPLC-methods to separate *Podophyllum* lignanes have been reported so far [1–3]. Capillary electrophoresis is a rather new technique in the analysis of natural products. Usually it is applied on charged molecules like alkaloids or peptides, but by using buffers containing certain ionic detergents, even uncharged substances can be separated (micellar electrokinetic capillary chromatography, MECC). We have developed a MECC-method, which allows a baseline separation of seven lignans found in *P. peltatum*, using a phosphate buffer system (pH 7.25) containing methanol and the anionic detergent SDS. Results of analyzing different extracts of *P. peltatum* will be compared with those obtained by HPLC. [1] Graham, N., Chandler, F. (1990) Herbal Medicine—Podophyllum, CPJ-RPC, 330–333. [2] Stdhelin, H., von Wartburg, A. (199 1) Cancer Research 51, 5–15. [31 Bastos, J. et al. (1995) Phytochemical Analysis 6, 101–105.

11:35 ETHNOVETERINARY MEDICINE IN DRUG DISCOVERY AND DEVELOPMENT: CHEMICAL AND PHARMACOLOGIC EVALUATION OF SOME INDIGENOUS REMEDIES

N.J. Toyang [1, 2]*, I.A. Khan[1], A. Nfi[3], A.C. Nimrod[1], S. Django[3], C. Wirmum [4], and L.B. Sondengam [5], [1]University of Mississippi, University, MS 38677;[2]Helfer Project International, Little Rock, AR 72202; [3]Institute for Agricultural Research (IRAD), Bambui, NWP Cameroon; [4]Medicinal Foods and Plants Research Center, Bamenda, Nkwen, NWP, Cameroon; and [4]University of Youande 1, BP 812, Yaounde, Cameroon

Livestock farmers as well as many other people in Cameroon depend mostly on plants for treating animal and human diseases or conditions due to the unavailability or high cost of conventional drugs. Heifer Project International and its collaborators have documented information on ethnoveterinary treatments used to control various livestock health problems in Cameroon. Over 400 plants with reputed medicinal value have been identified. Botanic and backyard medicinal plant gardens for cultivation and conservation of plants are being setup. Preliminary evaluation of the chemical and pharmacologic properties of some selected plants has been initiated. Some of the conditions or diseases being targeted include: *Streptothricosis, coccidiosis*, tick and worm infestation. Some plants have exhibited antimicrobial activity in preliminary screen for *in vitro* antibiotic activity.

11:40 ANTIGIARDIAL ISOFLAVONES FROM *DALBERGIA FRUTESCENS*

I.A. Khan*, Mitchell A. Avery, C.L. Burandt, Jr., D.K. Goins, Julie R. Mikell, and L.A. Walker, University of Mississippi, University, MS 38677

Giardia lamblia (or *G. intestinalis*) is a flagellated protozoan parasite that is the most frequent cause of intestinal protozoal infections in the world and the most frequent cause of non-bacterial diarrhea in North America. In some parts of the world, 20–30% of the population is affected. The disease is especially prevalent in infants and children in the developing world, resulting in malabsorption and malnutrition. Massive outbreaks occur after contamination of water supplies, but person-to-person transmission occurs commonly in day care centers and among homosexuals; some outbreaks have been traced to improperly prepared foods. Current therapies for giardiasis include metronidazole, furazolidone and quinacrine, with undesirable side effects and/or emerging resistance. In an effort to discover and characterize naturally occurring antiprotozoal compounds, a rapid, simple *in vitro* assay has been established, and several thousand plant extracts have been screened, leading to the isolation of active isoflavone constituents. Forrnononetin (IC50 of 100 nM), pseudobaptigenin, and some of its analogs have marked antigiardial activity, with the best at about 6 times more potent than the current drug of choice, metronidazole (600 nM). In addition, the selectivity of the effect is striking, with no toxicity observed to mammalian cell lines or to fungal and bacterial pathogens.

11:45 FLAVONOID GLYCOSIDES FROM *PAULLINIA PINNATA* L.

N.J. Toyang [1, 2], E.A. Abourashed[1]*, I.A. Khan[1], and J.S. Choinski, Jr.[3], [1]University of Mississippi, University, MS 38677;[2]Heifer Project International, Little Rock, AR 72202; [3]University of Central Arkansas, Conway, AR 72035

Paullinia pinnata L. (Sapindaceae) is a medicinal plant widely used in the treatment of various animal and human conditions in Cameroon, West Africa. This plant was collected and identifed through ethnoveterinary surveys conducted by Heifer Project International. In an attempt to verify the medicinal value of P. Pinnata, phytochemical investigation of the leaf extract resulted in the isolation of a number of flavonoid glycosides that are believed to be new.

Purification of these flavonoids was achieved by successive chromatographic separations on Celite and C18 columns. Structure elucidation utilized a combination of spectroscopic methods (UV, IR, NMR and MS).

11:50 HPLC METHOD FOR THE SEPARATION OF KAVA PYRONES

M. Ganzera*, and I.A. Khan, University of Mississippi, University, MS 38677

From the rootstock of *Piper methysticum* Forst. (Piperaceae) the traditional Oceanean beverage kava (or kawa, awa, yagona) is prepared. The knotty, up to 3 m long roots are not only the ingredient for this intoxicating drink, but also of great importance in traditional medicine of the Pacific islands to treat urogenital infections, migraine and sleeping problems. Kava shows sedative, anticonvulsive and spasmolytic effects in animal experiments; the active components are pyrones [1]. We have developed a HPLC method for the baseline separation of the six main kava pyrones, which shows several advantages to previously published techniques [2–4]. With our system, a separation is possible within 40 min., in reversed phase mode, no additon of acid is necessary, as well as no column heating. [1] Leung, A., Forster, S. Encyclopedia of Common Natural Ingredients; John Wiley & Sons; New York, 1996; p. 330–331 [2] Boonen, G., Beck, A., Hdberlein, H. (1997) J. Chrom B 702, 240–244 [3] Hdnsel, R., Lazar, J. (1985) Dt. Apotheker-zeitung 41, 2056–2058 [4] Ross, S., de Freese, L., Melzer, M., Kolkmann, R., poster presented at the 46th annual meeting of the Society for Medicinal Plant Research, Vienna, 1998.

11:55 CAPILLARY ELECTORPHORESIS IN THE ANALYSIS OF NATURAL PRODUCTS

K. Gasser[1]*, H. Stuppner, M. Ganzera[2], and I.A. Khan[2], [1]University of Innsbruck, Austria, and [2]University of Mississippi, University, MS 38677

Panax ginseng is one of the most widely used Chinese herbs. It occupies an important role in the folk medicine of China, Korea, and Japan. for thousands of years, ginseng has been used as a tonic and emergency medicine and as a rejuvenating and revitalizing agent. This drug is not a therapeutic agent for the treatment of particular illnesses, but rather a prophylactic which heightens the resistance of the organism to various environmental influences and stimuli and/or reduces the disposition or susceptibility to illness [Dtsch. Apoth. Ztg. (1987) 127, p. 447]. The plant belongs to the Araliaceae family, comes originally from Korea, and is cultivated in China, Japan, the former USSR, and America. Ginseng root contains more than 20 saponines, known as ginsenosides. We tried to separate seven of these neutral compounds by applying a special method of capillary electrophoresis. CE has its main appearance in separating charged molecules as proteins and peptides. Recently a special method named Micellar Electrokinetic Chromatography (MEKC) was developed for neutral analytes. Using a dinatriumhydrogenphosphate buffer (pH 9.4) containing sodium cholate as surfactant, seven ginsenosides have been separated successfully within 30 min. The addition of acetronile as an organic modifier was necessary.

12:00 CHARACTERIZATION OF GLUCOSE TRANSPORTERS IN HaCaT AND DERMAL FIBROBLAST CELLS

Jeremy W. Allen[1]*, Hari H.P. Cohly[2], Barbara P. Rogers[2], and Michael F. Angel[2], [1]Belhaven College, Jackson, MS 39202, and [2]University of Mississippi Medical Center, Jackson, MS 39216

Introduction: Glucose transporters, a family of proteins associated with the insulin and non insulin regulated uptake of glucose into cells, have been studied in many organs but not cells of the skin. The purpose of this study was to determine the presence of glucose transporters 1 (Glut1) and 4 (Glut 4) in cell from the skin: epidermal keratinocytes (HaCaT) and human dermal fibroblast (HDF). **Methods**: Cell lines studied were: HDF, HaCaT, and 3T3L1 adipocytes (positive control for Glut 1 and Glut 4). Insulin free media containing 4500 µg/ml of glucose was placed on near confluent cell cultures for 4 hours. Cells then received either 200, 100, 50, and 0 nM/ml of insulin for 5 min at 37°C, then were harvested, and proteins prepared in boiling sample buffer. Immunoassay using protein slot blot was carried out with constant concentrations of collected proteins and titrated concentrations of Glut 1 and Glut 4 primary antibodies. Alkaline phosphatase conjugated to the secondary antibody was used to determine the presence of Glut 1 and Glut 4 with BSA as the negative control. **Results**: Adipocytes had a strongly positive signal for Glut 1 and 4. HDF was positive for Glut 1 and inconclusive for Glut 4. **Conclusion:** Adipocytes contained large amounts of Glut 1 and 4. Glut 1 is present in HDF. HaCaTcells are continuing to be investigated.

12:05 MODELING GROWTH OF HETEROGENEOUS TUMOR

Wei-Yin Chen[1], Phanidhar Annamreddy[1]*, and L.T. Fan[2], [1]University of Mississippi, University, MS 38677, and [2]Kansas State University, Manhattan, KS 66506

It has long been recognized that the growth of tumor population depends on the initial age distribution and the age-dependent cellular birth rate. To take into account the effects of the resultant cell heterogeneity, deterministic dual-cell models have been available for sometime. Nevertheless, these models ignore various important variables of the growth process, some characterizing the cells' inherent properties, and others, environmental factors. This gives rise to uncertainties, or fluctuations, when the growth is simulated based on the

models. Such fluctuations are the focus of the current stochastic analysis. Two types of cells are visualized to proliferate separately and to transform mutually during the process. The master equations of the system have been formulated through probabilistic population balance around a particular state by considering all mutually exclusive events. The governing equations for the means, variances and covariance of the random variables have been derived through the system-size expansion of the master equations. The stochastic pathways of the two different types of cells have been numerically simulated independently by the algorithm derived from the master equations as well as by an event-driven Monte Carlo algorithm. These algorithms have yielded results which are in excellent agreement.

FRIDAY AFTERNOON

Room 2

1:30 Divisional Business Meeting

1:45 Divisional Awards: High School, Undergraduate, Graduate, Post-doctoral

2:15 CHANGE OF SPINAL κ-OPIOID RECEPTOR AFFINITY FROM CHRONIC EXPOSURE TO INTRATHECAL BUTORPHANOL

Brian K Tsang*, Wichai Wongchanapai, Zhi He, Ing K. Ho, and John H. Eichhorn, University of Mississippi Medical Center, Jackson, MS 39216

The spinal cord itself appears to be a primary site in the development of tolerance to intrathecal (IT) opioids. The involved spinal opioid receptor affinity is poorly understood. Male rats were implanted with lumbar IT catheters and received IT saline or butorphanol (52 nmol/hr) for 96 hr via implanted osmotic pumps at a rate of 1 µl/hr. Thereafter, the spinal cords were dissected out, frozen and sectioned to slices 14 µm thick. To measure the receptor affinity for antagonists, competitive binding assays for µ-, δ-, or κ-opioid receptors were performed by incubating the tissue sections with [^{3}H]DAMGO, [^{3}H]DPDPE, or [^{3}H]U-69,593 (the selective agonist for µ-, δ-, or κ-opioid receptors, respectively), and with various concentrations of the corresponding unlabeled selective antagonists: CTOP, naltrindole, or nor-binaltorphimine. The ability of the antagonists to inhibit the binding of the hot agonists yielded a measure (IC50) for the antagonist affinity. In butorphanol-infused rats, the spinal κ-(but not δ- and µ-) opioid receptor developed a higher affinity for its selective antagonist, compared to the control rats. These results indicate that spinal κ-opioid receptors become more sensitive to antagonists with chronic exposure to IT butorphanol. Further investigation as to the mechanism leading to the receptor affinity change is indicated.

2:30 ULTRASTRUCTURE OF THE MACAQUE PUPILLARY LIGHT REFLEX PATHWAY

Paul J. May[1]*, Jonathan T. Erichsen[2], and Nick F. Wdglif[2], [1]University of Mississippi Medical Center, Jackson, MS 39216, and [2]University of Wales, Cardiff, CFI-3XF, United Kingdom

In the pupillary light reflex pathway, the retina projects to the olivary pretectal nucleus (OPt), which in turn contacts preganglionic motoneurons; (PGMs) in the Edinger-Westphal nucleus (EW). We used dual labeling EM experiments to examine this reflex arc. Retinal terminals with spherical vesicles made synaptic contacts with slightly asymmetric membrane densities in OPt. The anterogradely labeled retinal terminals synapsed on the somata and proximal dendrites of neurons labeled retrogradely from EW. EM analysis of EW revealed several types of synaptic profile contacting the somata and dendrites of PGMs retrogradely labeled from WGA-HRP injections into the ciliary ganglion. They contained either spherical or pleomorphic clear vesicles, and some also contained dense-cored vesicles. Axons, projecting from the OPt were labeled with BDA in the same animal. The distribution of labeled terminals only overlapped ventromedially placed PGMs. At the EM level, anterogradely labeled terminals with clear spherical vesicles and scattered dense-cored vesicles were observed making asymmetric synaptic contacts on retrogradely labeled PGM proximal dendrites. These data represent an ultrastructural verification that the pupillary light reflex pathway has only two central relay neurons and the olivary pretectal projection in the circuit may use a peptide cotransmitter. In addition, the circuit utilizes only ventromedially located preganglionic motoneurons in the Edinger-Westphal nucleus. Supported by NEI grants EY09762 (PJM) and EY04587 (JTE).

2:45 NOVEL BIOMARKERS FOR ASSESSMENT OF THE HOST RESPONSE TO PERIODONTAL INFLAMMATION

Roger B. Johnson*, Francis G. Serio, and Xiaoli Dai, University of Mississippi Medical Center, Jackson, MS 39216

There is little definitive information concerning biologic markers for the diagnosis and assessment of progression of periodontal diseases. The purpose of this study was to determine relative concentrations of several biomarkers of inflammation during progression of periodontal diseases in 120 Hispanic patients. The following markers were assessed by ELISA from gingival biopsies with active periodontal disease, obtained during routine tooth extraction, IL-1-p, VEGF, IL-6, IL-2, bcl-2, IL-8, IL-12, IL-10 and IL-2. Biopsies were grouped according to the depth of the adjacent gingival sulcus (which indicated severity of the disease): ≤3 mm (normal), 4–6 mm, and >6 mm. Means were compared by factorial ANOVA and Sheffè comparisons and $p<0.05$ was used to reject the null hypothesis. IL-8, IL-12 and bcl-2 concentrations were highest in the ≤3 mm group; VEGF, IL-2, IL-4, and IL-10 were highest in the 4–6 mm group; and IL-6 and IL-1-β were highest in the >6 mm group. The data suggest the ability of tissue biomarkers of inflammation for prediction of the severity of periodontal diseases. The data also suggests that a panel of these biomarkers could be developed as an adjunct diagnostic test for diagnosis and assessment of progression of periodontal diseases.

3:00 CORTICOTROPIC RELEASING HORMONE (CRH) SUPPRESSES THE MIGRATION OF ACTIVATED HUMAN MONOCYTES

Antoinette Walker[1], Xinchun Zhou[2], Pamela G. Banks[3], and Pratibha C. Joshi[2]*;[1]Wingfield High School, Jackson, MS 39204;[2]University of Mississippi Medical Center, Jackson, MS 39216; and [3]Jackson State University, Jackson, MS 39217

It is now widely accepted that a bidirectional communication exists between neuroendocrine and immune systems. The present study was done to investigate the effect of a stress-induced neuropeptide, corticotropic releasing hormone (CRE), on the migration of human monocytic cell line THP-1. Cells ($2x10^6$) were packed in nonheparinized capillary tubes (0.8 mm x 75 mm), sealed with a tube sealer and mounted in Sykes-Moore chambers. Chambers were filled with RPMI1640 with or without CRH (1 µM). In some experiments THP-1 cells were activated with LPS, CRH or both for 4 or 28 hs before packing them into the capillary tubes. Chambers were kept at 37°C for 18 hrs. The cell migration area was calculated as product of both the diameters (height x width) of the migration zone. The results showed that CRH alone had no effect on migration of THP-1 cells, however significant inhibition of migration was observed when cells were activated with LPS ($P=0.005$) and LPS plus CRH ($P=0.001$). Thus, activation state of THP-1 cells may play an important role in the action of CRH.

3:15 NUTRITION, ENVIRONMENT, AND DISEASE: A COMPARATIVE STUDY OF AFRICANS IN DIASPORA

Lovell E. Agwaramgbo[1]*, Eucharia Agwaramgbo[1], Robbye Hayes[1], Erica Quinn[1], David Wilson[1], Chidi Anujulu[2], and Enoch Agunanne[3]*;[1]Tougaloo College, Tougaloo, MS 39174;[2]University of Nigeria, Calabar; and [3]Edendale Hospital, Pietermarlitzburg, Natal, South Africa

To investigate if nutrition and environment serve as modulators of aging and disease, we examined the nutritional intake of the residents of two Imo State counties in Nigeria and five counties in Mississippi. The study, particularly, wanted to examine in influence of age, culture, geographical location, and parental influence on dietary intake and habit. Consecutive seven-day dietary intake information was obtained from the general public residents, from an elderly nursing home, and from a pre-school establishment. The results suggest a wide variation in nutritional exposure among the three groups studied. The research data also show a disparity in incidences and mortality of certain diseases among the groups. Whether the observed disparity in aging, cancer, hypertension, and obesity are due to genetically programmed processes or life style stochastic events will be discussed. Acknowledgement: Funding was provided by Ramgbo Innovative Research Concepts.

3:30 DIFFERENTIAL EFFECT OF PRO-INFLAMMATORY CYTOKINES ON ACTH PRODUCTION BY MOUSE PITUITARY CELL LINE

Chasity R. Ducksworth[1], Xinchun Zhou[2], Pamela G. Banks[3], and Pratibha C. Joshi[2]*, [1]Callaway High School, Jackson, MS 39206;[2]University of Mississippi Medical Center, Jackson, MS 39216; and [3]Jackson State University, Jackson, MS 39217

The present study was done to investigate the effects of pro-inflammatory cytokines interleukin-I beta (IL-1β), tumor necrosis factor alpha (TNF-α.), and migration inhibitory factor (MIF) on the release of adrenocorticotropic hormone (ACTH) by a mouse pituitary tumor cell line At-T20. Cells (500,000/well) were cultured with or without cytokines (50 ng/ml) at 4, 24, and 48 hs. Supernatants were collected and stored at -20°C. Levels of ACTH in the supernatants were measured by a bioassay that used morphological rounding of mouse adrenal tumor cells (Y_1). The results showed that ACTH release was increased by IL-Iβ and MIF up to 24 hs but declined thereafter. In contrast, TNF-α had suppressive effect on ACTH release at 4, 24, and 48 hs. These data indicate that pro-inflammatory cytokines have differential effect on ACTH-producing cells.

3:45 Divisional Poster Session

HEMOLYSATE ACTIVATED TYROSINE PHOSPHORYLATION IN CULTURED HUMAN FIBROBLASTS

Anita Patlolla*, Kotaro Ogihara, Kazuya Aoki, Alexander Y. Zubkov, Eva Bengten, Andrew D. Parent, and John Zhang, University of Mississippi Medical Center, Jackson, MS 39216

Hemolysate, a proposed candidate for cerebral vasospasm, produces contraction of cerebral arteries by activation of tyrosine kinases. In addition, hemolysate accelerates fibroblast collagen compaction that could play a role in cerebral vasospasm. We studied the effect of hemolysate on tyrosine phosphorylation and fibroblast collagen compaction in cultured human dermal and dog cerebral fibroblasts using tyrosine kinase inhibitors and tyrosine antibodies. Results indicated that (1) Hemolysate was found by Western Blot to enhance tyrosine phosphorylation of two proteins approximately 64 and 120 kD. The effect was time-dependent that the maximum effect of hemolysate (10%) was observed 5 min after treatment and the phosphorylation lasted more than 60 min. The effect of hemolysate was also concentration dependent. (2) Two main components in hemolysate, oxyhemoglobin and adenosine triphosphate (ATP), were tested separately. Oxyhemoglobin produced a biphasic response, a peak phosphorylation of both 64 and 120 kD at 3 min and a second peak at 60 min. ATP produced similar effect on phosphorylation to that of oxyhemoglobin. (3) Tyrosine kinase inhibitor genistein and tyrphostin A51 (30 µM), pre-treated with cells for 60 min, markedly reduced the effect of hemolysate on tyrosine phosphorylation. (4) Hemolysate also increased tyrosine phosphorylation in cultured canine basilar artery fibroblasts and this effect of hemolysate was inhibited by genistein and tyrphostin A51. Genistein and tyrphostin A51 also abolished the effect of hemolysate in human dermal fibroblasts. (5) In another study, hemolysate accelerated fibroblast collagen compaction and the effect of hemolysate was abolished by tyrosine kinase inhibitors genistein and tyrphostin A51. We conclude that hemolysate activates tyrosine kinase which lead to acceleration of fibroblast compaction. This effect of hemolysate may contribute to cerebral vasospasm.

ALTERNATIVES FOR SYSTEMIC DELIVERY OF DELTA-9-TETRAHYDROCANNABINOL (THC: PRO-DRUG PHARMACOLOGY AND PHARMACOKINETICS

L.A. Walker*, E.C. Harland, and Mahmoud A. ElSohly, University of Mississippi, University, MS 38677

Although delta-9-tetrahydrocannabinol (THC) has demonstrated utility for several medicinal applications, several studies have reported the inconsistent bioavailability of the oral soft gelatin capsule formulation, due to erratic absorption and/or variable first-pass metabolism of THC. This problem limits the utility of THC for its approved indications, and also prevents efficient assessment of other potential therapeutic applications. In an effort to overcome these pharmacokinetic limitations, the utility of various ester “pro-drugs” of THC and various suppository formulations were evaluated as alternatives for effecting the systemic delivery of THC. Studies were designed to characterize the bioavailability and efficacy of these preparations. In addition, studies evaluated the behavior of THC-hemisuccinate (THC-HS) as a pro-drug. In rodents and dogs, intravenous administration of THC and THC-HS produced identical pharmacological responses (hypothermia and potentiation of thiamylal sleep times in mice, bradycardia in dogs) except at very high doses. After i.v. and rectal administration of THC-HS, the parent ester could not be detected in plasma, but that THC and its metabolite were detected in a fashion consistent with the hydrolysis of THC-HS to THC in the absorption process, or immediately on appearance in the plasma. THC-HS administration via suppositories resulted in excellent bioavailability, sustained plasma levels of THC, and improved efficacy as compared to the oral formulations, suggesting the feasibility of this route for the delivery of THC in some therapeutic applications.

DETECTION OF PARAQUAT IN MARIJUANA SAMPLES CONFISCATED BETWEEN 1994–1997

Samir A. Ross*, Zlatko Mehmedic, Shelba Lalchandani, Rawia Arafat, Bao Yi, and Mahmoud A. ElSohly, University of Mississippi, University, MS 38677

Paraquat is the common name for 1,1'-dimethyl-4,4'-dipynidinium salt. Today paraquat is the most widely used non-selective herbicide. It is the most effective herbicide in controlling *Cannabis sativa* L. Several reports indicated that the most prominent toxicological problems associated with paraquat are related to its effects on the lung. Therefore, pulmonary damage could potentially result from smoking marijuana that has been sprayed with paraquat. A total of 2314 marijuana samples confiscated between 1994 and 1997 were analyzed for the herbicide Paraquat. One hundred and thirty one of these samples (5.7%) tested positive for the herbicide. The paraquat concentration for the positive samples ranged from 1.0 to 131.1 ppm with an average concentration of 11.7 ppm.

GC/MS DETERMINATION OF HEROIN METABOLITES IN MECONIUM: EVALUATION OF FOUR SOLID PHASE EXTRACTION CARTRIDGES

Maissa Y. Salem[1, 3], Samir A. Ross[1]*, Timothy P. Murphy[2], and Mahmoud A. ElSohly[1, 2], [1]University of Mississippi, University, MS 38677;[2]ElSohly Laboratories, Inc., Oxford, MS 38655; and [3]Cairo University, Cairo, 11562, Egypt

Heroin, 6-monoacetyl morphine, morphine and codeine were extracted from meconium samples using solid

phase extraction techniques. Four different types of commercially available extraction cartridges were used. This was followed by the simultaneous analysis of the four analytes using GUMS. The performance of the different SPE cartridges was evaluated. In each case, the extraction efficiency, linearity range, LoD, LoQ, between run precision, and within run precision were determined. Satisfactory results were obtained with the four different types of SPE cartridges. LoD as low as 20 ng/g for codeine, 10 ng/g for morphine and 2.5 ng/g for 6-monoacetyl morphine and LoQ as low as 20 ng/g for codeine, 10 ng/g for morphine and 5 ng/g for 6-monoacetyl morphine were obtained.

THE DEVELOPMENT OF A RISK ASSESSMENT TOOL FOR ESTIMATING RESIDENT EXPOSURE TO AGRICULTURAL PESTICIDES

John P. Juergens* and Dennis A. Frate, University of Mississippi, University, MS 38677

The potential health effects of acute and chronic exposure to agricultural pesticides, particularly in rural populations, has become an important societal concern. In 1994 work began on the development of a method to assess the exposure risk of Mississippi Delta residents to agricultural chemicals from a variety of sources. This paper presents the development process of a field survey instrument, the Household Environmental Risk Appraisal (HERA), as it progressed through several stages including preliminary data collection, pilot testing, refinement, and large-scale implementation. In two separate studies it was learned that such an instrument was capable of identifying sources of pesticide exposure, frequency of exposure, and lifestyle practices that contributed to unnecessary exposure. For example, it was learned that nearly one-third of those surveyed are regularly exposed to agricultural chemicals through multiple pathways; the large majority of residents, including children, experience routine acute exposure from crop spraying; and about one-third of residents admit to using cotton poisons in their homes. Additional data are presented along with lessons learned throughout the evolutionary process of the survey instrument, and recommendations for further research and plans for community education programs on exposure risk reduction.

ELICITATION OF PODOPHYLLOTOXIN IN PODOPHYLLUMPELTATUM SHOOT CULTURE BY FUNGAL AND CHEMICAL TREATMENTS

Rita M. Moraes[1]*, C.L. Burandt, Jr.[1], M. Ganzera[1], Julie R. Mikell[1], J. Baslos[1], N.P.D. Nanayakkara[1], J.D. McChesney[2], I.A. Khan[1], [1]University of Mississippi, University, MS 38677, and [2]NaPro BioAerapeutics Inc., Boulder, CO 80301

Podophyllum species are the natural source for the lignan podophyllotoxin, a compound from which the semi-synthetic drugs etoposide and temposide are derived. These drugs have been used for the treatment of cancers. The commercial source of podophyllotoxin is *Podophyllum emodii* Wall., a species found in India. This species has been considered endangered. To ensure future stable supplies of podophyllotoxin, a working group at the National Center for the Development of Natural Products (University of Mississippi) screened populations of *Podophyllum peltaturn* L, the North American species, and developed a shoot culture protocol to study podophyllotoxin elicitation. Shoot cultures were treated with fungal elicitors and stress related compounds. The stress compounds were glutathione, jasmonic acid, methyl jasmonate, salicylic acid, arachidonic acid, ethylene at concentrations varying between 10, 100 and 1000 pM. Treatments of autoclaved extract of *Puccinia* and *Mucor* homogenates on *Podophyllum* plantlets for ten days resulted in major increases of podophyllotoxin 241.8%. Homogenates of autoclaved *Puccinia* and *Mucor* produced in MS liquid media without sugar induced the highest increase of the toxin in target plantlets. However, when sugar was added to Mucor media, the effect of fungal elicitors on the yield of podophyllotoxin decreased if the extract had been homogenated and autoclaved prior to application to target plantlets. Thus, it appears fungal species, growth media and type of extract that influenced elicitor production which in turn affected podophyllotoxin content.

QUALITY OF HERBAL MEDICINES

M. Ganzera and I.A. Khan*, University of Mississippi, University, MS 38677

A recent study (Grifo et al., Biodiversity and Human Health, 1996) found that, on the basis of the number of prescriptions filled each year, 57 percent of the top-selling 150 pharmaceutical products in 1993 contained active ingredients that were natural products, derivatives, or analogs of natural products [1]. For nonprescription medicine and dietary supplements the percentage is even higher. In our project we chose six of the most important herbal drugs (St. John's Wort, Gingko, Ginseng, Echinacea, Saw Palmetto and Valerian), developed analytical methods for their standardization, and checked marked products for their content. Our results showed enormous product to product variations, for example in Valerian (0–0.3 % valerenic acid) or Ginseng (1.01–9.60% ginsenosides). These facts underline the importance of quality control for the production of herbal medicine, an aspect which has been neglected commonly so far. [1] Artuso, A. Drugs of Natural Origine; Pharmaceutical Products Press; Haworth Press; New York; 1997; p. 4.

Δ^9-THC AND OTHER CANNABINOIDS CONTENT OF CONFISCATED MARIJUANA: POTENCY TRENDS, 1980–1997

Mahmoud A. ElSohly, Samir A. Ross*, Zlatko Mehmedic, Rawia Arafat, Bao Yi, and Benjamin F. Banahan III, University of Mississippi, University, MS 38677

The analysis of 35,312 Cannabis preparations confiscated in the United States over a period of 18 years (1980–1997) for delta-9-tetrahydrocannabinol (Δ^9-THC) and other major cannabinoids is reported. Samples were identified as cannabis, hashish or hash oil and cannabis samples were categorized as marijuana (loose material , kilobricks and buds), sinsemilla, Thai sticks and ditchweed (wild cannabis growing in the USA Midwest). Since the sample collection form had no classification for ditchweed prior to 1995, cannabis samples analyzed from 1980–1994 were retrospectively examined and classified as ditchweed if they met the qualification criteria of having less than 1 % Δ^9-THC and CBD greater than Δ^9-THC. The data showed that more than 82% of all confiscated samples (cannabis, hashish and hash oil) were in the marijuana category (loose material, kilobricks, or buds) for every year except 1980 (61%) and 1981 (75%). The potency of marijuana samples rose from less than 1.5% in 1980 to approximately 3.3% in 1983 and 1984. The THC level then dropped to 2.4% in 1986 before it rose again to 3.3% in 1988. From 1988 to 1992, the average THC level fluctuated slightly around 3%. Since 1992, the THC concentration in confiscated marijuana samples has continuously risen, going from 3.1 % in 1992 to 4.2% in 1997. The increase in marijuana potency was evident even when high potency outliers were excluded from the analysis. The potency of all cannabis samples including sinsemilla and ditchweed along with marijuana was almost parallel to that of marijuana. The average levels of Δ^9-THC over the last seven years showed a gradual rise from 3% in 1991 to 4.47% in 1997. Hashish and hash oil, on the other hand, showed no specific potency trends. The average Δ^9-THC in hashish samples ranged from less than 3% to greater than 19%, while hash oil showed an average of approximately 13% to 20% Δ^9-THC for most samples. For other major cannabinoids (Cl3D, CBC, and Cl3N), there were no trends in their levels. The average concentration of these cannabinoids for all cannabis samples was typically less than 0.5%. The levels of these cannabinoids were much higher in hashish and hash oil samples, which also varied more from year to year.

CYTOTOXIC CHALCONE FROM *FARAMEA SALICIFOLIA*

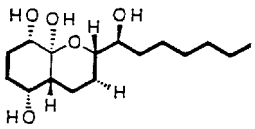
Samir A. Ross[1]* , A. Zagloul[2] , A.C. Nimrod[1], Zlatko Mehmedic[1], and H.N. ElSohly[1], [1]University of Mississippi, University, MS 38677, and [2]University of Mansoura, Mansoura, Egypt

Cytotoxicity-guided fractionation of the ethanol extract of the aerial parts of *Faramea sallcifolia* Presl. (Rubiaceae) led to the isolation of two known compounds: a dihydrobenzofuran lignan identified as 4-O-methyldihydrodiconiferyl alcohol (3',4-O-dimethylcedrusin) (**1**) and a chalcone identified as 3,4,2'-trihydroxy,4-methoxychalcone (calythropsin)(**2**). Compound **1** was previously isolated from *Croton* spp. while compound **2** from *Calythropsis aurea*. This is the first report on the isolation of compounds **1** and **2** from this plant. Compound **2** was active, its antitumor activity expressed as IC_{50} µg/ml was less than 1.1 for each of SK-MEL, KB, and SK-OV-3 and 1.5 for BT-549 human cancer cell lines.

KONINGININ G: A NOVEL METABOLITE FROM *TRICHODERMA AUREOVIRIDE* RIFAI

H.G. Cutler[1], S.J. Cutler[1], Samir A. Ross[2], K. ElSayed[2], F.M. Dugan[3], M.G. Bartlett[4], A.G. Spiers [5], R.A. Hill[5], S.R. Parker[5], [1]Mercer University, Atlanta, GA 30341;[2]University of Mississippi, University, MS 38677; [3]American Type Culture Collection, Rockville, MD 20852; [4]University of Georgia, Athens, GA 30602; [5]Hortresearch, Ruakura Research Centre, Ruakura, Hamilton, New Zealand

A strain of *Trichoderma aureoviride* was isolated from hybrid willow, *Salix matsudana* x *alba* and fermented on semi-solid substrate. Upon extraction and separation of the crude mixture, a compound with the molecular formula $C_{16}H_{30}O_5$ was isolated, and given the trival name Koninginin G (**1**). The metabolite significantly inhibited the growth of etiolated wheat coleoptiles 56% at 10^{-3}M . The structure was established by spectroscopic methods including ID and 2D NMR.



EFFECTS OF TOXIN METALS ON THE PROTEIN KINASE C MEDIATED PHOSPHORYLATION OF ENDOGENOUS SUBSTRATES IN RAT AORTA *IN VITRO*

T. Morgan [1,2]* A. Qin[1] , J.A. Cameron[1], and P.J.S. Vig[1], [1]University of Mississippi Medical Center, Jackson, MS 39216, and [2]Jackson State University, Jackson, MS 39217

Low exposure to toxic metals, especially lead, has been shown to produce hypertension and cause contraction of vascular smooth muscles. The toxic effects of metals like lead, cadmium, and mercury are also associated with both stimulation and inhibition of Protein Kinase C (PKC). Since PKC is known to regulate smooth muscle contractions, the present study was initiated to determine if these metals mediate their toxic effects by the present study was initiated to determin if these metals mediate their toxic effects by altering the phosphorrylation of endogenous substrates of PKC in the rat aorta, *in vitro*. Rat aortic tissue was homogenized in the appropriate buffer and the soluble fractions were prepared.

Purified PKC from the rat brain was used to phosphorylate aortic proteins in the soluable fractions in the presence and absence of lead, cadmium and mercury. The phosphorylated proteins were separated by SDS-polyacrylamide gel electrophoresis, and visualized by autoradiography using Hyperfilms. The phosphorylation of endogenous proteins was inhibited by alll three metals and the inhibition was in the following order: mercury>lead>cadmium. Various concentrations of mercury inhibited the phosphorylation in the nanomolar range, and in a concentration dependent manner. Currently, the phosphorylated proteins are being identified by western blot analysis. These data suggest that toxic metals may manifest their effects via altering the PKC mediated phosphorylation of proteins involved in the contractile process.

MUTATION ANALYSIS OF FRAGILE HISTIDINE TRIAD GENE TRANSCRIPTS IN PRIMARY BREAST AND COLON CARCINOMAS AND UNAFFECTED TISSUE

C.S. Ringelberg, A. Goel, S.T. Case, and M. Kaelbling*, University of Mississippi Medical Center, Jackson, MS 39216

The Fragile Histidine Triad gene (FHIT) is a putative tumor suppressor gene (TSG) that spans the fragile chromosomal site at 3p14.2. To elucidate the role of this TSG in tumorigenesis, the transcripts of 60 primary neoplasias and 10 benign tumors (leiomyoma uteri) were compared to those of constitutive tissue of the same patients. Total RNA was extracted from all samples and reverse-transcribed into cDNA. Exons 3–10 including the translated exons 5–9 were PCR-amplified. The transcripts of each tumor/constitutive panel were first analyzed in agarose gels for size differences of > 50 bp. In one panel, the constitutive FHIT transcript was underexpressed and the tumor transcript was absent. In two other constitutive samples FHIT also appeared to be underexpressed while it was expressed in the matching tumor tissues. The transcripts were next compared by restriction endonuclease fingerprinting; this modified SSCP technique allows detection of any nucleotide change. Single samples were compared to other samples of the same tumor type. Of 46 panels analyzed, 38 contained mutations. Mutations were found in five of five breast cancer panels analyzed (5/5), 9/9 colon cancers, 2/3 endometrial cancers, 4/5 kidney cancers, 1/1 liver cancer, 3/3 lung cancers, 3/3 ovarian cancers, 3/4 skin cancers, 4/4 stomach cancers, 1/1 Wilms' tumor, and in 4/7 leiomyoma uteri. Samples that revealed mutations were sequenced. Here, emphasis will be placed on the comparison of breast and colon cancer panels. The results suggest that FHIT is nonrandomly mutated in breast as well as colon cancer and, most likely, in many other tumor types. Future work will include an analysis of underexpressed transcripts for transcriptional inactivation by hypermethylation.

HIV EARLY-INTERVENTION FOR COMMUNITY HEALTH CENTERS

Harold Henderson, University of Mississippi Medical Center, Jackson, MS 39216

The incidence of HIV infection in Mississippi remains high. The state is predominantly rural, many infected persons are impoverished and lack health insurance, and there is a shortage of practitioners who are willing to deliver primary care to HIV-positive individuals. Many HIV patients thus have very poor access to needed health care resources. **Major goals:** 1) Increase the number of primary care practitioners, including dentists, statewide state who are willing and capable of giving high-quality primary care to HIV-infected persons. 2) Establish an HIV consultative and informational network for primary caregivers around the state based at the University Medical Center. 3) Enhance communication and cooperation between practitioners delivering primary care to HIV-positive persons and HIV specialty practice in Jackson. **Project accomplishments:** This project has established an on-line, statewide educational network, based at the University Medical Center, with primary care practitioners working at 10 community health centers (CHCs) in the highest HIV seroprevelance areas. Practitioners have had the option of traveling to Jackson for a two-day HIV preceptorship, or participating in a 6-month p.c. based distance learning course offered at their CHC. To date, 72 providers in 8 CHCs have been completely trained through the project. Pre and Post surveys and knowledge tests have been disseminated at all involved CHCs trained to date. Changes in follow-up and referral patterns of HIV-infected patients are being tracked through patient chart abstracting at the CHCs. Interim evaluation of data indicates a high degree of acceptance of the training and significant increases in HIV knowledge across all disciplines. **Planned activities:** The Mississippi HIV training model will be transitioned to a web based, self-directed equivalent course of study to address retraining issues. A piloting of telehealth technology using existing computer centers will continue in selected CHCs. A HIV Grand Rounds videoconferencing series as well as on-line HIV Case Conferences will be hosted between community providers and HIV specialty practitioners using the enhanced p.c. centers that have been established at the CHCs. Specialized case studies of directed patient referrals will be completed. **Expected outcomes:** The training aspect of this project will assist in the strengthening of appropriate HIV referral networks throughout the state. As a direct outcome, the project will serve as an available resource to any effort by participating CHCs to integrate HIV service delivery between clinics and the university through other federal and non-federal funding initiatives.

MARINE AND ATMOSPHERIC SCIENCES
Chair: Dawn L. Lavoie, Naval Research Laboratory
Vicechair: Charlotte Brunner, University of Southern Mississippi

THURSDAY MORNING

Executive Room

8:00 ENVIRONMENTAL AND CLIMATE CHANGES ON EARTH

Abdul N. Mohamed* and Juluis Baham, Jackson State University, Jackson, MS 39217

Due to population, it is important to document and study the development of environmental and climate changes on Earth. Through the use of remote sensing and other geographical information systems, we can analyze a piece of data of a certain area of the environment and discover anything what is going on in that respectable area. Remote sensing simply means any technique of data collection without physical contact. The major technical work that remote sensing inhibits are detection and measurements of targets with devices that absorb light, heat, and radio waves. For this particular research project, remotely sensed data taken around the U.S. Gulf Coast and the Ross Barnett Reservoir, which is located in Jackson, Mississippi, will be analyzed and manipulated. Once the data is consumed, basic files or images will be compiled in a database. The database will consume of a georeference of the data, classification of the data, digitized images of highways and boundaries, and true color images. Finally, a final output poster of the data will be constructed to give a valid description of the research.

8:20 A STUDY OF HEAVIEST RAINFALLS AND ASSOCIATED THUNDERSTORM ACTIVITY USING GOES-8 SATELLITE DATA OVER THE WEST COAST OF GULF OF MEXICO

R.S. Reddy[1]*, Richard L. Mi1ler[2], Ronnie Guyton[1], and Lail S. Hossain[1], [1]Jackson State University, Jackson, MS 39217, and [2]Earth Systems Science, Stennis Space Center, MS 39529

Under the NASA/JSU Joint Venture (JOVE) Augmentation Program, a study has been undertaken to establish a research on the relationship between the heaviest rainfalls and the associated thunderstorm activity during landfall of hurricane. When a hurricane moves over land, strong winds associated with the severe thunderstorm activity causes heavy rains and floods over the coastal areas. Many hurricanes have caused wide spread death and destruction. Hurricane Opal is such an example which formed during October 4–5, 1995, over the Gulf of Mexico. In the present study, we have analyzed the heaviest rainfalls vis-à-vis precipitable water and associated thunderstorm activity {stability indices including Lifted Index (LI) and K-Index (K1)} over the Gulf of Mexico using GOES-8 satellite data during October 15–30, 1998. The study has suggested an increase in thunderstorm activity on or around October 18–23 causing heaviest rainfalls and floods over the West Coast. This increase in thunderstorm activity and precipitable water was associated with the landfall of tropical depression, over the West Coast of Gulf of Mexico as depicted from the satellite images.

8:40 MESOSCALE MODELING FOR THE GULF COASTAL STATES

Paul J. Croft, R.S. Reddy, P.J. Fitzpatrick, and A.M. Sealy*, Jackson State University, Jackson, MS 39217

In the present study, preparatory mesoscale modeling work is being completed for a study of atmospheric processes in the Gulf Coastal State. The study area selected will include portions of Arkansas, Louisiana, and Tennessee and all of Mississippi and Alabama. The principal focus of the research is to simulate the approach of a major hurricane to the Gulf Coast and the result of its making landfall. The model is also used for real-time operational prediction, the results of which are featured on our departmental home page at http://santa.jsums.edu. The MM5 is the most recent in a series of models used for mesoscale simulations and diagnostics. The model consists of a number of components: TERRAIN, DATAGRID, RAWINS, GRIN and MM5. Each component, or pre-processor, is edited to accommodate detailed study of any region of interest. As part of this effort, involvement of JSU meteorology majors and the local NWS office in Jackson, MS is essential. An additional benefit will be the availability of MM5 modeling results for use in the classroom and for student projects and research.

9:00 EFFECT OF HURRICANE EARL ON THE SEA-FLOOR OFF PANAMA CITY BEACH, FLORIDA

Peter Fleischer*, Wolfgang Jans, Kevin B. Briggs, and Michael D. Richardson, Naval Research Laboratory, Stennis Space Center, MS 39529

By fortunate circumstance, a section of the sandy inner continental shelf (20 m water depth) off Panama City Beach, Florida, was comprehensively surveyed and sampled two days (28–30/8/98) before Hurricane Earl passed directly over the area (2–3/9/98). The same section was reexamined two days after the hurricane (05/09/98). The investigations employed side-scan sonar, acoustic profiler, as well as diver observations and cores. The most evident change of seafloor morphology was in the form of small-to medium-scale, shore-diagonal bedforms. The large-scale morphology of flat-crested,

shore-normal ridges and troughs appeared unaffected. Prior to the hurricane, the seafloor was uniformly bioturbed and free of bedforms. Post-hurricane morphology consisted of long-crested small dunes or oscillation ripples having ½–1 m crestal spacings. Near the troughs, they were supplanted by incipient short-crested medium dunes with 3–7 m spacings. A discontinuous layer of soft mud covered the bedforms, predominantly in lows and in bedform troughs. Despite producing currents >1 m/s on the sea floor and prominent bedforms, the effect of small hurricanes like Earl (category 1, 85 kt sustained winds) on the northern Gulf of Mexico shelf is transient. Due to their relative frequency, however, such tropical cyclones are a major long-term process for shelf sediment reworking and transport in this environment.

9:20 EFFECTS OF WAKE- AND WAVE-INDUCED TURBULENCE ON EPIPHYTE RESUSPENSION IN SEAGRASS BEDS

Nicole Lee[1]*, Cynthia A. Moncreiff[2], Robin K. McCall[2], Todd A. Randall[2], John D. Caldwell[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

Epiphytes are a key component of organic material vital to the nursery function of seagrass ecosystems. Little is known about the contribution of resuspended epiphytes to planktonic organic matter. Effects of wave- and wake-induced turbulence on this is also not well known. We designed an experiment to address this question in the water column by measuring chlorophyll concentrations in samples taken over seagrass beds compared to water samples taken from areas devoid of seagrasses. Three water samples were collected immediately over three shoal grass (*Halodule wrightii* Ascherson) beds. Three replicate samples were also collected from the water column in areas where no seagrasses were present. Samples were also obtained from over the grass beds after artificial agitation to mimic wave- and wake-induced turbulence. Sampling was attempted on one to two additional dates. Water masses containing suspended epiphytes from shoal grass (*Halodule wrightii*) are expected to exhibit higher chlorophyll concentrations than water masses not associated with submerged aquatic vegetation. Agitation is also expected to have an effect on chlorophyll concentrations.

9:40 DENSITY AND GROUP SIZE OF BOTTLENOSE DOLPHINS IN MISSISSIPPI SOUND, MISSISSIPPI

Carrie W. Hubard*, University of Alabama, Tuscaloosa, AL 35487, and National Marine Fisheries Service, Pascagoula, MS 39567

Line-transect theory was used to estimate the size of the bottlenose dolphin, *Tursiops truncatus*, population in a 446 km^2 portion of Mississippi Sound, Mississippi. From June 1995 through September 1996, north-south transect lines were surveyed from a 6.4 m boat. Using DISTANCE software, density was estimated to vary seasonally, peaking in Summer 1995 with 1.3 dolphins/km^2 (percent coefficient of variation, %CV, = 17.1) and reaching a low in Fall 1995 with 0.60 dolphins/krn^2 (%CV = 22.6). Dolphin groups ranged in size from solitary animals to 54 dolphins with an overall mean of 6.5 dolphins/group. Group size varied significantly ($P \leq .0\ 1$) between seasons with peaks in summer ($\bar{x}$ = 6.0, $\bar{x}$ = 9.1), lows in fall ($\bar{x}$ = 4.1) and intermediate size groups in winter and spring ($\bar{x}$ = 5.2, $\bar{x}$ = 5.0, respectively). Groups containing calves were found to be larger ($\bar{x}$ = 13.0) than groups without calves ($\bar{x}$ = 4.9) ($P \leq 0.0001$). Behavior also affected group size with socializing groups being significantly ($P \leq 0.001$) larger than groups feeding or traveling. Density estimates were comparable to seasonal estimates previously made in Mississippi Sound. The large seasonal fluctuations in abundance may be explained by dolphins moving into the Gulf of Mexico in the fall and winter, possibly in response to changes in prey distribution.

10:00 HOW TO UNDRESS A BOTTLENOSE DOLPHIN FOR THE CLASSROOM

Jennifer Gollott[1]*, Amber Webb[1]*, Willie R. Heard[2], and Rebecca Espey[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]J.L. Scott Marine Education Center, University of Southern Mississippi, Ocean Springs, MS 39566

The primary focus of this presentation was to show the trials and errors of removing the flesh off of a beached baby Bottlenose Dolphin. This presentation highlighted the federal licensing procedures for possessing the dolphin, the decision-making process for deciding how to best remove the flesh, the procedure for removing the flesh from the skeleton, and the procedures for preserving the skeleton for later exhibition. We do not know if the baby dolphin's bones have developed fully enough for constructing a skeleton due to the possibility of being more gristle than true bone.

10:20 Break

10:40 THE LIFE CYCLE OF CASSIOPEIA FRONDOSA IN AN ARTIFICIAL HABITAT

Jeremy Edwards[1]*, Heidi Hurst[1]*, Jeannie Flint[2], and Kimberly B. Damon-Randall[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39533, and [2]J.L. Scott Marine Education Center and Aquarium, University of Southern Mississippi, Ocean Springs, MS 39566

The natural habitat of *Cassiopeia frondosa* (Upside-down Jellyfish) promotes production of numerous and hearty specimens of each stage of the life cycles of this Cnidarian. In

the United States, Upside-down Jellies range from Texas to Florida in warm, shallow habitats, such as mangrove swamps and muddy or sandy-bottom grassbeds. At the J.L. Scott Marine Education Center and Aquarium, the adult stage and a number of the sessile polyp stage are being reared in an aquarium. Historically, the sessile polyps have not progressed through the other life cycles. The purpose of this project is to create conditions in artificial/control habitats to aid in the survival of *Cassiopeia frondosa* through its entire life cycle and rear adults for the Jim Jones Memorial Tank. Six tanks were set up, with different variables, in an attempt to isolate a condition which might expedite further growth. Cassiopeia were exposed to different amounts of iodine, essential trace elements and micronutrients for invertebrates and micro-organisms.

11:00 ABNORMALITIES IN EMBRYONIC AND LARVAL STRIPED BASS

K. Keenan Benefield* and Larry Nicholson, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

Striped Bass, *Morone saxatilis*, have been the basis of a major restoration program in the Pascagoula and Pearl Rivers since the 1960s. Multiple abnormalities have been found in 1998 fry obtained from the Marion Fish Hatchery in Marion, Alabama. The objective of this project was to find the cause of the abnormalities and determine what can be done to correct them.

11:20 THE SPATIAL AND SEASONAL DISTRIBUTION OF WILD SHRIMP POPULATIONS

M. Andres Soto*, Jeffrey M. Lotz, James R. Warren, and Anne Marie Moore, Gulf Coast Research Laboratory, Ocean Springs MS 39566-7000

The probability of introduction and establishment of non-indigenous viruses into wild shrimp populations may depend on such factors as host population structure, density, and size. To address this probability, we examined the seasonal and spatial distribution by size and density of the three commercially important penaeid shrimp species: *Farfantepenaeus aztecus*, *F. duorarum*, and *Litopenaeus setiferus*, occurring in Mississippi Sound and Biloxi Bay. Three gear types were used: a beam plankton tow (BPL), a 16-foot trawl, and a 36-foot trawl. High and low density seasons were assigned for each species based on recruitment periods. High density months for *F. aztecus* caught in the BPL were from March through October with peak densities occurring in March and April. High density months for *L. setiferus* were from May through October and for *F. duorarum* were from June through November. The high density season for *F. aztecus* caught in the 16-foot trawl was from April through July, and for *L. setiferus* was from July through December. Mean density of *F. duorarum* was less than 1 per hectare. Mean number of shrimp per hectare caught in the 36-foot trawl was typically less than 10 for each species. The spatial dispersion of the three species was clumped ($k < 0.4$) and was well described by the negative binomial distribution. The generally low densities and patchy occurrence of shrimp in the natural environment suggest that an epidemic is less likely to occur in wild populations than in an aquaculture setting.

THURSDAY AFTERNOON

Executive Room

1:40 INFECTIVITY TO *LITOPENAEUS VANNAMEI* OF TAURA VIRUS AFTER HEAT TREATMENT

Anne Marie Moore*, Jeffrey M. Lotz, and M. Andres Soto, Gulf Coast Research Laboratory, Ocean Springs, MS 39566-7000

Taura Virus (TV) has affected shrimp aquaculture in the Western Hemisphere since 1992. Current research on this virus is to determine its infectivity after exposure to heat. Viral extracts were prepared from the cephalothorax of individuals collected during the acute phase of TV infection and stored at -20°C. The frozen cephalothoraces were homogenized, diluted, centrifuged, and the supernatant filtered through a 0.45μm membrane filter. Five mls of supernatant were aliquoted into 15 ml Falcon tubes and were treated in water baths at temperatures from 40°C to 100°C for times ranging from 10 to 30 minutes for five separate experiments. The filtered viral extract was then injected into the abdominal musculature and subsequent mortalities were monitored. Confirmation of viral infection was done by histological examination. In expt. 1 there was a significant increase in survival with increased temperature ($P < 0.05$). However, Taura Virus was found to remain infective by injection to *Litopenaeus vannamei* after exposure to 100°C for 30 minutes. TV is a ss+RNA virus that is a member of the family *Picornaviridae*. Subjection to heat may disrupt the capsid of the virus. But due to the positive nature of ssRNA, or perhaps receptor site recognition remaining in the capsid, the virus is able to cause an infection and mortalities.

2:00 INFECTIVITY TO *CALLINECTES SAPIDUS* OF WHITE SPOT SYNDROME VIRUS

Charles H. Flowers, Jr.*, Jeffrey M. Lotz, and Verlee Breland, Gulf Coast Research Laboratory, Ocean Springs, MS 39566-7000

White Spot Virus (WSV) has been devastating to shrimp aquaculture in Asia as well as North and South America. Although primarily known as a virus of penaeid shrimp, molecular and histological signs of infection have

been observed in several decapod crustaceans associated with aquaculture facilities in Asia. Because WSV 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 WSV. Blue crabs were collected in bayous near Ocean Springs, MS. Crabs were exposed to the virus *per os* using tissues of *Litopenaeus vannamei* that died from acute WSV infection. Additionally, crabs were exposed by intramuscular injection into the manus of the cheliped or injection directly into the infrabrachial sinus of the fifth pereiopod. Innocula for *per os* and injection exposures were prepared from the same tissues. Tissues for injection were homogenized, diluted 1:10 with dH_2O, and centrifuged 10 min. at 4000 rpm, and the supernatant was collected and used as injectant. Mortalities in feeding and injection treatments were 75% and 100% respectively. Confirmation of WSV infection was accomplished through the use of polymerase chain reaction (PCR), histology, and bioassay.

2:20 HEAVY METAL UPTAKE BY EMERGENT ESTUARINE PLANTS AND THEIR POTENTIAL USE IN PHYTOREMEDIATION

Ben Wyser[1]*, Thomas F. Lytle[2], and Julia S. Lytle[2], [1]Mississippi State University, Mississippi State, MS 39762, and [2]Gulf Coast Research Laboratory, Ocean Springs, MS 39564

As marine pollution becomes a more serious world problem, science is ardently searching for ways to decontaminate polluted areas. It is desirable to investigate how organisms remediate pollution, a process called natural attenuation. Plants play a major role in this process, through processes known as phytoremediation. Because marsh plants have been neglected in existing studies of phytoremediation, we have studied a specific remediating activity, heavy metal uptake by emergent marsh plants. Plants and sediments were sampled from five sites, four of which were characterized by various pollutants, and the fifth serving as control. Four plant species (*Spartina alterniflora*, *Sagittaria lancifolia*, *Scirpus robustus*, *Juncus roemerianus*) were sampled from all collection sites and tested for concentrations of Cu, Zn, Hg, Pb, Cd, Ag, and Ni. *S. lancifolia* showed the most promise as a phytoremediator, though *S. robustus* and *S. alterniflora* also showed promise at certain sites. Of species not sampled from every site, *Distichlis spicata* and *Solidago* sp. were shown to be good accumulators of almost every metal, and *Alternantha philoxeroides* was shown to be a tremendous accumulator of Cu. Since these marsh plants thrive in very heavily polluted areas and are able to accumulate such high levels of toxic metals, they all show extremely high potential for use in phytoremediation processes.

2:40 TOXIC RESPONSES OF ESTUARINE PLANTS TO POLLUTED ENVIRONMENTS

Julia S. Lytle* and Thomas F Lytle, University of Southern Mississippi, Ocean Springs, MS 39564

Assessing generalized toxic responses and organismal adaptation to chemical insult is one way to better understand environmental risk of chemical pollution. Oxidative stress is a generalized response to exposure to redox cycling compounds. Plants can respond by activating certain adaptive enzyme systems and synthesizing various antioxidants to relieve oxidative stress. Glutathione is widely distributed in plant cells and has been implicated in the adaptation of plants to environmental and chemical stressors. Glutathione and ascorbic acid act as antioxidants to protect labile macromolecules against attack by free radicals and hydrogen peroxide which are formed as a result of oxidative stress. Peroxidase enzymes are often activated when an organism is under oxidative stress. Little in known regarding the sensitivity or adaptability of estuarine macrophytes to environmental toxins in coastal sediments. Under field conditions there may be numerous stressors which can cause oxidative stress. A field study was designed to measure and compare glutathione and ascorbic acid responses in estuarine plants collected from sites where the major chemical pollutant was known. A suite of estuarine plants was collected from four polluted sites and from one “clean” site. Glutathione and ascorbic acid content and peroxidase enzyme activity was compared among species at each site and for each species among the sites. Results showed that, in general, estuarine plant species exposed to high levels of environmental toxins had elevated levels of antioxidants and peroxidase activity, though the level of response was both species specific as well as site specific.

3:00 TECHNIQUES TO ASSESS DAMAGE TO WETLAND PLANTS FROM ATRAZINE EXPOSURE IN COMBINATION WITH OTHER PESTICIDES

Thomas F. Lytle[1]*, Julia S. Lytle[1], and Bruce Libman[2], [1]Gulf Coast Research Laboratory, Ocean Springs, MS 39566-7000, and [2]University of Mississippi, University, MS 38677

In 48–500L mesocosms *Juncus effusus* was exposed to combinations of four toxicants. Nominal levels were 192, 51 and 291 µg/L for atrazine, chlorpyrifos, monosodium methanearsonate respectively with methyl mercury chloride added to raise top cm sediment to 0.4 µg/g. 18 mesocosms received half-strength doses of all compounds. After exposure plant clumps were removed and growth endpoints measured: mean shoot length, number of shoots, total length of all shoots and frequency distribution of shoot length to determine the effects of the herbicide, atrazine. Multiple analysis of variance was applied to first three endpoints with results varying considerably. Total shoot length provided most ambiguous results with significant effect being overall positive growth

effect by chlorpyrifos. The overall greatest effect on mean shoot length was demonstrated by atrazine. Though this effect was significant inhibition on day 2 and 4, by day 32 the greatest single effect in any treatment was significant enhancement in atrazine treated mesocosms (mean of 71 cm vs 61 cm shoot length). Significantly longer shoots after 32 days of atrazine exposure were accompanied by significantly reduced number of shoots in these same plant clumps. Frequency distributions yielded clearest (though statistically unsubstantiated) evidence of atrazine impact with severe deleterious effects on new shoot production in all atrazine treated mesocosms regardless of other accompanying pesticides.

3:20 Divisional Poster Session

GROWTH RATE COMPARISONS OF CATFISH FINGERLINGS

Vonshae Evans*, Rochelle Dixon, and Michael D. Porter, Mississippi Valley State University, Itta Bena, MS 38941

The goal of this project was to compare growth rates of catfish fry in several ponds to determine spatial differences between ponds that affect growth. The study ponds were stocked in a one week period in 1998 at the same density. Fish were fed at the same rate throughtout the growing season. Individual weight and length of catfish fingerlings were measured from several ponds in October. Catfish fingerlings in smaller ponds were larger than fingerlings from larger ponds. This project will examine how spatial parameters may affect growth rates in channel catfish fry and fingerlings.

PATTERNS IN WATER QUALITY ASSOCIATED WITH PHYTOPLANKTON AND ZOOPLANKTON COMMUNITIES

Peggie Ann Moore* and Michael D. Porter, Mississippi Valley State University, Itta Bena, MS 38941

While phytoplankton and zooplankton are major components of commerical catfish ponds, little research has been done to examine their influence on water quality. The purpose of this study is to determine if there are any correlations between water quality and the phytoplankton and zooplankton communities in commercial catfish ponds. Water samples were collected from twenty commercial catfish ponds. Water chemistry measurements include night-time dissolved oxygen, pH, calcium hardness, phosphates, and nitrates. Phytoplankton and zooplankton were classified and counted. Patterns in phytoplankton and zooplankton communities will be compared with night-time dissolved oxygen trends in the study ponds.

A PILOT STUDY ON CATFISH FEEDING AND FLAVOR

Nieasha Parker* and Michael D. Porter, Mississippi Valley State University, Itta Bena, MS 38941

This project tests the hypothesis that consumption of the amphipod *Hyaella azteca* by channel catfish (*Ictalurus punctatus*) will affect the flavor of the flesh. Catfish were fed daily measured amounts and types of food. The experimental group received 50% commercial catfish food and 50% *H. azteca* by volume. The control group received only commercial catfish food. The catfish were fed these diets for four weeks. The fish were then processed and evaluated by a commercial taster for determining any differences in flavor.

VERTEBRATES ASSOCIATED WITH ARTIFICIAL LOW PROFILE REEFS IN CENTRAL MISSISSIPPI SOUND

Danielle Slade[1]*, Jamie McFerrin[1], Harriet Perry[2], Kirsten Larsen[2], Christine Trigg[2], and James R. Warren[2], [1]Mississippi Gulf Coast Community College, Jackson County Campus, Gautier, MS 39553, and [2]Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

The popularity of low profile reefs as fishing banks and the need to increase the potential for harvestable food from the ocean has prompted coastal states to begin artificial reef programs. Supported by local, state, and federal governments, many state agencies have begun reef building in an effort to enhance already established sportfish fisheries and to increase (numbers and access) the less common structure-associated fishes. The creation of artificial fishing reefs from concrete rubble, crushed limestone, and oyster shells in Mississippi coastal waters provides an opportunity to obtain information on the colonization of these different substrates by benthic vertebrates and invertebrates and on the association of fish populations with these reefs. To determine colonization of these reefs, eight trays of artificial substrate were placed approximately 300 yards offshore near Gulf Park Estates in Jackson County, MS. Four trays contained crushed limestone rubble and the remaining four contained oyster shells. After three months, the trays were brought back to the laboratory and the organisms were removed and identified to the lowest taxonomic level. Fish were measured to the nearest 0.1 mm TL and weighed to the nearest 0.01 g. Fish colonizing the reefs included representatives of the following families: Gobiidae, Blennildae, Gobiesocidae, Ophichthidae, and Batrachoididae. Community structure and biomass estimates will be determined for both substrates and statistically compared.

INVERTEBRATES ASSOCIATED WITH ARTIFICIAL LOW PROFILE REEFS IN CENTRAL MISSISSIPPI SOUND

Jamie McFerrin[1]*, Danielle Slade[1], Harriet Perry[2], Kirsten Larsen[2], Christine Trigg[2], and James R. Warren[2], [1]Mississippi Gulf Coast Community College, Jackson County Campus, Gautier, MS 39553, and [2]Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564

The popularity of low profile reefs as fishing banks and the need to increase the potential for harvestable food from the ocean has prompted coastal states to begin artificial reef programs. Supported by local, state, and federal governments, many state agencies have begun reef building in an effort to enhance already established sportfish fisheries and to increase (numbers and access) the less common structure-associated fishes. The creation of artificial fishing reefs from concrete rubble, crushed limestone, and oyster shells in Mississippi coastal waters provides an opportunity to obtain information on the colonization of these different substrates by benthic vertebrates and invertebrates and on the association of fish populations with these reefs. To determine colonization of these reefs, eight trays of artificial substrate were placed approximately 300 yards offshore near Gulf Park Estates in Jackson County, MS. Four trays contained crushed limestone rubble and the remaining four contained oyster shells. After three months, the trays were brought back to the laboratory and the organisms were removed and identified to the lowest taxonomic level. Invertebrates were measured to the nearest 0.1 mm and weighed to the nearest 0.001 g. Invertebrates colonizing the reefs included representatives of the following groups: Xanthidae, Porcellanidae, Alpheidae, Palaemonidae, Amphipoda, Polychaeta, Bivalvia, and Gastropoda. Community structure and biomass estimates will be determined for both substrates and statistically compared.

PHYTOCHELATINS: HOW DOES THEIR PRODUCTION AID IN THE PROCESS OF PHYTOREMEDIATION?

Nicole A. Housley* and Thomas F. Lytle, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

Phytoremediation refers to the use of plants to degrade, contain, and stabilize organic and metal contamination. Phytoremediation is being used in upland applications, but little is known about how coastal plants may be used. Several heavy metals, notably Cd, occur at elevated levels in sediments at some locations in coastal Mississippi, and three sites have been examined to see how the marsh plants respond to heavy metal contaminants in these sediments. Plant tissue and sediment has been obtained from the plants *Juncus roemerianus*, *Scirpus robustus*, *Spartina alterniflora*, and *Sagittaria lancifolia*. The locations include fort Bayou/Eagle Point whose sediments contained low levels of the heavy metals, Cd, Ni, Ag, Hg, Cu, Pb and Zn. Keagan's Bayou contained large amounts of Cd in sediments underlying its marsh plants. One site at Keesler Air Force Base contained elevated levels of several metals studied. These plants have been investigated to see if phytochelatins help them to survive in highly contaminated areas. Phytochelatins are compounds that plants produce to defend themselves against highly toxic materials by sequestering heavy metals. Extracts are analyzed for these compounds derived from glutathione to see which plants most successfully defend themselves against metal contamination and therefore would be most beneficial in phytoremediation efforts.

RELATIONSHIP BETWEEN PHYSICAL PROPERTIES AND MICROFABRIC OF SEDIMENTS OFF THE MOUTH OF THE PATUXENT RIVER, MARYLAND

Nancy W. Carnaggio[1]*, William B. Sawyer[1], Dawn L. Lavoie[1], and Richard Bennett[2]; [1]Naval Research Laboratory, Stennis Space Center, MS 39529, and [2]SEAPROBE, Inc., Picayune, MS 39466

The objective of this investigation is to relate physical properties to microfabric. Sediments were collected and analyzed in support of mine penetration modeling studies for the Naval Surface Warfare Center-White Oak and the Defense Nuclear Agency in an effort to gain a better understanding of mine burial in shallow-water coastal sediments. Physical properties, including index properties, grain size, and shear strength were analyzed using standard laboratory techniques. Sediments were prepared for microfabric analysis by embedding slices in Spurr's resin, ultra-thin sectioning, and examining them using a 100 kV and a 300 kV transmission electron microscope (TEM). Results of microfabric analysis show a highly porous fabric consisting of fine-grained clays (smectite and illite) with acid volatile sulfides throughout the 250 cm of sediment recovered. Pore space decreases downcore, and the density of clay domains increases. Physical properties results support the microfabric observations. The sediments have high water content and porosity decreasing with depth, a low wet bulk density increasing with depth, grain size distribution coarsening downward, and shear strength increasing downward.

INVESTIGATIONS OF ETHANOL PRESERVATIVES IN USE AT THE GULF COAST RESEARCH LABORATORY MUSEUM

Wendy Nicole Donohoe[1]*, Ann M. Uzee O'Connell[2], and Stuart G. Poss[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

Factors such as fluid chemistry, temperature fluctuations, and conditions of jars and lids affect the quality of the media that used to preserve specimens in wet, scientific archival collections. Consequently, monitoring fluid levels, concentrations, and pH so that they are within acceptable ranges is critical for proper maintenance of research materials. Unsuitable ranges for these factors result in degradation of specimens, thus decreasing the value of these materials for scientific purposes. The objectives of this study were to

determine the status of the GCRL collections in terms of fluid quality and to identify factors within the GCRL archive primarily responsible for affecting fluid quality. Specimen jars of the museum were randomly sampled, and the following information recorded: jar location, date of specimens collection, family name, number of specimens, size of specimens, jar type, conditions of jar bails and gaskets, pH, ethanol concentration, and fluid level. Results were analyzed statistically and compared with studies of other museum collections.

AN EVALUATION OF THE WEATHER FORECAST FOR GREENWOOD, MISSISSIPPI

Anil K Sharma* and Tammy Denice Thomas, Mississippi Valley State University, Itta Bena, MS 38941

Since the early twentieth century, great strides have been made in weather forecasting largely as a result of advances in computer technology, instrumentation, satellites, and communications.Weather is the state of the atmosphere at a particular time and place with respect to variables, such as temperature, humidity, cloudiness, precipitation, wind velocity, and pressure. This study investigated and analyzed the weather forecasts for the Greenwood area for January 1, 1998 through April 1, 1998. All the basic aspects as well as the complications weather can bring were studied and the unpredictability understood.

PEROXIDASE ACTIVITY AS AN INDICATOR OF OXIDATIVE STRESS USING *ALTERNANTHERA PHILOXEROIDES*

Tyler D. Tran* and Julia S. Lytle, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

Estuarine plants respond biochemically to stress in various ways depending on the strengths of their defense system. Previous studies have shown that peroxidase (POD) enzymes are activated in a dose response manner in some plants when exposed to environmental pollutants. Because *A. philoxeroides*, better known as alligator weed, showed strong ascorbic acid, glutathione and POD responses to pollutant exposure, it was chosen as a model aquatic plant to test the POD response using a wide array of chemical and physical stressors. This plant was collected from a stream in Ocean Springs and suckers were removed with nodes and placed in a nutrient solution for cultivation. Test plants were exposed to each test chemical at three concentrations for 96 hours. Plant tissues were extracted, centrifuged and analyzed for POD using a UV/Vis spectrophotometer. The objective of this study was to determine the elicited POD plant response to various environmental toxins and physical stressors; such as salinity and temperature to see if the response is of sufficient magnitude to use as a signal of toxic stress.

FRIDAY MORNING

Executive Room

8:00 PRELIMINARY TEST RESULTS OF THE NAVY COASTAL TIDE/SURGE SYSTEM

Portia Harris[1]*, Ruth Preller[1], Pamela Posey[1], and Graeme Hubbert[2], [1]Naval Research Laboratory, Stennis Space Center, MS 39529, and [2]Bureau of Meteorology Research Centre, Melbourne, Australia

Tidal amplitudes and phases, as predicted by a 2-dimensional barotropic ocean model are compared to tidal amplitudes and phases predicted from tidal station data using the Foreman Model (Foreman, 1977). The Navy Coastal Tide/Surge System (NCOTS) consists of an atmospheric model coupled to a barotropic ocean model both of which are linked to global Navy data bases for the purpose of forecasting global tide and storm surge. Use of global data bases is key in that this model was developed for rapid global prediction. Atmospheric forcing was not included for the purpose of this study. The barotropic ocean model is driven by the Grenoble global tide model at its boundaries. The system includes a global data base of amplitudes and phases at tidal stations based on the Canadian Interational Hydrographic Office (IHO) data base. This data is used for model validation and can also be assimilated by the model during predictions. The results of a specific analysis of NCOTS versus tidal station data will be presented here for the Persian Gulf area. The NCOTS system is run for a period of 96 hours (4 days), both with and without the assimilation of the IHO tidal station data. The NCOTS resulting tidal time series for points located at the IHO tidal stations are compared with tidal time series calculated from the IHO data using the Foreman model. These results show the value added in the tidal predictions by assimilating data in this region. Global testing/validation of the NCOTS system will continue during the next year. Upon completion of the system validation, the model will be transitioned to the U.S. Navy's Operational Centers for purposes of real-time forecasting.

8:20 THE IX 508: A "NEW" RESEARCH VESSEL FOR THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Vernon L. Asper* and D. Jay Grimes, University of Southern Mississippi, Ocean Springs, MS 39566-7000

In collaboration with the NAVOCEANO at the Stennis Space Center, new research capabilities have become available in the form of the IX 508, a former LCU-1600 which has been converted for AUV (Autonomous Undersea Vehicles) tending. This vessel is 130' (39.6m) long and capable of supporting 23 scientists and crew for short, nearshore research activities. Specific modifications to the vessel for AUV work

include: personnel and electronics vans, specialized launch/recovery hardware, a transducer fixture and the addition of a covered vehicle service area. The 508 was originally operated by the Naval Research and Devlopment (NRAD) in San Diego, but was transferred to NAVOCEANO via the Panama Canal last spring. Since that transit, both shipyard and minor repair work have brought the vessel up to operational readiness in anticipation of beginning AUV work in early 1999. The vessel will be operated by USM personnel in support of the Navy AUV test and development mission but will also be available for other research work.

8:40 PARTICLE MEASUREMENTS IN RIVER AND COASTAL WATERS USING SPLIT-FLOW THIN-CELL FRACTIONATION

Toshihiko Uozumi* and Alan M. Shiller, University of Southern Mississippi, Stennis Space Center, MS 39529

Determining the particulate composition as a function of size is an important aspect of understanding chemical transport in rivers and coastal waters. This is because particle size affects transport and relative adsorption properties. Split-flow thin-cell lateral transport (SPLITT) fractionation is a continuous separation method based on particle settling rate, which is governed by density, shape and diameter. Particles are introduced into the cell and are merged with a carrier solution creating two laminar flows within the 0.4mm wide cell. The two flows exit from different outlets each carrying a different size fraction of the particles. Under the assumption that all particles are spherical, the flowrate can be controlled to adjust the critical separation diameter. With SPLITT fractionation, particles are exposed to low stress and a large volume sample can be processed rapidly. Recently a new operation method (full feed depletion SPLITT fractionation (FFDSF)) has been introduced to avoid dilution of the sample, which is a major drawback with the conventional method explained above. The new method retains the advantages of the conventional method but reprocessing of the separated sample is required for a sharp cutoff diameter. We are testing FFDSF to evaluate its applicability to natural samples. Preliminary work involves separation of sediments from the Louisiana shelf as well as suspended particles from the Mississippi River.

9:00 THE OPTIMIZATION OF FLOW FIELD-FLOW FRACTIONATION FOR CHARACTERIZING FLUVIAL COLLOIDS

Kenneth P. Grembowicz* and Alan M. Shiller, University of Southern Mississippi, Stennis Space Center, MS 39529

Flow field-flow fractionation (flow-FFF) is an elution technique capable of simultaneous separation and measurement of sub-micron particles and macromolecules. Colloidal material is separated within a thin ribbon-like channel based on its hydrodynamic diameter. While there have been numerous studies of the application of flow-FFF to the separation of latex beads, proteins, and polymers, only recently has the technique been applied to the characterization of environmental colloids. Part of the difficulty in applying flow-FFF methods to the characterization of environmental samples is the dilute nature of colloids in natural waters relative to the sensitivity of detectors coupled to the FFF channel. Also, there is a relative amount of uncertainty as to whether the flow-FFF process may itself cause coagulation of environmental colloids during sample loading and separation. We have been utilizing an on-channel concentration technique that allows us to inject up to 10 ml of river water directly onto the FFF channel and thereby avoid the problem of dilute samples. Additionally, we have been examining numerous elution conditions (e.g., different carrier solutions and membrane barriers) to investigate potential artifacts when dealing with environmental samples. Discrete fractions from samples separated under differing conditions have been examined by SEM. The results are allowing us to select optimum conditions for flow-FFF separation of fluvial colloids and determine the validity of this promising methodology.

9:20 RESUSPENSION POTENTIAL OF FINE GRAINED SEDIMENTS IN SELECTED ESTUARINE ENVIRONMENTS

Michael A. Rich, University of Southern Mississippi, Stennis Space Center, MS 39529

Approximately 60% of the total global volume of sediments is made up of fine grained particles, i.e., those that are less than 62 microns in size, and these type of particles are frequently trapped in estuarine environments. Because of their mobility and pollutant-trapping affinities, an understanding of the resuspension potential of fine grained sediments is important, especially as it relates to sediment management in ports, harbors, bays, and estuaries. Resuspension can occur as the result of tides, currents, storm-generated winds, and other physical effects. The rate of erosion of a bed of fine grained sediments depends on the degree of consolidation, and, once they are resuspended, fine grained sediments can occur in three forms: as mobile or stationary suspensions, or as settled mud. This research examines the resuspension potential of fine grained sediments in selected estuarine environments along the Mississippi and Alabama Gulf Coast through the use of a settling tube instrumented with pressure transducers to measure internal pore pressures of settled muds. By examining fine grained sediments from several different areas, it is possible to note differences in physical properties between geographically-disparate locations, to determine the reasons for those differences, and to classify fine grained sediment types on the basis of their settling behavior.

9:40 MICROPHOTOMETRIC ANALYSIS OF LIGHT ABSORPTION CHARACTERISTICS FOR SPECIES WITHIN A RECURRENT COASTAL PLUME OF LAKE MICHIGAN

Kimberly A. Kelly* and Steven E. Lohrenz, University of Southern Mississippi, Stennis Space Center, MS 39529

Light absorption by photosynthetic pigments is an important process for phytoplankton growth and primary production. It is also an important factor influencing the optical characteristics of a water body. Typically, phytoplankton absorption has been determined at the community level using bulk measurements. Use of microphotometric techniques enables the direct measurement of the *in vivo* absorption efficiency factor (Q_a(l)) of individual cells. This technique combines microscopic and spectrophotometric methods to provide a measure of spectral transmittance of individual particles, from which Q_a(l) can then be calculated. Applications of this method were used to study phytoplankton populations in southern Lake Michigan. Light is an important variable controlling the development of the spring diatom community in Lake Michigan. Current studies examine the impact of a recurrent coastal plume on variations in light availability and the associated absorption characteristics of species in the vicinity of the plume. Comparison of variations in Q_a(l) for individual species were made for taxa within and outside the plume. Differences in light absorption efficiency were examined in order to identify the species having a competitive advantage for harvesting light.

10:00 Break

10:20 INFLUENCE OF A TIDAL STAGE ON REMOTELY SENSED OPTICAL PROPERTIES IN THE CHESAPEAKE BAY PLUME

Michele E. Routhier[1]*, Robert A. Arnone[2], and Richard W. Gould[2], [1]University of Southern Mississippi, Stennis Space Center, MS 39529, and [2]Naval Research Laboratory, Stennis Space Center, MS 39529

Remote sensing of ocean color was used to locate and follow physical and biological processes such as plume movement, mixing, and phytoplankton growth within the Chesapeake Bay Plume. Airborne hyperspectral data was taken at the mouth of the Chesapeake Bay using the Hyperspectral Digital Imagery Collection Experiment (HYDICE) as part of the Chesapeake Bay Outflow Plume Experiment II (COPE II). HYDICE imagery was processed using current NRL SeaWiFS algorithms to obtain remote sensing reflectance (R_{RS}), backscatter (b_b), dissolved organic material and particulate absorption (a_{dg}), and chlorophyll absorption (a_f). Fresh water mass movement was indicated by the backscatter image. The a_{dg} distribution was used as a conservative tracer to characterize the dispersion of fresh coastal waters. Phytoplankton growth associated with coastal nutrients extending outside of the plume was identified by a_f. We will show the influence of a tidal cycle on these optical properties using five HYDICE images that were taken on May 14, 1997. During slackwater, mixing processes are reduced which results in elevated a_f and a_{dg} located in a region close to the plume front. During ebb and flood stages, when the mixing process are stronger and elevated a_f and a_{dg} values extend farther from the plume front.

10:40 ACOUSTIC CLASSIFICATION OF SEDIMENTS NEAR THE PATUXENT RIVER IN THE CHESAPEAKE BAY

D.J. Walter*, D.C. Young, N. Carnaggio, William B. Sawyer, and D.N. Lambert, Naval Research Laboratory, Stennis Space Center, MS 39529

A study site near the mouth of the Patuxent River was surveyed using a high frequency, normal incident, Acoustic Seafloor Classification System (ASCS). The acoustic data were used to develop a sediment property map for comparison to sediment physical properties obtained by analysis of several sediment core samples. Representative examples of real-time, color (seismic-like) acoustic images obtained within this study area are presented. Predictions of sediment acoustic impedance were completed and presented in real time on a navigation trackplot, with the trackline color coded to the acoustic impedance value for the surficial sediment. These predictions have been gridded and contoured to create a color-coded sediment property map of the study site. The ASCS uses empirical relationships between the predicted impedance and sediment physical properties to estimate the sediment physical properties along the acoustic track. A contour map illustrating an interpolated view of sediment density throughout the study site is presented and compared with core-analyzed density data. Surficial sediment facies in this area range from a very fine silt in the offshore zone to a coarse sand close to the coastline.

11:00 DIEL PHOTOCHEMICAL CYCLES OF THE MISSISSIPPI AND PEARL RIVER

Jinchun Yuan* and Alan M. Shiller, University of Southern Mississippi, Stennis Space Center, MS 39529

Hydrogen peroxide is a strong oxidant and reductant that can affect chemical speciation as well as organisms in natural waters. In accordance with its photochemical production, seasonal and diel cycles of hydrogen peroxide have been reported for seawater and estuarine waters. We conducted a diel photochemical study on the Mississippi River in New Orleans and on the Pearl River at Stennis Space Center. Water samples were collected approximately hourly for the determination of hydrogen peroxide, dissolved oxygen, pH,

temperature, and trace metals. In the Mississippi River, diel cycles were observed for the concentration of hydrogen peroxide, surface solar radiation, and temperature. Hydrogen peroxide varied from less than 5 nM at night to more than 50 nM in late afternoon. Only small changes in pH and dissolved oxygen were observed. In the Pearl River, although there were clear diel cycles of solar radiation and temperature, hydrogen peroxide started with a morning high of approximately 700 nM, decreased to about 300 nM before noon, and stayed around 300 nM for the rest of the day. Thus, there was no obvious diel cycle of hydrogen peroxide. However, significant changes in pH and dissolved oxygen were observed. It thus appears that some other process affects hydrogen peroxide in the Pearl River more effectively than diel photochemical production.

11:20 USE OF DISSOLVED V AND MN DISTRIBUTIONS IN PROVIDING ESTIMATES OF THE FLUX OF BOTTOM-RECYCLED NUTRIENTS ON THE LOUISIANA SHELF

Alan M. Shiller, University of Southern Mississippi, Stennis Space Center, MS 39529

High nutrient fluxes coupled with seasonal stratification appear to cause the observed seasonal oxygen depletion in bottom waters of the Louisiana Shelf. While there is a substantial flux of nutrients onto the shelf from the Mississippi River, there must also be recycling of these nutrients on the shelf in order to account for observed high levels of primary productivity. A pertinent question is how much recycling occurs in shelf bottom waters and the flux of bottom recycled nutrients to shelf surface waters. The distributions of dissolved V and Mn may be useful in understanding bottom nutrient recycling processes. This is because the bottom sediments are a sink for V and a source for Mn. Interpreting the trace element distributions in the context of a box model suggests a flux of nutrients from bottom waters into shelf surface waters that is of a similar magnitude to the fluvial nutrient flux.

11:40 PRODUCTION OF PLANKTONIC FORAMINIFERS IN THE SHELF-EDGE ECOTONE OF THE SOUTHERN MIDDLE ATLANTIC BIGHT (MAB)

Charlotte A. Brunner* and Pierre E. Biscaye, University of Southern Mississippi, Stennis Space Center, MS 39529, and Lamont-Doherty Earth Observatory, Palisades, NY 10964

In this work we identify specific types of mesoscale hydrographic events that stimulate foraminifer production in an ecotone, quantify the magnitude of the production events in comparison to those in other oceanic regions, and attempt to constrain the low end of the temporal scale on which foraminifer production responds to hydrographic forcings. We examined production and resuspension of planktonic foraminifers on the shelf edge and upper slope of the MAB using trap samples, temperature data, and ancillary data collected as part of the SEEP II experiment offshore from the Delmarva Peninsula. Examined were a time series of 30 sediment trap samples with an average trapping period of 13 days from February of 1988 to May of 1989 and cross-shelf transects of trap samples taken during three selected trapping periods (snapshots). Hydrography during the time series and snapshots was interpreted from 395 daily temperature sections. Planktonic foraminifer fluxes exceeded 6000 tests/m2/d in seven trapping periods in the time series. Planktonic foraminifer production in the MAB ecotone was about 1.5 to 7 times higher than that in warm-water oceanic ecosystems and comparable to that in the subarctic ecosystem and other ecotones. The largest flux event, which exceeded 40,000 tests/m2/d, was related to storm-driven resuspension and transport of particles from the shelf to the upper slope. The other peaks in foraminifer flux were due to production associated with specific, short upwelling events. The events were short in duration lasting only 6 days to 2.5 weeks and occurred with greater frequency than typical of an oceanic ecosystem.

FRIDAY AFTERNOON

Executive Room

1:40 Divisional Business Meeting

2:00 ASSESSING THE POTENTIAL OF FORAMINIFERAL ORGANIC LININGS AS A SEDIMENT PALEOTEMPERATURE INDICATOR

Allen H. Reed* and Charlotte A. Brunner, University of Southern Mississippi, Stennis Space Center, MS 39576

This study evaluated hemipelagic sediment samples from the Middle Valley, Juan de Fuca, as well as other marine environments, in order to determine if the color of foraminifer (*Globigerina bulloides*, dOrbigny, 1826) organic linings can be used to determine sediment paleotemperature. Pollen color change is a well established sediment paleotemperature indicator whereas the usefulness of color changes in the foraminifers primary organic membrane (POM) has not been determined. The importance of this study is that in deep water environments pollen becomes increasingly scarce whereas foraminifers become increasingly abundant. Thus if the foraminifers POM color relates to sediment paleotemperature an economically beneficial color chart could be constructed. Middle Valley, Juan de Fuca is a thermally active spreading center located east of Washington and a catch basin for hemipelagic sediments (constituents include pollen and foraminifers). Laboratory samples of foraminifers and pollen, that were collected from areas with no known heat source,

were subjected to the same heat regime. The results of this study, based upon plain light and spectrophotometric microscopy, indicate that the POM of *G. bulloides* does not change color as readily as pollen does. In fact there was no differentiable color change for POMs subjected to high or low heat. Therefore there appears to be no utility in determining sediment paleotemperature from POM color

2:20 MODELING BIOTURBATION: BIOLOGICAL INFLUENCES ON PHYSICAL PROPERTIES IN THE SHALLOW SEABED

Samuel J. Bentley*, Michael D. Richardson, and Kevin B. Briggs, Naval Research Laboratory, Stennis Space Center, MS 39529

Bioturbation of sediments can alter the acoustic response of the seabed to sonar systems, influence the erodibility of the seabed under energetic flow conditions, and replace structures produced by physical processes with biogenic sedimentary fabric, thus modifying the stratigraphic record. Bioturbation models for physical properties such as porosity or sedimentary structure lag in development behind geochemical/diagenetic models. A major reason for this lag is the lack of data necessary for model calibration. We present results from an ongoing study of bioturbation and physical sediment properties, combining field (biological study and radioisotope geochronology) and laboratory observations (muddy-seafloor microcosms). The objective is to develop a new class of quantitative biological/physical models of seafloor processes. We are using a variety of methods (resistivity, x-radiography, and conservative tracers) to measure temporal and spatial variability of sediment structure and porosity in response to the burrowing activities of several invertebrate functional groups. Observed volumetric bioturbation rates are used to calibrate predictive models for sediment properties. Preliminary results indicate that: bioturbation produced by surface-deposit feeding is rapid (total mixing over weeks to months) and more spatially uniform than rates for deep mixing (from deep deposit feeders), which can vary 10–100 fold over lateral scales of centimeters. Thus, a simple one-dimensional steady state model of deep bioturbation cannot effectively characterize the observed range of local variability.

2:40 PERMEABILITY DETERMINATIONS OF OOIDS COLLECTED ON THE BAHAMA PLATFORM ADJACENT TO BIMINI, BAHAMAS

Allen H. Reed* and Dawn L. Lavoie, University of So Mississippi, Stennis Space Center, MS 39576, and Naval Research Laboratory, Stennis Space Center, MS 39576

Ooid sands were collected near Bimini on an August 1998 cruise as part of an Office of Naval Research project to study acoustic sound propagation in shallow sediments. Diver push cores were collected and then embedded in polyester casting resin so as to avoid distortion of grain interactions and disruption of pore space network and geometry. The objective was to determine if modeling sediment permeability using image analysis tools can effectively compare to in situ permeability. The embedded cores were imaged using scanning electron microscopy (SEM), thin sections with transmitted light microscopy and CT scanning techniques. The image analysis involves characterizing pore space distribution, size and interconnectedness. A binary image is made to determine porosity and effective medium theory (EMT) is used to determine permeability. Permeability calculated from SEM images using EMT and image analysis was 6.33 x 10^{-3} cm/s, which compares well to in situ measurements (3.41 x $10^{-3)}$cm/s. Future work should be to compare the results from image analysis to the Kozeny-Carmen equation and to utilize the same image processing techniques to derive tortuosity and formation factors. This may then facilitate acoustic propagation models and aid in assessing the importance of permeability in shallow water sound propagation.

3:00 MODELING SHALLOW-WATER SANDS OFF PANAMA CITY, FLORIDA, FOR PERMEABILITY USING EFFECTIVE MEDIUM THEORY

Dawn L. Lavoie* and Allen H. Reed, Naval Research Laboratory, Stennis Space Center, MS 39529, and University of Southern Mississippi, Stennis Space Center, MS 39529

Sediment physical sediment properties, especially permeability, are required to predict sediment geoacoustic and geotechnical behavior. Pore space distribution is probably the most significant of all the variables controlling permeability in surficial sediments. Our objective is to predict 2D fluid flow from a quantitative analysis of microfabric. Sandy sediments were collected off Panama City, Florida, during an August, 1998, experiment by divers. Push cores were impregnated with a polyester resin on board ship to minimize handling disturbance. The microfabric, or grain/pore space interaction, was examined using thin section and scanning electron microscopy techniques. Pore characteristics, including pore body and throat size, tortuosity, correlation number and distribution were defined using image analysis techniques e.g., erosion-dilation and Euclidean distance mapping. These pore characteristics were used as input parameters to effective medium theory to predict single-phase flow within the sediment. The modeling results (3.9 x 10^{-3} cm/s) compare well with in situ results using a falling head permeameter (1.36 x 10^{-3} cm/s) and laboratory results using a constant head permeameter (2.59 x 10^{-3} cm/s; 1.32 x 10^{-2} cm/s; Briggs, pers. comm.). [This work was supported by the Office of Naval Research.]

3:20 A QUANTITATIVE PREDICTION OF SEDIMENT PERMEABILITY AS A RESULT OF

BIOLOGICALLY-INDUCED DIAGENESIS

W. Chad Vaughan[1]*, Dawn L. Lavoie[1], and Allen H. Reed[2], [1]Naval Research Laboratory, Stennis Space Center, MS 39529, and [2]University of Southern Mississippi, Stennis Space Center, MS 39529

Sediment cores from three sites in Bay St. Louis, MS and one site in the Dry Tortugas Islands, near the Florida Keys, were collected in order to model permeability of fine-grained nearshore sediments by quantitatively describing the relationship between bioturbation, sediment physical properties, and permeability. These cores provide a comparison between siliclastic and carbonate depositional environments and were examined for benthic organisms, permeability, physical properties, and fabric using image analysis. UTHSCSA ImageTool was employed to analyze x-radiographs in order to define sediment parameters such as pore radii and throat length. These parameters were entered into a model based upon Effective Medium Theory (EMT), which calculates a permeabilty value. Preliminary data suggest the model predicts permeability rates slightly faster than those measured in the lab. Permeameter values range from 4.59 x 10^{-04} cm/s at the sediment-water interface to 3.21×10^{-04} cm/s at a depth of 15 cm, which are reasonable values for fine-grained sediments. However, the model predicts permeability at about 6.82E-04 cm/s. A possible explanation for this difference is that the pathways for fluid flow are modeled as 100% open tubular conduits. In reality the pathways are filled with material such as grasses, which should slow fluid transport. Further analysis of cores to determine a percent blockage of these pathways may add validity to the model.

3:40 RELATIONSHIP BETWEEN MEASURED IN SITU PERMEABILITY AND DIFFUSIVE TRANSPORT OF PORE WATER CONSTITUENTS

Yoko Furukawa[1]*, Dawn L. Lavoie[1], and W. Chad Vaughan[2], [1]Naval Research Laboratory, Stennis Space Center, MS 39529, and [2]University of New Orleans, New Orleans, LA

The relationship between (1) permeability measured in situ, and (2) diffusive transport of pore water constituents was modeled using measured porosity for the fine-grained shallow water carbonate sediments near the Dry Tortugas, Florida. The objective of this study was to investigate the use of in situ permeability as a tool to estimate diffusion coefficients. Conventionally, diffusion coefficients are estimated from porosity alone, and thus have been a problem for highly heterogeneous sediments typical of nearshore regions. Whereas both permeability and diffusive transport are determined by sedimentary fabric, neither has been explicitly linked to fabric parameters other than the porosity. This lack is partly due to the difficulties in parameterizing sedimentary fabric which involves numerous variables including porosity, grain size distribution, packing, grain geometry, and burrow distribution. Because in situ permeability is a function of all fabric parameters, it can be used to estimate the diffusive transport coefficients more accurately than when porosity alone is used.

4:00 MICROWAVE PREPARATION OF SEDIMENTS FOR ELECTRON MICROSCOPY

Janet Watkins* and Yoko Furukawa, GB Tech, Inc., and Naval Research Laboratory, Stennis Space Center, MS 39529

Traditional Electron Microscopy (EM) preparation methods are time-consuming and occasionally destructive to the original sediment microfabric. We have adapted a microwave processing technique from clinical sample methodology. The new microwave preparation technique allows serial dehydration and polymerization to be completed in a few hours with minimal microfabric disturbance compared to using traditional methods which take several days. Serial dilutions of solvent and LR White resin and the final polymerization of the samples are performed utilizing a specialized microwave. Temperature in the microwave is computer-controlled so as to maintain even temperature throughout for a more even polymerization. LR White is used because it is more hydrophilic than traditional resins and is an easy-to-use one-component mix. Sediment samples do not seem to require the tedious exchange of solvents and the numerous serial dilutions that were required for clinical samples, thereby shortening the preparation time even further. The resulting resin-embedded sediments were satisfactory for EM viewing. Examples from St. Louis Bay, MS, and North Key Harbor, Florida, illustrate the feasibility of this technique.

MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Chair: Andrew Royappa, Millsaps College
Vicechair: Walter T. Brehm, US Air Force, Keesler Medical Center

FRIDAY MORNING

Room 604

9:00 FACTORING MERSENNE NUMBERS

Conrad W. Curry, University of Southern Mississippi, Hattiesburg, MS 39406

An integer greater than one is prime if its only positive divisors are itself and one, otherwise it is composite. Multiplying two prime numbers together is simple, but factoring the number back into its prime divisors is computationally difficult. My investigation as part of the

Cunningham project is to factor Mersenne numbers. The Cunningham project was started in 1925 and is likely the longest running computational project in history. It has the goal of factoring $b^n \pm 1$, for b = 2, 3, 5, 6, 7, 10, 11, 12 up to high powers. Numbers of the form $2^n - 1$ are called Mersenne numbers. My investigation used trial division, Pollard Rho, P-1, Elliptic Curve Method (ECM) and the Special Number Field Sieve (SNFS) to find many new factors and complete factorizations for Mersenne numbers including one record factorization for the Elliptic Curve Method and a record factorization for the SNFS for the Cunningham project.

9:20 SYMMETRIC DIFFERENCES OF FINITE DEGREE

Saad Adnan, Mississippi Valley State University, Mississippi State, MS 38941

The symmetric difference of two sets is the intersection of their union and the union of their complements. The article "Symmetric Differences of Degree n" starts by establishing the distributive property of the symmetric difference operation over disjoint unions, intersections, Cartesian products, and inverse functions. The article then proves that the set of all symmetric differences of degree n is closed under taking complements and that the number of ways each such symmetric difference can be expressed is n! times the $(n-1)^{th}$ power of 2. The article also proves that a symmetric difference of degree n is the disjoint union of [(n+1)/2] sets each of which is the intersection of an odd number of the totality of the sets in question. Finally, the article concludes with a demonstration of how to shade out a Venn diagram for a symmetric difference L of degree n out of a Venn diagram of the union of the n factors of L.

9:40 GEOGRAPHICAL WEB SITE COUNTER

Kenneth Davidson* and James Etheredge, University of Southern Mississippi Gulf Coast, Long Beach, MS 39560-2699

The Internet provides many interesting challenges, as its usage becomes more common in the consumer marketplace. Most forms of media provide some means of obtaining profiles of the people using that media. The purpose of the project described in this paper was to develop an Internet web page counter that provides a geographical representation of the people visiting the site. Very little information is available about the particular user downloading a web page. The network protocols provide a means of obtaining personal information about the user, such as their e-mail address, but for reasons of privacy, commercial programs generally do not implement those elements of the protocol. One piece of information, which is available, is the user's domain. This is the piece of information used to determine the person's geographical location. For people using national domains, such as America On-Line, however, no information can be obtained regarding that particular person's location. This program will determine the person's location approximately 70% of the time. The output of the program is a map of the United States showing the number of hits by state. In addition to the development of a new Internet application the project served as a vehicle for the exploration and utilization of complex and often poorly documented networking concepts.

10:00 Break

10:20 VISUAL MODELS FOR STRUCTURED TEXT DOCUMENT TYPE DEFINITIONS

Andrew V. Royappa, Millsaps College, Jackson, MS 39210

Extensible Markup Language (XML) is a new international standard for defining structured text markup languages for the World Wide Web. An XML document type definition (DTD) employs a notation similar to extended Backus-Naur form (EBNF), which is used to specify context-free grammars for describing programming languages. The present work first develops a visual model that is complementary to DTD notation, and gives an algorithm for constructing a diagram for a given DTD. Then, applications of the visual model are described. First, it is shown how diagrams provide visual insight into the structure of complex markup languages. Next, it is shown how diagrams can be visually manipulated to modify an existing DTD or to construct a DTD for a new markup language. Finally, diagrams may be most useful for specifying structured text document transformations, e.g. for transforming XML documents into standard hypertext for display on the World Wide Web. This might make it possible to automatically generate code for performing structure transformations. Ideas for further research in this area are presented, that may lead to new software tools for structured document transformation. In conclusion, the visual DTD model is shown to be a useful tool for analyzing and manipulating structured text documents.

10:40 A COMPARISON OF METHODS USED TO TEACH PROBABILITY IN INTRODUCTORY STATISTICS

Karen D. Morgan* and Dale Bowman, University of Mississippi, University, MS 38677

Recently there has been much debate about the amount of probability which should be taught in an introductory statistics course and about the manner in which probability should be presented. Studies have shown that many students have intuitive beliefs about probability which often are self-contradictory and often contradict laws of probability. These intuitions, difficult and often impossible to correct, are based in large part upon a frequentist approach to computing probabilities. The challenge of this research is to use the

students' intuitive understanding of frequentist computations to teach the basic concept of probability. In this way, it may be possible to alter some misconceptions and reinforce basic concepts of probability. A study was designed to compare a new approach to teaching probability using computer simulations with a more classic method using the laws of probability.

11:00 MODELING MANUFACTURING DATA WITH A DOUBLY TRUNCATED LOGISTIC DISTRIBUTION

Mary L. Baggett* and Duane A. Meeter, University of Mississippi, University, MS 38677, and Florida State University, Tallahassee, FL 32306

Statistical tolerance analysis typically assumes data from manufacturing processes have a normal distribution. Processes from a wide variety of industries have output with skewed distributions or finite ranges. One method of coping with this problem has been to use the beta distribution to model manufacturing data. We examine the use of a doubly truncated logistic distribution for this situation. This distribution is suitable for a wider class of processes that the beta distribution. Parameter estimation for this distribution is more straightforward than it would be for a truncated normal distribution. Comparisons are made between the use of the normal, beta, and truncated logistic distributions for predicting the proportion of nonconforming product using actual manufacturing data.

11:20 Divisional Business Meeting

FRIDAY AFTERNOON

Room 604

1:30 USING HEALTH SERVICE AREA AND URBAN-ICITY MEASURES FOR MISSISSIPPI COUNTY-BY-COUNTY ANALYSES

Todd G. Nick* and Joe Surkin*, University of Mississippi Medical Center, Jackson, MS 39216, and Mississippi State Department of Health, Jackson, MS 39215

The population of Mississippi is approximately 2.5 million. The populace is dispersed throughout 82 counties and some 290 incorporated cities, towns, and villages. With 53% of the population residing in areas classified as rural, Mississippi is quite a provincial state. Mississippi currently contains seven counties (three regions) that are classified as standard metropolitan statistical areas which account for almost half of the state's population. In order to classify an area as either urban or rural, it is necessary to first define the terms that quantify a region. Goodall, Kafadar, and Tukey (1998) discuss many measures of urban-versus-rural character including the most frequent measures based on (i) total population; (ii) population density; and (iii) percent urban population. The authors give many examples of the measuring systems using U.S. county data as well as elaborating on a new measure (urbanicity) that may be useful in classifying urban-versus-rural characteristics. The urbanicity measure is compared and contrasted with a measure that reflects current travel patterns between counties for routine hospital care (health service areas). Using Mississippi county data, we demonstrate that the choice of measurement for adjustment purposes can have a tremendous impact on the outcomes of county-by-county analyses. For example, Kemper county residents have very good access to health care but the county is considered a very rural area by the urbanicity measure. In conclusion, urbanicity and health service area measures should be considered in county-by-county analyses with the possibility of including both measures in a statistical model.

1:50 A COMPARISON OF BIOASSAY DESIGNS

Gibson Johnston* and Dale Bowman, University of Mississippi, University, MS 38677

In a typical bioassay for assessment of adverse or toxic effects, animals are randomly assigned to various dose groups where they are exposed to a fixed level of toxin. In many cases the responses of interest are binary. Within each dose group the observed response rate is used to estimate a dose-response curve. At low doses few animals are likely to respond making it difficult to estimate the response rate there. Since typical human exposure is most likely to occur at low doses, this is the area where more information about the dose response curve is required. In many cases high response rates at higher doses have undue influence on the estimated dose response curve. An alternate design is examined and compared here. The alternate design consists of exposing randomly selected animals at a particular dose level until a fixed number of animals exhibit positive response. The advantage of this design is that more information may be obtained at lower doses.

2:10 A PARAMETRIC TEST FOR LITTER EFFECT IN DEVELOPMENTAL STUDIES

Dale Bowman, University of Mississippi, University, MS 38677

Researchers in developmental toxicity often observe average number of implantation sites (or litter size) decreasing with increased exposure levels. Such a decrease has implications in reduction in fertility associated with the material being studied. Althought the trend is easily observed, it is rarely statistically significant in part due to the relatively small number of litters observed in each dose group (typically 20–25). In this paper a parametric procedure is proposed which allows for a test for decrease in the number of

implantation sites due to exposure. The parametric model assumed is the exchangeable binary model, requiring only an assumption of exchangeability of potential implants. The parametric model is able to detect significant dose trends in number of implantations in situations where other methods do not.

2:30 Break

2:50 RANDOMIZING EXPERIMENTAL DESIGNS USING THE SAS® PLAN PROCEDURE

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

The valid use of statistical procedures to analyze experimental data requires that the experimental units be randomly assigned to the treatment groups. All statistics texts emphasize the importance of this assumption; however, the methods they suggest for carrying out a randomization (e.g., flipping coins, drawing lots, using random number tables) are cumbersome when the experiment is large or is to be repeated many times. In those situations it is more convenient to use readily available statistical software, such as the SAS® PLAN procedure, to create an appropriate randomization plan. PLAN was designed primarily to generate randomization plans for experiments with a nested factor structure. Although many experiments involve a crossed factor structure, the PLAN user's guide and online documentation give only a single example of that situation: a Latin square design with one treatment factor. It may not be obvious to the casual SAS® user how to apply PLAN to other crossed designs such as a completely randomized design with two or more treatments in a factorial arrangement. This paper describes the syntax of the PLAN procedure and demonstrates the use of PLAN to produce randomization plans for completely randomized, randomized complete block, and split-plot designs with crossed treatment structures. These examples will assist statisticians and scientists to randomize many commonly used experimental designs with PLAN.

3:10 BAYESIAN BOOTSTRAP PROCEDURES FOR CORRELATED BINARY DATA

Gwen Aldridge* and Dale Bowman, University of Mississippi, Oxford, MS 38655

Correlated binary data arise can from experiments where binary observations are made within clusters. Often an assumption of independence among observations is violated due to the clustering. Estimation procedures for modeling correlated binary data must take into consideration this intra-cluster correlation. Parametric models for the binary response rate which have been proposed include the beta-binomial and the exchangeable binary. Even for non-informative priors, Bayesian procedures to estimate response rates result in mathematically intractable posterior distributions. In this paper Bayesian bootstrap procedures are developed to model correlated binary data. The advantages of the Bayesian bootstrap over classic estimation procedures and ordinary bootstrap methods include the ability to incorporate prior information into the analysis and the ability to simulate a posterior distribution.

3:30 ON LINEAR REGRESSION UNDER THE KOZIOL-GREEN MODEL OF RANDOM CENSORSHIP

Ke Wu, University of Mississippi, University, MS 38677

In the Koziol-Green model of random censorship the survival distribution of the censoring times is some power of the survival distribution of the life-times. We give a method of estimating parameters in the linear regression model under the Koziol-Green model of random censorship. The maximum likelihood estimator for the survival function under the K-G model is used in the proposed method, rather than the product-limit estimator of Kaplan and Meier (1958) used in Buckley & James's (1979) procedure for estimating parameters in the linear regression model with censored data. Simulations comparing the two methods are described and the results show that the new estimator using the MLE of the survival distribution function outperformed the Buckley-James estimator under the K-G model.

3:50 Business Meeting of the Mississippi Chapter of the American Statistical Association

PHYSICS AND ENGINEERING

Chair: M. Amin Haque, Alcorn State University

Vicechair: T.M. Parchure, Waterways Experiment Station

THURSDAY MORNING

Mississippi Room

8:40 ENVIRONMENTAL IMPACT OF DREDGING

T.M. Parchure, US Army Engineer Waterways Experiment Station, Vicksburg, MS 39180

Several rivers, estuaries and harbors require maintenance dredging in order to ensure adequate depths in the navigable waterways. The activity of removing sediment from the bed and its placement at a designated disposal area (on land or in water) may cause significant environmental impacts such as the following. 1. Both dredging and aquatic disposal of sediment change hydrodynamic conditions and

adversely affect water quality due to increased suspended sediment concentration. The amount of sunlight available to the submerged aquatic vegetation is considerably reduced by the sediment particles in suspension. Fine sediments such as silt and clay remain in suspension for a long period of time, resulting in a significant light attenuation, which hinders plant growth. 2. Resuspended sediment may clog fins of fishes. 3. Deposition of fine sediment on leaves hinders photosynthesis. 4. If the resuspended sediment is contaminated, its transport and deposition over other sensitive areas such as oyster beds can have serious consequences. 5. Turtles and other aquatic life forms may get killed and their habitats damaged due to dredging and disposal activities. 6. Dredging and sediment placement near river mouth may cause bank erosion. The adverse impact can be minimized by adopting improved dredging techniques, and by taking precautionary measures based on the results of numerical hydrodynamic and sediment transport studies.

9:00 A FINITE DIFFERENCE TIME DOMAIN FORMULATION WITH PERFECTLY MATCHED LAYER ABSORBING BOUNDARIES FOR THE ANALYSIS OF AXI-SYMMETRIC BODY OF REVOLUTION STRUCTURES

Vicente Rodriguez-Pereyra*, Atef Z. Elsherbeni, and Charles E. Smith, University of Mississippi, University, MS 38677

Various types of antennas and transmission media for electromagnetic waves (cables, waveguides, etc) are geometrically symmetrical around an axis of rotation. The conventional three dimensional (3D) finite difference time domain (FDTD) technique, which is a popular approach to the analysis and design of such systems, requires large amount of memory and computational time. However, by analytically extracting the azimuth periodic behavior of the fields of these geometries a body of revolution (BOR) approach can be developed. Thus the field everywhere may be obtained by solving Maxwell's equations in a single two dimensional (2D) plane. Although FDTD-BOR has already been reported [A. Taflove Computational Electrodynamics: The Finite Difference Time Domain Method. Norwood, MA.–Artech House, 1995], this work presents advanced integration of the perfectly matched layer (PML) [J-P. Berenger "A Perfectly Matched Layer for the Absorption of Electromagnetic Waves," J. Comp. Phys. Oct. 1994] absorbing boundary condition into the FDTD-BOR formulation. This implementation significantly reduces the undesired (artificial) reflection of outgoing waves for a wide range of frequencies. Good agreement with published computed and measured data are obtained by the developed FDTD-BOR technique for dielectric resonators and microstrip antennas. This developed algorithm is being used for the analysis and design of new types of axi-symmetric antennas for personal wireless communication systems.

9:20 LOCATING AND DETERMINING THE AMOUNT OF RADIONUCLIDE IN A WOUND USING A PLUTONIUM WOUND MONITOR

Amin Haque*, A.T. Keane, and Hazel A. Thorniley, Alcorn State University, Lorman, MS 39096; Argonne National Laboratory, Argonne, IL 60439; and Florida Southern College, Lakeland, FL 33801

The primary region of interest for the Pu 238 and Pu 239 spectra is the 12–24 keV, corresponding to the uranium L X-rays. This region also corresponds to the 241 neptunium L X-rays, emitted following the nuclear transformation of Am . A second region of interest is 37–78 keV, corresponding to the 59.6 keV γ-rays of Am^{241}. The NaI (Tl) detector used to detect X- and γ-rays emitting materials in wounds was 25 mm in diameter and 0.75 mm thick. Calibration of the detector was performed by measuring its readings relative to NBS standard radiation sources (Pu^{238} 62.4 nCi, 2310 Bq, and Am^{241} 495 nCI, 18300 Bq) and in the energy range of interest (7.9 keV–25.2 keV and 43.5 keV–74.9 keV). The Np X-ray peak had a full width at half maximum (FWHM) resolution of 8.8 ± 0.2 keV. The 59.5-keV peak had FWHM resolution of 14.4 ± 0.5 keV. Also, a variable energy X-ray source was used to produce K X-rays which were used to obtain a linear calibration curve. Different thickness of Alderson-Rando (radiation analog dosimetry) tissue-equivalent materials were used to simulate human muscle, and the attenuation curves were obtained. The calibration factors and attenuation curves enable the operator to determine the quantity and depth of contamination.

9:40 AN ACOUSTIC TOMOGRAPHIC METHOD FOR MONITORING OF ATMOSPHERIC TURBULENCE

Michael L. Morgan, University of Mississippi, University, MS 38677

A method using acoustic tomography for monitoring of turbulence in the atmospheric surface boundary layer is presented. A simplified model of the forward problem and a method for inversion of time of flight measurements are formulated. The inversion from time of flight data to meteorological information requires accurate timing resolution from short duration measurements. Maximal length sequence signals are used to meet these demands. Results from preliminary measurements are discussed.

10:00 Break

10:20 SENSITIVITY OF ACOUSTIC BACKSCATTER TO THE ROUGHNESS OF OUTDOOR SOIL SURFACES

M.L. Oelze* and James M. Sabatier, University of Mississippi, Oxford, MS 38655

Acoustic characterization of the roughness of outdoor soil surfaces has been done historically by looking at the sound propagated in the forward direction. Backscatter has been used to characterize surface roughness in underwater sound. Underwater backscatter methods and outdoor sound techniques for characterizing soils are combined to utilize acoustic backscatter for the characterization of outdoor soil surface roughness. The statistics obtained from the backscatter method to describe the roughness give an approximate curve for the 2-D roughness power spectrum. The roughness power spectrum gives the scattering power inherent in each roughness size distribution for a given surface. From the roughness power spectrum, the RMS height and the correlation length of the roughness elements can be obtained. The models indicate that backscatter measurements are not only invertable, but also very sensitive to retrieving the roughness power spectrum statistics for medium to hard soil surfaces.

10:40 VIBRATIONAL SPECTRA AND NORMAL COORDINATE ANALYSIS OF 3-CHLO

Chandra M. Pathak[1]*, S.N. Singh[2], P.C. Mishra[2], and B.P. Asthana[2], [1]Alcorn State University, Lorman, MS 39096, and [2]Banaras Hindu University, Varanasi 221005 India

The vibrational spectra of 3-chloropyridine (3cl-p) have been investigated recording the IR and Raman spectra in the liquid phase covering the spectral region 4000–100 cm^{-1}. Polarization measurement of the Raman lines were made which aided the frequency assignments considerably. The molecule was assumed to have a $\mathbf{c_s}$ symmetry and its geometry was calculated using the PRECISE option in the semi-empirical MNDO method of geometry optimization. The normal coordinate analysis and the force field calculations were carried out using a general valence force field (GVFF) employing 14 principal and 13 interaction force constants using the least squares iterative technique. The planar and non-planar vibrations were dealt with separately. The force field calculations reproduced the observed frequencies quite well giving an average percent error of 1.35%. Some of the fundamental frequencies in 3cl-p are found to be shifted toward lower wavenumber as a result of the substitution of the chlorine atom in pyridine at the meta-position with respect to the nitrogen atom. Our investigation has led to the conclusion that the breathing mode in 3cl-p, observed an nearly 730 cm^{-1}, is about 260 cm^{-1} lower than in the parent molecule pyridine.

11:00 IDENTIFICATION AND QUANTIFICATION OF A RADIONUCLIDE DEPOSITED INSIDE THE BODY USING A WHOLE BODY COUNTING

Amin Haque* and A.T. Keane, Alcorn State University, Lorman, MS 39096, and Argonne National Laboratory, Argonne, IL 60439

The NaI(Tl) detector measured the rate of emission of X- and γ-rays from a radionuclide deposited in the body to determine the amount of the material at the time of measurement. The radionuclides emitted photons with sufficient energy to reach the detector placed outside the body in a heavily shielded room. The person to be investigated was laid on a flat table and the detector scanned over the whole body with a mechanical drive mechanism. The 50 keV resolution of the detector was sufficient to identify most of the γ-emitting nuclides commonly encountered by the radiation workers. However, it had low counting efficiency, ~ 10 %. The detector was calibrated by placing standard radionuclide sources in an anthropomorphic phantom or phantom organ constructed of tissue equivalent material and measuring the emitted photons. The replaceable organs could be molded with different amounts of radioactivity incorporated in them to allow the detector sensitivity to be accurately measured. Different chest wall thickness was available for this phantom to allow a correction factor. The detector was able to detect the average 17 keV X-rays from Pu^{239} and the 60 keV γ-rays from Am^{241}. The Whole-Body Counting has the ability to obtain results quickly. This detector can also accomplish individual organ counts. The actual location of the radionuclide may not be so definite.

11:20 PROGRESS IN LASER DOPPLER VIBROMETER BASED LANDMINE DETECTION EXPLOITING ACOUSTIC-TO-SEISMIC COUPLING

Ron Craig*, James M. Sabatier, and Ning Xiang, University of Mississippi, University, MS 38677

A non-contact method is required to detect objects in air-filled soils, specifically landmines. Using acoustic-to-seismic (A/S) coupling of airborne sound into the poro-elastic soil, the velocity vibrations on the ground surface were measured. Audio frequencies of 0.06-10 kHz were broadcast on the soil to induced seismic vibrations. These vibrations are measured using an off-the-shelf scanning laser Doppler vibrometer (LDV). Some major results will be discussed. [Work supported by CECOM, Night Vision & Electronic Sensor Directorate.]

11:40 INVESTIGATION OF EVAPORATION-CONDENSATION ON SOUND PROPAGATION IN CYLINDRICAL TUBES INCLUDING HEAT TRANSPORT AT TUBE WALLS

William V. Slaton, University of Mississippi, University, MS 38677

Attenuation of sound in porous media is a complicated field in acoustics. In dry media the primary agent leading to attenuation is viscous losses. In wetted media,

however, the effects of condensation and evaporation also lead to energy loss. This presentation parallels a recent work by Raspet et al. to be published in the Journal of the Acoustical Society of America. To simplify the derivation of the attenuation of sound in air filled tubes with wet walls, Raspet assumed that tile heat capacity of the walls was large enough so that temperature fluctuations in the walls could be ignored. For this boundary condition, the fluctuation in the vapor pressure of tile condensed liquid will vanish at the tube wall since the vapor pressure depends only on temperature. Allowing heat transport at tile boundary complicates the analysis due to the dependence of the vapor pressure on tile temperature, however, these may be more realistic boundary conditions. In this work the basic physics of the solution is described and the predictions of attenuation with and without temperature fluctuations compared.

THURSDAY AFTERNOON

Mississippi Room

1:30 ON THE USE OF WAVELET-LIKE BASIS FUNCTIONS IN A FINITE ELEMENT TIME DOMAIN (FETD) ALGORITHM

W. Elliott Hutchcraft[1]*, Richard K. Gordon[1], and Jin-Fa Lee[2], [1]University of Mississippi, University, MS 38677, and [2]Worcester Polytechnic Institute, Worcester, MA 01609

The objective of this research was to employ wavelet-like basis functions into a time domain algorithm to solve electromagnetics problems. To obtain one-dimensional basis functions, we have employed the techniques described in an article by Stephan Jaffard in a SIAM journal. We have used combinations of these one-dimensional basis functions to form two-dimensional basis functions. We then used these basis functions in a FETD algorithm to look at both one-dimensional propagation, two-dimensional propagation, and to determine the cutoff frequencies of a waveguide. We have found that our results are in good agreement with theory.

1:50 THE ONSET OF SPATIAL PATTERNS GENERATED BY A TORSIONALLY OSCILLATING CONE IN STRATIFIED FLUIDS

R.F. Folse and R.J. Hallstein*, University of Southern Mississippi, Hattiesburg, MS 39406-5046

Previous experiments with cellular flow patterns in density stratified fluids resulted in a discrepancy between theory and experiment. Observations of the size of secondary flow cells generated by torsionally oscillating spheres in stratified fluids were found to correlated by power laws relations which differed from predictions based on an energy balance argument. This discrepancy may be resolved if the onset of the flow is governed by critical values of the parameters. Measurements have been made of the time for onset of cellar flow patterns for a 25 degree right-circular cone torsionally oscillating in stratified fluids with buoyancy frequencies between 1.77 rad/s and 3.3 rad/s. Driving frequencies ranged from 0.9 rad/s to 5.2 rad/s and the amplitude of oscillation was less than 0.75 rad. These measurements provide evidence for the existence of critical frequencies and amplitudes below which secondary flow cell formation will not occur. A correlation of these critical values with the buoyancy frequency of the stratified fluid will be presented that may resolve the discrepancy with the sphere experiments.

2:10 PREDICTING SOIL-MOISTURE BY DETERMINING THE INFILTRATION-EVAPORATION-RUNOFF RATES APPLYING PHYSICAL MODELS

Amin Haque, Waterways Experiment Station, Vicksburg, MS 39180

Accurate and timely surface Moisture estimates are valuable to crop growth, river basin flood, off-road traffic, and climatology. Infiltration rate depends on the soil parameters such as initial soil water content, hydraulic conductivity, and soil water pressure head. The solution of Richard's equation describes the infiltration rate in terms of the soil parameters, space and time. Surface runoff occurs when the rainfall intensity exceeds the saturation hydraulic conductivity of the soil or if the initial water table is shallow. The overland flow of rainfall-excess is described by kinematic wave equations. Applying appropriate initial and boundary conditions and surface resistance law the equations are solved analytically, giving the runoff profile as a function of space and time. Evapotranspiration from a soil-plant surface depends on the availability of heat energy, which is a function of the net radiation incident on the surface and the temperature and humidity of the overpassing air, and on the availability of water on the surface, which is a function of the precipitation and the complex processes in the soil-moisture-plant system. Applying the energy balance and transport equations and physical models, estimates of evapotranspiration have been made using meteorological data of several places in the world. Thus a knowledge of the rates of rainfall, infiltration, runoff, and evaporation using physical models enables to predict surface water content at any time of the year, anywhere in the world.

2:30 ANALYSIS AND REDUCTION OF ELECTROMAGNETIC COUPLING ON RIBBON CABLES

Atef Z. Elsherbeni, Charles E. Smith, and Chun-Wen P. Huang*, University of Mississippi, University, MS 38677

In general, computers and electronic equipments rely

on accurate transmission of data between components within a system, and in many cases, these data propagate between the system components via ribbon cables. The continuous advances in technology have created requirements for higher speeds for data transmission between these devices (as an example, data transmission between the computer CPU chip and the data bus and other peripheral components). This increase in transmission speed, unfortunately, contributes to undesired electromagnetic interference between the signals on the ribbon cable wires. To reduce this electromagnetic interference (coupling or cross-talk), one would first need to develop a tool to analyze the mechanism of coupling and then introduce ways to reduce and, possibly, eliminate this phenomena. The current design of ribbon cables is adequate for existing computer and electronic systems. However, as the clock speed of computers increase, the need to insure data transmission integrity becomes critical. This paper presents a simple numerical approach to analyze the crosstalk on ribbon cables and also provides an experimental procedure to measure the induced crosstalk. Several approaches for reducing the coupling and electromagnetic interference on two industrial ribbon cables are implemented. Our numerical and experimental results show a practical reduction in crosstalk coupling. For two types of ribbon cables, a reduction over 20 dB is observed at low frequencies, and for frequencies up to 300 MHz, a reduction of 5dB is achieved at the near end cable connection.

2:50 Break

3:00 Divisional Poster Session

USING NETWORK ANALYZERS TO DISPLAY STANDING WAVE FOR SLOTTED LINE-TYPE IMPEDANCE MEASUREMENTS

Mohammed Sayeed Zaman Khan*, Charles E. Smith, and Darko Kajfez, University of Mississippi, University, MS 38677

In a companion lecture presentation paper, the authors describe a technique where a computer controlled vector network analyzer can be used to display standing waves as visualized in the past for impedance measurements on slotted lines. This capability is accomplished by writing computer modules to compute the reflection coefficient at a given frequency and then computing and displaying the related standing wave. The objective of this work is to provide a visual display of the standing waves to enhance students understanding of waves while using modern measurement techniques based on vector network analyzers. This poster paper presents the step-by-step procedure for obtaining the standing wave pattern, the measurement of VSWR, and the distance from the first minimum to the load for impedance calculation. Measured standing waves are presented for open, short, 50 Ohm, 100 Ohm, and a general impedance, and the impedance measured from the standing wave technique is found to be in very good agreement with the calibrated network analyzer's measured data. It is demonstrated that a RF, wireless, microwave laboratory can be based on modern network analyzer while having the capability of displaying standing waves patterns that provide us an intuitive feel for how electromagnetic energy propagates.

3:20 Oral Presentations Resume

3:20 MAGNETICALLY DRIVEN STANDING WAVES ON AN AC CURRENT CARRYING WIRE

Jessica Drewrey* and James M. Sabatier, University of Mississippi, University, MS 38677

An elastic cord or slinky is often used to demonstrate various wave phenomena, including the nodes and antinodes of a standing wave. In this demonstration, the drive force results from the interaction of an electric current in a tensioned conducting wire, and an applied magnetic field. With sufficient current, the wire will glow brightly at the nodes. The antinodes will be dark due to cooling by convection. This demonstration will be accomplished using a variac. In conclusion, a magnet can be used to drive standing waves in an ac current carrying wire, and different orders can be achieved by adjusting the tension of the wire. Enough current cause the wire to glow brightly at the nodes, while the antinodes are dark from convective cooling. This is an impressive, very visible lecture demonstration for introductory physics students.

3:40 CONDITIONS FOR OPTIMAL NARROWING OF THE PHOTON DISTRIBUTION OF A SQUEEZED STATE

Henk F. Arnoldus, Mississippi State University, Mississippi State, MS 39762

A coherent state of the radiation field (laser beam) has a Poisson photon number distribution, and therefore the variance for the uncertainty in the number of photons in the field is equal to the average number of photons in the field. For most other states of the radiation field, the distribution is considerable wider than a Poisson distribution, and the corresponding statistics are called super-poisson. In general, any type of noise, and in particular thermal fluctuations, will lead to a widening of the photon probability distribution. It is extremely difficult to generate light with sub-poisson statistics, e.g., with a variance smaller than the average. One possibility is to 'squeeze' the fluctuations of a coherent state. This leads primarily to reduced quantum fluctuations in the quadrature components of the phase, but it can have the additional effect of reducing the photon number fluctuations below the Poisson limit. The general notion in the literature is that the more the

coherent state is being squeezed, the narrower the photon distribution becomes. We show that this is incorrect, and that there exists an optimum degree of squeezing which minimizes the width of the probability distribution.

4:00 THE SURVIVAL TIME OF SQUEEZED LIGHT IN A SINGLE-MODE CAVITY

Qiuhan Xue* and Henk F. Arnoldus, Mississippi State University, Mississippi State, MS 39762

A coherent state of the radiation field (laser beam) has inevitable quantum fluctuations in its amplitude and phase, essentially due to the vacuum. This undesirable noise can be suppressed by a process called squeezing. According to Heisenberg's uncertainty principle, however, a reduction of fluctuations in one quadrature component (phase or amplitude) of the field necessarily leads to enhanced fluctuations in the other component. Such squeezed states have been generated experimentally through four-wave mixing in a sodium vapor in a single-mode cavity. Due to the presence of the mirrors, the radiation in the cavity will evolve to thermal equilibrium, thereby enhancing the quadrature fluctuations dramatically, and to a value well above the vacuum limit. We have studied the time evolution and damping of the quadrature fluctuations of radiation in a cavity, and determined the survival time of a squeezed coherent state. This time depends on the temperature and the cavity quality factor, but is otherwise independent of the details of the initial state. It is also shown that for a cavity at zero temperature, a squeezed state never becomes 'unsqueezed'.

4:20 DEVELOPMENT OF A PHOTOFRAGMENTATION-LASER INDUCED FLUORESCENCE (PF-LIF) SENSOR FOR THE DETECTION OF 2,4,6-TRINITROTOLUENE (TNT) IN SOIL AND GROUNDWATER

Tracy S. Miller*, Amanda J. Kunefke, Jagdish P. Singh, Fang-Yu Yueh, and David L. Monts, Mississippi State University, Mississippi State, MS 39762-5932

The soil and groundwater of defense sites may be contaminated with toxic energetic materials (EMs), such as 2,4,6-trinitrotoluene (TNT). If the EMs can be detected, then the soil or groundwater can be treated to destroy these toxic compounds. We have been working on a technique for detecting EMs in situ. Laser photofragmentation (PF) and subsequent nitric oxide (NO) laser-induced fluorescence (LIF) spectrometry is being developed to measure the concentration of EMs in soil and groundwater. Gas-phase EMs photodissociate, releasing NO_2 when exposed to radiation near 226 nm. The NO_2 then absorbs another photon of the same energy and undergoes predissociation to from NO. The resulting NO absorbs a third photon of the same energy and emits an intense fluorescence. The EM concentration is inferred from the intensity of the NO fluorescence. A PF-LIF laser-based sensor is being developed to be used with the U.S. Army Corps of Engineers' Waterways Experiment Station's (WES) cone penetrometer in order to measure EM concentration at selected distances beneath the soil surface. An investigation of the changes of the PF-LIF temporal waveform as a function of temperature, concentration, and water content is reported.

FRIDAY MORNING

Mississippi Room

8:40 RAPID PROTOTYPING—THE CURRENT STATUS

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

As a recent technology rapid prototyping (RP) has been shortening the concept-to-market time of new or extensively modified products. It enables physical modeling of a design using specialized computer-aided technologies. RP systems produce models rapidly by prototyping parts from three-dimensions computer-aided design (CAD) data. Complex shapes are produced layer-by-layer through additive approaches to liquid, powder, or sheet materials. The resulting prototypes can be made of plastic, wood, ceramic, or metal. The prototypes are later used to make injection-molded parts or metal castings that are assembled to manufacture a large variety of products. RP has mostly been accepted in four major industries—automobile, aerospace, business machines, and consumer products. It has by now grown to become a one-billion industry, with 5,000 RP systems in use worldwide. One primary bottleneck to faster growth of RP technology is the fragmentation of CAD/CAM/CAE software industry comprising 20 major vendors. None of the vendors is a leader, as evidenced by the current consolidation in this industry. The CAM market is the worst, with MasterCAM capturing only 12% of the market, while the other nine vendors with 3–7% each. However, RP has a bright future in the medical sector.

9:00 USING VECTOR NETWORK ANALYZERS FOR TEACHING STANDING WAVES IN THE LABORATORY

Mohammed Sayeed Zaman Khan*, Charles E. Smith, and Darko Kajfez, University of Mississippi, University, MS 38677

With the tremendous development of instrumentation for network analyzers (NA) that possess the capability of measuring both magnitude and phase, a new era in measurement metrology has begun. Vector network analyzers coupled with both internal and external computer controllers have, to some extent, taken over the role from manual measurements using slotted lines and the Smith Chart. The

ability to characterize a component in terms of magnitude and phase changes the methods used in design and development, and, thus, how the student and the practicing engineer thinks about and visualizes these processes. Vector measurements are not usually covered in undergraduate HF and microwave laboratories, primarily because of cost and reluctance by the instructors to move away from slotted line techniques because of its intuitive visual representation of standing waves. In this paper a computer program has been developed that makes it possible to emulate the classical standing wave pattern on a network analyzer display. This program is based on computer program modules, that use the single frequency measured reflection coefficient to compute and draw the standing wave on the NA screen. Therefore, the intuitive advantage of slotted line technique can be preserved even in the future laboratory environment, that is based on the network analyzers. With such new, low-cost NA's and customized displays, students can be educated in current measurement metrology employed in industry while teaching is based on the intuitive concepts of standing waves. This paper reviews standing wave theory needed for the computer modules and describes the program used to customize the network analyzer display for drawing the standing waves and computing impedance using slotted line techniques. Examples for various general load impedances are presented to demonstrate this capability.

9:20 THE EFFECTS OF GLASS SAMPLE TEMPERATURE ON LASER-INDUCED BREAKDOWN SPECTROMETRY

John T. Rigsby III*, Chun Fu Su, Jagdish P. Singh, Fang-Yu Yueh, and Robert L. Cook, Mississippi State University, Mississippi State, MS 39762

Over the past few years, the results for applications of the laser-induced breakdown spectroscopy (LIBS) technique to investigate the vitrified glass samples have been presented to the MAS annual meetings. They have included the identified metallic elements and the effects of the sample temperature on both the spectral intensities and the inferred plasma temperatures. Other interesting aspects of the research such as the computed electron density and the concentration ratios of the identified elements to iron at various sample temperatures will be presented at the meeting this year. The calculated electron density indicates that at a higher sample temperature the laser beam produces a laser spark with a higher electron density. The concentration ratio inferred from the sample at different temperatures shows that the concentration ratio of a certain element to iron is affected by the melting temperature of the element. For an element with a lower melting temperature than iron, the concentration ratio of the element to iron decreases while the sample temperature increases. On the other hand, the concentration ratio of an element with a higher melting temperature than that of iron increases when the sample temperature increases. The concentration ratio is almost independent of the sample temperature for the element that has a comparable melting temperature with respect to iron. Detailed results and explanations will be presented.

9:40 A COSMIC EXPLOSION AS BRIGHT AS BILLIONS AND BILLIONS OF GALAXIES!

John Patrick Lestrade, Mississippi State University, MS 39762

In many ways the story of cosmic gamma-ray bursts (grb) closely resembles the enigma of the "spiral nebulae" that astronomers faced 80 years ago. Are they in our galaxy or are they at cosmological distances? We have been gathering data on these transient explosions for over 30 years. For most of this time, we felt sure that they were the result of some mildly violent event near or on neutron stars in the Milky Way. In this decade however, our view has changed. The current model of grb requires them to emit unimaginable amounts of energy in a short period of time. For example, in 1997 there was a cosmic burst of gamma rays from what appears to be a source located at a redshift of z=3.14. Its measured flux and cosmological distance imply an intrinsic luminosity as bright as 10 billion galaxies! We used to be impressed that a supernova could be as bright as its host galaxy. If our current models of grb survive future observations and scrutiny, than grb like this one will be the objects that impress and supernovae will fade to a distant, dim second. In this paper, in addition to some historical background, I present the results of an entropic analysis of grb time profiles and show how it relates to an expanding fireball model for grb.

10:00 Break

10:20 QUALITY—A DEFINITION FOR THE TWENTY-FIRST CENTURY

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

Like most terms with abstract meanings such as beauty or honesty, quality is primarily subjective. It is one of those terms for which we say: *we know when we see it*. While this concept of quality suffices in the social arena, it fails in industrial use. In engineering and technical fields, quality must be defined *objectively* so that it can be measured, quantified, and evaluated. For over 100 years we have used technical parameters such as closer dimensional tolerances, better surface finish, longer product life, lower maintenance, higher reliability, faster service, and lower prices to describe quality. The competition from Japan during the eighties and nineties forced us to rethink this approach of indirect assessment of quality. We are back into the abstract domain. Quality-conscious companies have realized that the quality of a product or service is not what their engineers and designers claim it to be. The quality is rather what consumers think it is;

it is thus a consumer-determinant. The modern definition of quality is: what makes a Toyota Toyota. A newer definition, the one appropriate for the twenty-first century, will arise from the concept that quality is set by the most demanding customer.

10:40 HOW TO FAKE A GAMMA-RAY BURST

DeWayne McCollum* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

Cosmic gamma-ray bursts (GRB) are short, transient, flashes of gamma-rays apparently coming from sources at the horizon of the observable universe. For the past 30 years there have been many attempts to analyze the spectral and temporal properties of GRB. In this paper I generate artificial gamma-ray burst time profiles that share the same Fourier power spectrum and amplitude distribution as the original GRB. These surrogate time profiles can be used as a control group in tests on actual GRB profiles.

11:00 MULTIPLE CYCLES IN GAMMA RAY BURST TIME PROFILES: THE SIGNATURE OF A TRANSITION TO CHAOS

Yuan Yan* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

Previous studies have failed to reveal any explicit periodicities in Gamma Ray Burst Time Profiles (GRB's). Our previous report (Yan et al., MAS 1995) showed, however, that there are "statistical" cycles in GRB's. Furthermore, a recent re-examination of GRB cycle plots shows the presence of complicated multiple cycles which are not a simple geometric progression of the cycle durations. The cycle phenomenon is due not only to the temporal autoregression process in GRB's, but also, is a signature of the transition to chaos in GRB formation processes. These observations augment our understanding of the turbulent processes in burst formation.

11:20 A WAVELET ANALYSIS OF GAMMA-RAY BURST TIME PROFILES

Ted Dunsford* and John Patrick Lestrade, Mississippi State University, MS 39762

With practically no exceptions, the time profiles of Gamma-Ray Bursts(GRB)have yielded no information when subjected to Fourier analysis. Since wavelets are localized in frequency and time, they may be better suited to the analysis of these complicated and transient time profiles. Our preliminary investigation uses both adaptive and dyadic decompositions of the Haar and Daubechies wavelets to represent GRB. In this talk we present histograms of the wavelet coefficients and show how this analysis can be used for noise reduction as well as correlative studies with other burst parameters such as burst fluence and duration. One of our secondary goals is to find the wavelet(s) that would be most appropriate for GRB analyses.

11:40 FRED'S TRUE SHAPE

Jing Hao* and John Patrick Lestrade, Mississippi State University, MS 39762

The time profiles of Gamma-Ray Bursts (GRB) from the Burst And Transient Source Experiment (BATSE) show an incredible morphological diversity as well as a very large dynamic range in duration (milliseconds to kiloseconds). We have selected a subset of bursts that are affectionately called FRED's—Fast Rise Exponential Decay. It has already been shown that the "exponential decay" is only an approximation. We have have more closely scrutinized the decay shape and show that there are different phases present in the decay. In addition our preliminary work shows that there is a bimodality in the decay time histogram.

FRIDAY AFTERNOON

Mississippi Room

1:00 THE EVOLUTION OF FRACTAL DIMENSION IN GAMMA-RAY BURST TIME PROFILES

Virginia Hamilton* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

Gamma-ray bursts produce as much energy in 10 seconds as the sun will produce in its entire 10 billion year lifetime. This phenomenon is one of the greatest mysteries in astrophysics. Our aim in this study is to calculate the evolution of the fractal dimension during burst profiles using a mathematical model developed by Shakura et al. (1998). Our preliminary results show two populations of grb which differ from one another in both their overall dimensions and also in the pattern of dimension evolution.

1:20 ASTROPHYSICAL TRANSIENT OPTICAL MULTIPLE IMAGING CAMERAS

Chadwick H. Young* and Todd J. Haines, Mississippi State University, Mississippi State, MS 39762, and Los Alamos National Laboratory, Los Alamos, NM 87544

ATOMIC, Astrophysical Transient Optical Multiple Imaging Cameras, is an ongoing project being designed and built at Los Alamos National Laboratory under the direction of undergraduate students. The project, in its third year of conception, will be used as a base of knowledge and observations at the Fenton Hill Observatory in the Jemez Mountains of New Mexico. In conjunction with Milagro, an all-sky surveyor of TeV gamma-rays, and optical observing tools such as ROTSE (Robotic Optical Transient Search Experiment), ATOMIC will be used to stem an understanding of the evasive optical counterparts to gamma-ray bursts. It is well-suited for this purpose due to its all-sky monitoring

capabilities but is limited by its lack of puissant light-gathering power. However, ATOMIC will prove to be a useful tool in the search for optical counterparts as well as adding to our knowledge of "things that go bump in the night."

1:40 THE SPECTRAL SIGNATURE OF GAMMA-RAY BURSTS AT HIGH ENERGIES OBSERVED WITH THE SIGMA GAMMA-RAY TELESCOPE ABOARD THE GRANAT SATELLITE

Francois A. Pelaez, Mississippi State University, Mississippi State, MS 39762

The SIGMA telescope aboard GRANAT has been operating for nearly 8 years as a high-resolution imager in the hard X-ray range, providing evidence of the highly variable behavior of the sources at these energies. One of the functions of SIGMA was also to detect Gamma-Ray Bursts (GRB), by using its set of large-area veto-shield scintillators. These detectors were sensitive in the 0.2–15 MeV range and they provided high quality spectral and temporal data for nearly 50 bright GRBs. Their analysis shows that: 1. model-fitting of the energy spectra favors multi-component models, 2. the spectra of some bursts exhibit a high-energy break/attenuation, 3. a correlation is observed between the energies of these turn-overs and the observed intensity of the bursts. We will show how, on one hand, the recent observations of high-redshift GRB counterparts at optical wavelengths allow us to interpret this correlation (at least in part) as the signature of a cosmological effect and why, on the other hand, the high-energy attenuation observed for some bursts is hard to reconcile with the models proposed/required for sources at high-redshift cosmological distances.

2:00 THEORY OF OPTICAL PHASE CONJUGATION THROUGH FOUR-WAVE MIXING IN A NONLINEAR CRYSTAL

Sungho Kim* and Henk F. Arnoldus, Mississippi State University, Mississippi State, MS 39762

A phase conjugator is an optical device which reflects an incident signal as its complex conjugate. This process is identical to time reversal, and hence an incoming wave is reflected as a counterpropagating image beam. Such a device can be constructed by irradiating a nonlinear crystal with two intense laser beams (the pumps). Four-wave mixing in the medium then couples a weak incident field to a phase-conjugate image, which emanates from the crystal as a time-reversed replica of the incident signal. We have studied in detail the mechanism by which such an image beam is generated. The nonlinear Maxwell equations were solved analytically for the Fresnel reflection coefficient of the image beam. This coefficient depends in a complicated way on the properties of the nonlinear material, the angle of incidence and the polarization. We also show that the device has a geometrical resonance near the pump frequency, although for certain values of the optical parameters the response can actually be a minimum at resonance. For future applications to atomic radiative phenomena near such a device, we are mainly interested in the delicate dependence of the reflectivity on the angle of incidence and on the polarization. Numerical results show a strong oscillatory behavior as a function of the angle of incidence.

2:20 OPTIMIZING PENDULUM ARCHERY SIGHTS

John W. Lipscomb, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

An arrow has an arching trajectory that requires accurate judgement of the distance to the target. Unfortunately, 20% distance error is typical for field conditions. For distances over about 60 feet, more accuracy is lost in judging the distance than in aiming. If the archer is shooting from an elevated position, sights using pendulums can partially correct for various target distances. Using pendulum sights requires considering the following variables: arrow speed, arrow speed decay, archer elevation, sight distance above the arrow, pendulum length, and pendulum angle. In this writer's experience, archers have difficulty applying pendulum sights to maximize their accuracy. To evaluate pendulum sights, the author developed a spreadsheet that mathematically models pendulum sights. This spreadsheet was used to observe the effects and sensitivities of the variables to optimize pendulum sight performance. The analysis discovered that a pendulum 1.25 inches long and oriented horizontally was optimum for arrow speeds of 240 fps. This pendulum sight can be "sighted-in" with the bow 16 feet above a target 57 feet away so that the arrow strikes 1.5 inches high. Interestingly, this pendulum sight can be sighted-in with the archer at the same elevation as a target 60 feet away with the arrow strike 8.7 inches high. The maximum horizontal range (± 1.5 inches) of this sight from 16 feet elevation is 86 feet. Additional relationships between the above parameters and the process of optimization will be presented.

2:40 PRESSURE ROTATING WHEELCHAIR SEAT

Suzanne Flutchinson, Mississippi State University, Mississippi State, MS 39762

Individuals that are wheelchair-bound suffer from pressure sores. Pressure sores are areas of necrotic tissue resulting from asphyxia. When a load 30 mmHg or over is applied constantly, blood flow to the surrounding tissues is inhibited. Tissue death can occur in just 30–45 minutes. In a seated position, the ischial tuberosities produce the most significant shear stresses in the soft tissue in the buttock area. If the applied load can be re-distributed periodically, blood flow will not be inhibited in any one area long enough to cause tissue death. A wheelchair seat with alternating airflow

reduces peak pressure and can be fully automated to re-distribute pressure in cycles. The wheelchair seating system can be tailored to an individuals specific weight, seating position, and level of activity. System controls may also be configured to meet an individual specific need and level of physical ability.

3:00 SURFACE TENSION STUDIES OF FREE-STANDING LIQUID-CRYSTAL FILMS

Nathan D. Allen*, Steven A. Scott, and Michael P. Veum, Millsaps College, Jackson, MS 39210

Employing a flexible-string tensiometer, we have measured the surface tension of free-standing films in a series of four different liquid-crystal compounds from one homologous series. The differences in molecular structures among these compounds are the length in one hydro-alkyl chain. By performing a comparative study of the surface tensions, we have gained insight into the effect that this molecular asymmetry has the on the molecular packing in these materials.

3:20 Divisional Business Meeting and Student Awards

PSYCHOLOGY AND BEHAVIORAL NEUROSCIENCE

Chair: Pamela G. Banks, Jackson State University
Vicechair: Stephen T. Black, Millsaps College

THURSDAY MORNING

Room 604

8:15 THE RELATIONSHIP BETWEEN GENDER, SOCIOECONOMIC STATUS, MEYERHOFF PROGRAM MEMBERSHIP AND AFRICAN SELF-CONSCIOUSNESS

Juanita Tennyson*, Monica Greene, and Kenneth Maton, Jackson State University, Jackson MS 39211, and University of Maryland Baltimore County, Baltimore, MD 21250

The purpose of this research was to ascertain whether a relationship exists between gender, socioeconomic status, program membership and African Self-Consciousness. Previous studies have been limited in examining relationships among these variables. The African Self-Consciousness scale (ASC) consists of 42 items and was designed to incorporate several dimensions considered important to African-American life and survival, including (1) awareness/recognition of one's African identity and heritage and (2) general ideological and activity priorities placed on Black survival. Questions about parents' occupational and educational levels were included to measure socioeconomic status. One-hundred and twenty-four subjects participated; all were students attending the University of Maryland Baltimore County (UMBC). More specifically, eighty-four students were enrolled in the Meyerhoff Scholars program at UMBC and forty were students taking similar math or science classes. Three hypotheses were generated based on a review of the literature. It was postulated that (1) Those involved in the Meyerhoff Scholars program would have higher levels of ASC than those not involved in the program. (2) Men would have higher levels of ASC than women. (3) Those with higher levels of socioeconomic status would report higher levels of ASC. Zero-order correlations were conducted to examine the relationships between the variables of interest for this study. Results of the analyses indicated that in the overall sample, gender was significantly and positively related to ASC ($r = .18$, $p < .05$). Within the Meyerhoff sub-sample only, females had higher levels of ASC than males ($r = .40$, $p < .01$). Findings and implications for future research are discussed.

8:30 THE ROLES OF THE VENTROMEDIAL HYPOTHALAMUS AND THE LATERAL HYPOTHALAMUS ON THE CONTROL OF EATING BEHAVIOR

Stephen F. Bollinger, Alexandra Roy*, and Korey B. Adams, Jackson State University, Jackson, MS 39217

The Lateral Hypothalamus (LH) and the Ventromedial Hypothalamus (VMH) have been reported to be of great importance in the control of feeding and satiety behaviors. It has been hypothesized, after observing small evidence of the phenomenon, that there might be possible input coming from the trigerninal nerve to the VMH about the way food is chewed by rats. The present study was designed to observe electrical activity in the LH and the VMH while the animal is eating by measuring impedance in these areas of the brain. The experiments attempted to affect the characteristic chewing patterns with Fluoxetine and Metergoline, a Serotonin agonist and antagonist respectively. Four free-feeding albino rats, weighing over 500 g, were implanted with Nichrome electrodes into the LH and the VMH. They were "run" in a pre-injection trial before being injected intraperitoneally (IP) with Fluoxetine (10 mg/kg) and "run" again. This process was repeated for a period of three days. The effects of Metergoline (1.0 mg/kg) were also examined in the same manner. Current findings show positive effects on one of two rats completing drug trials. Further trials will be carried out on the remaining two rats in anticipation of replicating the effects.

8:45 Divisional Business Meeting

9:00 Divisional Poster Session

COMPARISON OF CELL PATHOLOGY IN SCHIZOPHRENIA AND DEPRESSION: A POSTMORTEM STUDY OF THE ORBITOFRONTAL CORTEX

G. Rajkowska*, J. Wei, S. Pittman, J.J. Miguel-Hidalgo, and C.A. Stockmeier, University of Mississippi Medical Center, Jackson, MS 39216

The unique developmental origin of the dorsolateral prefrontal (dIPFC) and the orbitofrontal cortex (ORB) correlates with their specific cyto- and chemoarchitecture, connectivity and functions. Neuropsychological and neuroirnaging evidence implicates both subregions in the neuropathology of schizophrenia, manic-depressive illness and major depression. Whereas dIPFC exhibits reduced metabolic activity, smaller neuronal sizes and increased neuronal density in schizophrenia, ORB has been far less explored. In the present study neuronal and glial density, cell size and cortical thickness were measured in the rostral ORB (area 10-47) using a 3-D counting method. Nine postmortem brains from patients with schizophrenia and 12 normal controls were used. In schizophrenic rostral ORB, unlike in dIPFC (Selemon 1995, 1998; Rajkowska 1998), we found a significant 9% decrease in cortical thickness that was accompanied by lower neuronal density in layer I and smaller neuronal cell bodies in layers II-IV. In schizophrenic rORB, reductions in glial cell density were similar to those observed in rORB in major depression (Rajkowska 1998). These results in rORB indicate a regional pattern of cortical histopathology that differs from that observed in dIPFC and suggest differential involvement of these subregions in the neuropathology of schizophrenia. Histopathology of unique cortical circuits in dIPFC vs. rostral ORB, respectively, may underlie cognitive vs. depressive symptoms in schizophrenia. Supported by NARSAD and MH55872 (GR) and MH45488 (CS).

9:00 STUDY OF THE EFFECTS OF PERCEIVED FAMILY DRINKING BEHAVIOR, GENDER, AND STRESS AS THEY RELATE TO ALCOHOL CONSUMPTION

Scherrie L. Prince* and Marlene Setze, Jackson State University, Jackson, MS 39217

Greater alcohol consumption has been identified more frequently among college students than among non-college students. Several assumptions have been made as to why college students drink more. The purpose of this study is to examine the alcohol consumption rates of college students at an urban university in the south. The three main types of beverages that people drink are beers, wines, and distilled beverages. It was hypothesized that (1) there is a relationship between gender and alcohol consumption; (2) there is a relationship between stress and alcohol consumption; and (3) there is a relationship between family drinking behavior and alcohol consumption. Subjects consisted of 148 mostly African-American males and females who were enrolled in health, psychology, sociology, speech, and biology courses at a university in the south. Sixty percent of the subjects were Baptist. All participants were undergraduates. The instrument used was a questionnaire that included demographic information, a stress scale, and self-reported information about alcohol consumption. The questionnaire is three pages, one page back and front and consisted of four parts: (1) a demographic section; (2) questions relating to parental affiliation with alcohol and attitudes toward alcohol; (3) questions relating to long term and short term stressors; and (4) an anxiety scale. The questionnaire took approximately 7–10 minutes to complete. Data were gathered from mostly upper level courses across all disciplines within a two week period. The students were considered competent to understand the study purpose and to consent freely. Although self-reported measures of drinking habits are known to be inaccurate, subjects were asked to be as honest as possible and guaranteed confidentiality. Contrary to previous findings, results revealed that gender, stress, and perceived family drinking behavior had no significant effect on alcohol consumption. It is inconclusive to determine whether these factors did in fact have an effect on alcohol consumption. The discrepancy between the results in this study with the results of previous studies does not indicate a problem with the procedure or the subjects. It should be noted that the students at this particular university in the south are not representative of all colleges and universities. This research is supported by NIMH-COR GRANT MH-16926.

SCIENCE EDUCATION

Chairs: Sharon H. Walker, University of Southern Mississippi

Vicechair: John Ammons, Mississippi Delta Community College

THURSDAY MORNING

Room 706

9:00 HOW FIELD EXPERIENCE PREPARES PRESERVICE BIOLOGY TEACHERS FOR THE CLASSROOM

Rosalina V. Hairston, University of Southern Mississippi, Hattiesburg, MS 39406

This qualitative study was conducted in a biology methods course for students in the biology teacher certification program of the Department of Biological Sciences. The specific objectives of the study include: to assess the role of field experience, to analyze students preconceptions about biology teaching, and to examine teaching methods and classroom management skills of students that conform to the constructivist perspective. The research was conducted during the field experience assignment of students to mentors teaching high school biology in public schools within commuting distance from the university. Students accomplished five tasks including an observation of the school and the classroom, observation of biology teaching by mentors, helping to prepare a laboratory or classroom activity, tutoring to groups of students, and, finally, teaching a biology lesson. Data sources came from students' journals, mentors' evaluation of tasks performed by students, mentors' evaluation of student teaching, and ratings by three evaluators on the videotaped teaching episode of students. The analysis of data revealed variations on the perceptions about adolescent learners. The students perceived high school biology teaching as demanding in lesson presentation particularly for classes on block schedule. The major concerns of students were their ability to prepare adequate lessons, fear of losing the respect of their students, and communicating with adolescent learners. The difficulties experienced by students during teaching were relating pedagogy to student understanding and addressing students' misconceptions.

9:15 A QUALITATIVE STUDY OF PRESERVICE TEACHERS ENROLLED IN A DISCREPANT EVENT BASED PHYSICAL SCIENCE CLASS

James Edward Lilly* and Rudy Sirochman, University of Southern Mississippi, Hattiesburg, MS 39406

This paper evaluates the Heat and Conservation of Energy module of the POWERFUL IDEAS IN PHYSICAL SCIENCE (PIiPS) curriculum taken by students seeking to become elementary school teachers at the University of Southern Mississippi. The study focused on the evaluation of discrepant events used to address preconceptions and induce conceptual change in relation to student's ideas concerning heat and energy with particular emphasis on the concept of specific heat (heat capacity). The heat and energy module was evaluated qualitatively. The following questions were investigated: (1) what are the ideas of the students prior to entering the classroom regarding heat and energy, (2) which discrepant events in the heat and energy module are more effective and why, and (3) how much does the "risk taking factor" associated with not immediately telling the students the correct answer affect the learning of the material. The results to date are that (1) this group of students demonstrated the typical heat and energy misconceptions found in the literature, (2) the most effective and potentially confusing discrepant event dealt with the water equivalent experiment, and (3) the risk taking factor appeared to be make some students think more while frustrating the rest.

9:30 NATIONAL SEAFOOD INSPECTION LABORATORY SAFETY PROGRAM TRAINING VIDEO

Paul Williams[1]*, Barbara Comstock[2], and L. Hollis Melton[1], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]National Marine Fisheries Service, National Seafood Inspection Laboratory, Pascagoula, MS 39568

The National Seafood Inspection Laboratory routinely performs chemical and microbiological analysis of seafood products which involves the use of chemicals and other potentially hazardous materials. This training video details the components of its Laboratory Safety Program. Laboratory personnel must be adequately informed and trained on hazards in the workplace and how to protect themselves from these hazards. Well informed employees can contribute to a viable, productive seafood inspection laboratory safety program and the overall mission of the National Marine Fisheries Service.

9:45 Break

10:00 THE AUTONOMOUS PHYSICS REFERENCE STATION

Desirae A. Drummond*, Leah M. Walling, and Jason V. Pugh, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and Mississippi Space Grant Consortium, University, MS 38677

The autonomous physics reference station is a multimedia reference station introduced into the physics laboratory. Students are able to supplement written materials with audio, video, color photography, and instructions via computer. Software and exercises are designed for specific course work and equipment at Mississippi Gulf Coast Community College. The project is unique to physical science laboratories because it does not replace traditional equipment or center around computer data acquisition, as do most computer-assisted laboratory activities. Students acting on scholarships and work-study programs act as the software developers. Initial usage and evaluation of a six-experiment station will begin in the spring semester of 1999.

10:15 EDUCATING THE PUBLIC ON THE POPULAR POND SLIDER *CHRYSEMYS SCRIPTA*

Melissa Keenum* and Martha Sager, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS

39553, and J.L. Scott Marine Education Center and Aquarium, University of Southern Mississippi, Ocean Springs, MS 39566

Pond sliders, *Chrysemys scripta*, are among the most common reptiles kept in captivity. The J.L. Scott Marine Education Center & Aquarium in Biloxi, Mississippi, has sliders on display in Center's vivarium and other selected public viewing tanks. In acknowledgment of the turtle's popularity, this project involved the development of an informational brochure outlining the natural history of the slider and the biological needs of these animals when kept in captivity. In addition, a proposed habitat for raising, breeding and displaying sliders at the Center was designed.

10:30 Divisional Poster Session

THE DEVELOPMENT OF SELF DIRECTED LEARNING CENTERS FOR ELEMENTARY STUDENTS GRADES 2–4: COMPARISONS OF THE HUMAN SYSTEM TO NON-HUMAN SYSTEMS

Dawn Carter* and Edna WaIler, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and Magnolia Park Elementary School, Ocean Springs, MS 39564

There is little time for students to engage in self directed studies within the time constraints of the regular classroom. Some students, however, finish assigned tasks quickly and need opportunities to participate in more challenging and complex work that encourages them to make comparisons, ask questions, and develop independent learning skills. The focus of this project was the development of self directed learning centers. These learning centers can be checked out by students to use in their classroom once they have completed assigned tasks. By having the opportunities to make selections based on their own interests, students will be more motivated to become independent learners. The subject of these learning centers is based on systems of the human body. Included is a pre-test to assess students knowledge prior to beginning each center's activities. Activities include research of current resource materials and literature, games, projects, and multi-media programs. Students also have the opportunity to engage in activities that encourages them to make comparisons between systems of the human body and nonhuman systems. Evaluations included a post-test to assess the knowledge that students gained from the learning center.

CURRICULUM GUIDE AND MULTI-MEDIA TEACHING PACKAGES FOR MAGNOLIA PARK NATURE TRAIL

Tana Kostmayer* and Edna Waller, Mississippi Gulf Coast Community College-Jackson County Campus Gautier, MS 39553, and Magnolia Park Elementary School, Ocean Springs, MS 39564

Living in a wetlands area, teachers need to receive resources that demonstrate how to incorporate environmental activities into their regular science curriculum. We assisted in the development of a curriculum guide and multi-media teaching packages to be used by teachers and students along the Magnolia Park nature trail. Included in this interdisciplinary curriculum guide are lessons pertaining to seasonal changes in the various wetland areas along the nature trail. These lesson plans are housed in the Prism Lab Resource Center at Magnolia Park Elementary and are available to teachers of the Ocean Springs School District. In addition some of these activities are included on the Magnolia Park web site making them available to other teachers and students.

THE UNIVERSITY OF MISSISSIPPI BIOMEDICAL RESEARCH INTERNSHIP PROJECT (BRIP)

John S. Williamson, University of Mississippi, University, MS 38677

The University of Mississippi's Biomedical Research Internship Project (BRIP) is a comprehensive educational project devoted to increasing the numbers of individuals from under-represented backgrounds in the fields of biomedical research. The project is funded by the National Institutes of Health and Schering Plough Healthcare. The BRIP is divided into three separate programs, the K–12 Program, the Undergraduate Program, and the Graduate Program. Each summer this program provides an 8-week, in-house biomedical research opportunity for 10 to 15 talented high school students and 2–3 local K–12 teachers. This program is designed to improve the quality of pre-college science education and to increase the pool of disadvantaged students who are prepared to enter college and pursue a career in the biomedical sciences. The Undergraduate Program provides financial assistance, in the form of an hourly wage, to undergraduate students on the UM campus interested in pursuing careers in biomedical research. These students, typically majoring in disciplines such as Pharmacy, Biology and Chemistry, are introduced to modem biomedical research theory and methodology and are encouraged and mentored to pursue biomedical research careers. The Graduate Program provides competitive annual stipends to qualified graduate students majoring in biomedical fields such as pharmacology, medicinal chemistry, pharmacognosy, pharmacy administration and pharmaceutics. Together the three programs provide a unique comprehensive project that targets the nation's need for increased minority representation in the biomedical sciences.

PHYSICS CURRICULUM ENHANCEMENT TEAM AT MISSISSIPPI GULF COAST COMMUNITY COLLEGE

Leah M. Walling*, Desirae A. Drummond, Michele James, and Jason V. Pugh, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and

Mississippi Space Grant Consortium, University, MS 38677

The Physics Curriculum Enhancement Team, composed of faculty and students, focuses on curriculum enhancement and educational research. The primary team goal is to carry out projects that will facilitate student learning within the physical sciences. Current team projects are the Laboratory Enhancement Initiative (LEI) and the Internet Implementation Initiative (III). The LEI seeks to integrate technological resources into physics laboratories by way of a multimedia reference station. Integration of the Internet into traditional education methodologies is the focus of the III. The team has successfully begun pilot programs in both areas and anticipates expansion.

DR. GORDON GUNTER: A LIFE IN MARINE SCIENCE

Kelli Marshall* and Joyce M. Shaw, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

Archival materials are an important special collection at the Gunter Library of the Gulf Coast Research Laboratory (Institute of Marine Sciences). Within the archival collection are numerous publications, articles, photographs, and newspaper clippings by and about Dr. Gordon Gunter, director emeritus of the Gulf Coast Research laboratory. The purpose of this project was to document Dr. Gunter's numerous contributions to marine science by organizing those materials. Articles, reprints, and clippings were sorted, organized, and if necessary, copied to preserve the original document. A listing of Dr. Gunter's reprints and other publications was added to an existing bibliographic database. A poster highlighting Dr. Gunter's life in marine science was created.

THURSDAY AFTERNOON

Room 706

1:30 ONLINE ASTRONOMY AT MISSISSIPPI GULF COAST COMMUNITY COLLEGE

Michele James*, Martin V. Stringfellow, and Jason V. Pugh, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and J.L. Scott Marine Education Center and Aquarium, University of Southern Mississippi, Ocean Springs, MS 39566

An Online Astronomy course has been designed which effectively incorporates lab based sciences into the distance learning environment. Mississippi Gulf Coast Community College Honors Physics and Chemistry students in collaboration with science faculty members focused on online lectures and observations while maintaining traditional laboratory methodologies. With the new Online Astronomy course students actively participate in online lectures, and receive and return assignments via e-mail. Internet sites involving astronomical observations are implemented to reinforce the observation aspects of the Astronomy course. While participating in lecture and observation via Internet, students meet weekly for traditional laboratory exercises and observations. Astronomy instruction by this method allows scheduling flexibility for both student and instructor by reducing the number of hours in which they must be in direct contact. The Online Astronomy curriculum is in its pilot stages. However, pending successful completion and faculty evaluation, administrators anticipate expanding the program.

1:45 IDENTIFYING NATIVE FAUNA IN WALTER ANDERSON'S MURALS

Kim Dodez[1]*, Jason Holder[1]*, and Marshall Adams[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]Walter Anderson Museum, Ocean Springs, MS 39566

During the internship at Walter Anderson Museum of Art, the purpose of this study was to identify and catalogue all the animals in Walter Anderson's murals of the Community Center, the Little Room, and the WPA murals. The animals were identified by their common and taxonomic names, along with three reasons confirming that they were catalogued correctly. Photographs were taken of the animals depicted in the murals, both as painted and in their native habitats. The project determined whether the animals were native to the coast circa 1699. Animal behavior, as depicted in the murals, was correlated with the actual behavior of the animals. The painted animal distribution was calculated in percentages of animals per square meter. The symbolic relevance, placement, or association of particular animals was determined where applicable. The project resulted in the correct identification of the native fauna in Walter Anderson's murals.

2:00 SIMULATED NATURAL HABITATS CREATED FOR THE PROPOSE OF EDUCATION: THE OCEAN SPRINGS HIGH SCHOOL BOTANICAL GARDEN

Mary Beth Casto[1]*, Kay Baggett[2], and Aaron Barksdale[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]Ocean Springs High School, Ocean Springs, MS 39564

The purpose of our project was to simulate natural habitats in order to create a learning environment for the people of the community. Chemical tests of the water and the environment around the designated area were necessary in order to make sure that the surrounding environment is capable of supporting the habitat being simulated in that area. The construction of the garden was done in several phases. These phases were: the construction of the pond, butterfly/bird

garden, a wild meadow, a botanical garden, a bog, and a nature trail through the entire area, a recycling area for aluminum was also constructed.

2:15 Break

2:30 CREATING AN INTERACTIVE MULTIMEDIA INVERTEBRATE GUIDE

Ashley B. Butler[1]*, Todd A. Randall[2], and Kimberly B. Damon-Randall[2], [1]Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and [2]Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566

A computer driven interactive multimedia guide (IMG) is being developed for the J.L. Scott Marine Education Center and Aquarium. The IMG will contain live footage of the common invertebrates found in five representative habitat types in the northern Gulf of Mexico. These habitats include salt marshes, oyster reefs, sandy beaches, seagrass beds, and muddy bottoms. The video footage will be stored on a laserdisc and interfaced with a computer to allow students to take a simulated field trip through the Gulf habitats to view these animals in their own environments. The IMG will contain information about the ecology of each habitat type as well as basic scientific information about each species.

2:45 FACILITATING INTEGRATION OF CHEMISTRY AND PEDAGOGY BY TEACHER EDUCATION CANDIDATES

J. Emory Howell, University of Southern Mississippi, Hattiesburg, MS 39406-5043

Teaching Chemistry in the Secondary School is the final chemistry course taken by undergraduate teacher education candidates who are majoring in chemistry at the University of Southern Mississippi. This capstone course requires students to apply their knowledge of chemistry and their pedagogical content knowledge specifically to the teaching of chemistry. The course complements the science methods course by focusing specifically on chemistry and exploring issues and concepts unique to chemical education. Laboratory instruction, techniques for facilitating student-centered learning, assessment strategies, and field experience are emphasized. During a typical lesson as much time is devoted to chemistry content as to pedagogy. Specific chemical topics are blended into lessons so that by the end of the semester the candidate has reviewed all the chemistry that is typical of first and second year high school chemistry courses. Practical issues, such as ordering, storing, and disposing of chemicals, also are covered. Observation and practicum provide real classroom experience under the mentorship of practicing master teachers. The four-hour course, which includes one hour of laboratory credit has been taught four times. Considerable data has been gathered, enabling a process of on-going evaluation and revision. Feedback from high school teachers who are graduates of the program has been an especially important source of information.

3:00 PROVIDING PEDAGOGICAL KNOWLEDGE TO GRADUATE STUDENTS IN THE BIOLOGICAL SCIENCES WITHIN A TA ORIENTATION SESSION

Sherry S. Herron, University of Southern Mississippi, Hattiesburg, MS 39406

Graduate students in the sciences generally do not receive pedagogical education. The only teaching experience many have upon graduation is that obtained while teaching laboratory courses. Many feel unprepared to face a classroom. Graduate students assigned to teach laboratory courses in the Department of Biological Sciences participated in a two-day orientation session at the beginning of the fall 1998 semester during which they were introduced to former and current theories of learning and teaching. An orientation held the previous year only for those graduate students assigned to freshman laboratories and the subsequent research done to assess their changes in beliefs and teaching methods provided the rationale for including all teaching assistants in an annual orientation session. An outline of the session will be provided in addition to the research findings.

3:15 UTILIZATION OF WEB PAGES AND MULTIMEDIA IN GENERAL CHEMISTRY LAB MANAGEMENT AND PEDAGOGY

Johnnie-Marie Whitfield*, Brian S. Berryhill*, Peyton L. Hays*, and Carolina K. Whitfield-Smith*, Millsaps College, Jackson, MS 39210

In the past 10 years at Millsaps, there have been dramatic changes in the use of electronic media in General Chemistry and particularly the two semester General Chemistry lab sequence. This talk will trace the history along the ten year time line for the two lab courses from the days of CAS lessons and e-mail on the VAX to the dramatic transition from gopher, a text-based early Internet search engine, to the current graphical-based web browsers. The constraints, both physical and economic, will be presented. Pedagogical reasons behind the choice of design and use of the current course web pages will be outlined. The evolution of the current course pages will be presented and addressed from both the teacher's and students' perspectives and needs, including an overview of the organizational structure and logic behind the physical layout. A quick tour of the course pages will end the presentation.

FRIDAY MORNING

Room 706

9:00 LEARN TO WORK: CASE STUDY OF FIVE SELECTED PARTICIPANTS

Denise Richardson* and Dwight Hare, Mississippi State University, Mississippi State, MS 39762-9705

Learn to Work is a federally funded program to change the way high school science is taught and learned. Curriculum changes are to include instructions in the skills (measuring, interpersonal, etc.), needed for success in business and industry. High school science and technical teacher attend a three-work workshop which includes the development of classroom instructional practices, appropriate alternatives in assessment, and on-site visits with business and industry (Peavey, Southwire, etc.). This paper presents case studies of five Mississippi High School teachers who participated in the summer sessions. Observations were conducted during the workshops and on-site interviews and observations were conducted in each teacher's school. A case study for each teacher was prepared and a cross-case analysis was conducted. Results of the data analysis indicate teachers are changing what they teach and how they teach. In four cases, curricula have been adapted to reflect the needs and conditions of area business/industry. In one case, for example, the teacher has developed production teams to complete assigned projects. Another teacher has developed individual projects which presented to officials of a local industry. There officials evaluate the products and assist in assigning grades. In these four cases, assessment methods have been adapted which reflect the student work. For example, student work which does not meet accepted industry standards are rejected until such standards are met. Conclusions indicate participant teachers are changing what and how they teach, evaluate, and how teachers need support to make changes. In the cases where administrative support and financial resources are available, change takes place.

9:15 THE NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION (NESTA) IN MISSISSIPPI

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

NESTA is a professional association of classroom teachers dedicated to the improvement of Earth science education at the K-12 levels. Membership offers the quarterly journal The Earth Scientist, special summer school and field trip opportunities and mailings of special interest to Earth science teachers. A NESTA web site has been established at www.gosaints.com/nesta for anyone interested in any aspect of earth science in Mississippi. This site is for the exchange of any kind of information about local Earth science as well as specific information from NESTA.

9:30 HOW FIELD TRIPS IN NATURAL AREAS ASSOCIATED WITH MUSEUMS, ARBORETA, AND AQUARIA IMPACT THE EDUCATIONAL EXPERIENCES OF TEACHERS AND STUDENTS

Joyce A. Mullins, University of Southern Mississippi, Hattiesburg, MS 39406

The purpose of this study was to expose the variety of perspectives from which teachers, students, and museum instructors use natural settings associated with museums, arboreta and aquaria to enhance educational experiences. The qualitative study investigated the perspectives of the three groups by conducting field observations, teacher and museum instructor interviews, and per-using student journals associated with 22 natural field trips. Participants included 349 students, 17 teachers, and 9 museum instructors. Six veteran field teachers were also interviewed for their perspectives on both obstacles to and reasons for conducting field trips. The data analysis revealed that relationships among participants such as the equilibration in power structure between teachers and students, opportunities for interactive, experiential learning, unstructured time and space for discovery and exploration, and memorable events, significantly impacted students' making connections and perspective changes. In addition, data revealed that the greatest obstacle to conducting field trips stems from fear within the teacher as it relates to knowledge, experience, and relationships. It was shown that natural field trips served to revitalize and motivate teachers and that teachers must adopt a student's role in order to make a paradigm shift from leader to guide. A model for constructing field trips that incorporates unstructured time for students to explore, reflect, and develop relationships was developed. Implicit in the study are guidelines for field trip design and teacher education.

9:45 Break

10:00 CONNECTED TEACHING AND ENVIRONMENTAL EDUCATION: A REPORT ON "CONNECTED TEACHING" PRACTICES EMPLOYED TO FACILITATE ATTITUDE CHANGE IN A COLLEGE FIELD BIOLOGY COURSE

Susan J. Nodurft* and Joyce A. Mullins*, Pearl River Community College, Poplarville, MS 39470

In spite of several decades of environmental education, degradation of the environment continues at an alarming rate. In recent years, more and more environmental educators are vocalizing what they have come to believe is the major factor undermining all environmental efforts, that is, human's estrangement from the Earth. Prominent educators and environmentalists point out that a belief-value system which regards people as separate from, and above, all other

living things underpins this continued exploitation of the natural world. Behavior change rests upon attitude change. This presentation addresses 1) the issue of human estrangement from the Earth, 2) attitude change and its relationship to "connected teaching" practices in the classroom, and 3) "connected teaching" methods the presenters have utilized in a college field biology course to revive students' innate bondedness to the Earth. Students' verbatim quotes will be used to illustrate expressions of altered attitudes.

10:15 WATER SOLUBILITY OF INORGANIC SALTS AS A FUNCTION OF TEMPERATURE

Anil K Sharma* and Leola Gilson, Mississippi Valley State University, Itta Bena, MS 38941

Water is an excellent solvent for many compounds. Solubility is expressed in many ways: as molarities, as mass percent, or as g solute per 100 g water. Several inorganic salts e.g. ammonium chloride, potassium nitrate, potassium bromide, sodium chloride, potassium sulfate, potassium chloride, magnesium sulfate, etc. were investigated. Solubility of each salt in water was observed as a function of temperature and solubility curves were drawn and studied. The rate of solubility of ammonium chloride and potassium bromide were found greater than that of potassium chloride and sodium chloride. The rate of solubility with increasing temperature was greatest for potassium nitrate. The solubility of potassium sulfate was found to be the lowest at all temperatures compared to other salts tested.

10:30 THE IMPLEMENTATION AND RECEPTION OF A WETLANDS ENVIRONMENTAL AWARENESS AND INFORMATIONAL FIELD BIOLOGY PILOT PROGRAM

Eric B. Williams[1]*, Joan McCoy-Messer[1], and Karen Dierolf[2], [1]Jones Junior College, Ellisville, MS 39437, and [2]Mississippi Museum of Natural Science, Jackson, MS 39202

The purpose of this project is to teach students about the ecology of wetlands environment in a college level biology laboratory course while improving environmental awareness. This program addressed the attitude and aptitude of the students by employing field biology pedagogy while in a natural wetlands environment. This project included two basic written surveys to shape further the pilot program for a more beneficial biology laboratory curriculum. The surveys had two parts, first part addressed the student's aptitude of wetlands ecology and the second part ascertained the students attitude towards wetlands. Both surveys attempted to determine the same information from the students with the only difference being that the wetlands program was administered between the surveys. The surveys aided in defining the pragmatism of this program and to aid in defining the impact of this epistemological and pedagogical program. Furthermore, this information was vital to shape the program during the pilot phase in order to ascertain an effectual biology laboratory curriculum. The ancillary objective of this program involved introducing the students to basic field biology skills. The students were directed through various ecology sampling techniques and basic data recording requirements that were grouped by the following: (1) Specimen Collecting Techniques, (2) Soil Sampling and Environment Analysis, (3) Preliminary Water Quality Analysis, (4) Preliminary Vertebrate Habitation Awareness, (5) Preliminary Invertebrate Habitation Analysis, (6) Preliminary Vegetation Analysis, and (7) Basic Field Data Recording Methods. These skills are essential to comprehend the bionomics of a natural wetland environment and are essential for the overall pedagogy of this program.

10:45 Divisional Business Meeting

SOCIAL SCIENCE

Chair: James Flanagan, University of Southern Mississippi

Vicechair: Ann Marie Kinnell, University of Southern Mississippi

THURSDAY MORNING

Room 604

9:15 EXPLORATIONS IN SOCIAL SCIENTIFIC RESEARCH

James G. Flanagan and Ann Marie Kinnel, University of Southern Mississippi, Hattiesburg, MS 39406

This session will present papers drawn from the range of social science disciplines represented in the division focusing on ongoing and recently completed research. List of individual contributors, paper titles, and abstracts will be available at the meeting.

11:15 Divisional Business Meeting

11:30 HOUSING DILAPIDATION, ABANDONMENT AND CRIME IN TWO JACKSON NEIGHBORHOODS

Emmanuel C. Nwagboso, Jackson State University, Jackson, MS 39217

Housing dilapidation and abandonment is one of the major urban problems currently facing the city of Jackson. The cry for urban renewal and the growing demands for the

removal of slums and dilapidated houses to make way for a cleaner environment had become necessary with the decay of inner city housing drugs and crime in the city of Jackson. The city of Jackson is experiencing plight with the problems of dilapidated houses because the landlords or the owners of these decayed houses refused to repair them. It is certain that removing dilapidated houses is economic and political problems that warrant urgent attention of the government. The city of Jackson may not be able to undertake the costly task of restoring, removing, or demolishing these dilapidated housing units. Dilapidated housing units refer to those housing units that are in very bad shape and that may require costly repairs. In most cases, dilapidated houses are not liveable and may be boarded up to ward off undesirable elements. On the other hand, abandoned housing units may refer to those units that are virtually uninhabitable for one reason or the other, and therefore no longer occupied. Both the dilapidated or abandoned units are usually targets for demolition because of their conditions and also because they are said to be good structures for bandits, and criminals who indulge in several criminal activities.

11:45 RESEARCH IN PROGRESS: PARTICIPATORY EVALUATION OF THE DELTA PARTNERS INITIATIVE

Caryl M. Abrahams and Taylor Rowell*, Delta State University, Cleveland, MS 38733

Socio-economic, health, and educational indicators of the 18-county Mississippi Delta demand innovative and effective community development programs that may help bring parity to the region. In 1995, Delta State University's Center for Community Development received funding from the W.K. Kellogg Foundation and launched the Delta Partners Initiative (DPI). DPI is a comprehensive, five-year program focused on leadership, and community and economic development in the Mississippi Delta. The effort includes four primary programs: 1) The Delta Emerging Leaders Program, 2) The Community Development Demonstration Program, 3) The Public Policy Program, and 4) Building Capacity in the Mississippi Delta Region. The purpose of this paper is to use a participatory evaluation model to evaluate the DPI program. Secondary data, focus-groups, semi-structured interviews, and/or semi-structured questionnaires will be used to collect information from program participants. Targeted outcomes and goals of the four programs will be the primary focus. The research should produce benchmark information that may be integrated into the DPI program, as well as valuable lessons for the planning, design, implementation, and evaluation of future rural development projects. The evaluation may render information necessary in determining whether social intervention, in general, is worthwhile.

THURSDAY AFTERNOON

Room 604

1:00 MISSISSIPPI RESEARCH INITIATIVES IN THE SOCIAL SCIENCES

Emmanuel C. Nwagboso[1]*, Curlew Thomas[2], Garry Jennings[3], and J. Reid Jones[3], [1]Jackson State University, Jackson, MS 39217;[2]Mississippi Valley State University, Itta Bena, MS 38941; and [3]Delta State University, Cleveland, MS 39733

Social Science research proposals from undergraduates and faculty at eight Mississippi universities were presented and reviewed. Refinements of methodology were discussed. Plans were made for collaborative data collection using a standardized methodology at multiple universities. A statewide directory of participating social scientists was distributed. The merits of a statewide social sciences organization which included students, faculty, and multiple disciplines were discussed.

2:30 Break

2:45 SOCIAL SCIENCES DISCUSSION ON MINORITIES IN MISSISSIPPI HIGHER EDUCATION: FOCUS ON SCIENCE AND MATHEMATICS MAJORS

Caryl M. Abrahams[1]*, Watson L. Jackson[2], and J. Reid Jones[2], [1]Delta State University, Cleveland, MS 38733, and [2]Mississippi Valley State University, Itta Bena, MS 38941

A collaborative project involving eight universities in Mississippi developed methodology and reported preliminary results on the recent increases in graduation rates for minorities in mathematics and science. Data were reported on the increases which were spread over the past seven years. Particular attention was given to the role of a National Science Foundation Grant, the Mississippi Alliance for Minority Participation. Ways to sustain and institutionalize these gains were discussed.

ZOOLOGY AND ENTOMOLOGY
Chair: Tim Lockley, USDA-APHIS-PPQ-IFA
Vicechair: Alex D.W. Acholonu, Alcorn State University

FRIDAY MORNING

Room 606

10:00 GASTROINTESTINAL PARASITES OF SWINE

FROM SOUTHWESTERN MISSISSIPPI

Alex D. W. Acholonu*, George T. Bates, Richard Williams, Lloyd E. Swaninger III, and Quinton Cooper, Alcorn State University, Alcorn State, MS 39096

One of the major concerns of swine farmers is the existence of endoparasites in their hogs. Infection of endoparasites retards weight gain, decreases food conversion and consequently lengthens the time required to reach market weight. The present study was conducted to know the status of parasite population in hogs from southern Mississippi. During the period October, 1997, to May, 1998, fecal samples were collected from hogs from one or two representative swine farms from each of 14 counties in southwestern Mississippi. The samples were processed by the formalin-ethyl acetate concentration technique and examined under the compound microscope for gastrointestinal parasites. Of 153 hogs examined, 99 (65%) were infected with one or more different species of parasites. The hogs from Warren county were most infected (15/15 or 100%) followed by those from Amite county (10/11 or 90.1%). The least infected were from Franklin county (3/16 or 19%). The parasite fauna of the hogs examined included protozoans (*Isospora suis*, and *Eimeria* spp) and helminths (*Hyostrongylus rubidus*, *Physocephalus sexalatus*, *Ascaris suum*, *Strongyloides ransomi*, *Trichuris suis*, and *Oesolphagostomum* sp.). This study shows the hog gastrointestinal parasites are of economic importance for pork production in Mississippi. The need for pork producers and veterinarians in the State to maintain a surveillance on swine parasitism and keep it under control through periodic application of efficacious parasiticides, cannot be overstressed. To our knowledge, this is the first time such a study encompassing the study area is reported. This study was supported by Alcorn State University Institutional Grant.

10:15 A SCANNING ELECTRON MICROSCOPY STUDY OF THE NORTH AMERICAN *PARALEUCTRA* SPECIES (PLECOPTERA: LEUCTRIDAE)

Juliana Wise* and Bill P. Stark, Mississippi College, Clinton, MS 39058

The North American members of the genus *Paraleuctra* consist of nine species. Terminal structures of the males were examined using a scanning electron microscope. *P. projecta* Frison is removed from synonymy with *P. occidentalis* (Banks) and *P. rickeri* Nebeker and Gaufin is placed as a junior synonym of *P. projecta*. The female of *P. divisa* (Hitchcock) is described for the first time. Three main groupings within the genus are recognized: the *P. cercia* (Okamoto) group, the *P. occidentalis* group, and the *P. purcellana* (Neave) group.

10:30 COMPARISON OF METABOLIC RATES OF GUPPY (*POECILIA RETICULATA*) AND BLACK MOLLY (*POECILIA LATIPINNA*) AT DIFFERENT TEMPERATURES

Sharonda R. Stewart, Benita Page, and Julius O. Ikenga*, Mississippi Valley State University, Itta Bena, MS 38941

The metabolic rates (*mR*) of a guppy (*Poecilia reticulata*) and a black molly (*Poecilia latipinna*) were compared at 23–25°C and at 15°C, using the indirect respirometry. The latter technique measured the amount of metabolic carbon dioxide (CO_2) produced rather than the amount of oxygen used by the test fishes. Most home aquaria are kept at 23–25°C. The 15°C was chosen to test fish survivability at a lower temperature and to compare *mR* at different temperatures. A guppy and a molly with body volumes of 1 and 2 milliliters respectively, were individually allowed to carry on routine activities for 30 minutes in a test beaker. The latter was tightly sealed with a plastic wrap during the test period. Metabolic CO_2, produced by the fishes formed carbonic acid with water in the test beaker. The acid water was titrated to endpoint with 2.5 µM sodium hydroxide solution. Phenolphthalein was used as a color change indicator. Endpoint data collected were adjusted and used to calculate the *mR* in µM CO_2/ml/hr. The average *mR* of the guppy was found to be 13.5, 11.7 and 11.4 µM CO_2/ml/hr at 23, 24, and 25°C, respectively. The molly at the same temperature had average *mR* of 6.88, 9.13, and 7.84 µM CO_2/ml/hr. Both fishes survived tests at 15°C. The molly at 15°C regulated its *mR* (5.4 to 4.5 µM CO_2/ml/hr) much more closely than the guppy (8.0 to 6.39 µM CO_2/ml/hr) at 15°C.

10:45 ANALYSIS OF DEVELOPMENTAL DEFORMITIES IN AMPHIBIANS IN THE MISSISSIPPI DELTA AREA

Ramu Thiagrarjan*, Sarah Nordby, and Joseph M. Wahome, Mississippi Valley State University, Itta Bena, MS 38941

Four species of amphibians were examined for morphological deformities from May to October 1998. Deformities were minor and restricted to missing or defective digits. Toads had the highest percentage of deformities (30%), while Grass Frog and Leopard Frog populations had 23% and 9.6% deformities respectively. No deformed tree frogs were collected. Location of collection stations affected the number of deformed individuals collected. These data are discussed in light of habitat contamination and declining amphibian populations.

11:00 Divisional Poster Session

THE EFFECT OF FOREST MANAGEMENT ON THE POPULATION DENSITY OF THE COMMON ORCHARD SPIDER (*LICOUGE VENUSTA*)

Melodie Sheri Millsaps* and Paul Porneluzi, Mississippi

University for Women, Columbus, MS 39701, Central Methodist College, and University of Missouri at Columbia, MO 65211-7400

The purpose of this study was to determine the effects of forest management and land type on orchard spider population density. To observe these trends in population density, spot maps were collected for three randomly selected plots of even-aged, uneven-aged, and control treatments at Peck Ranch, MO. The spider's habitat preferences were classified into five different land types: A) stream beds, B) sloped adjacent to stream beds, C) north and east facing slopes, D) south and west facting slopes, and E) ridgetops. The data collected was analyzed and the following results were found. 44% of the spider preferred strearnbeds, 24% streambed slopes, 15% south and west facing slopes, 9% north and east facing slopes, and 8% prefer-red ridgetops. The data concerning forest treatments indicated that 46% of the spiders preferred uneven-aged, 33% control, and 21% preferred even-aged treatments. Thus, the overall experiment provided the information that orchard spiders are more abundant in moist and lowly elevated environments and that uneven-aged forest treatments provide the best managed habitat for these spiders.

INFLUENCE OF VISION AND PREY MEDIUM ON PREDATION IN MEXICAN BLACK-BELLIED GARTER SNAKES, *T. MELANOGASTER*

Jennifer Parker* and Lani Lyman-Henley, Mississippi University for Women, Columbus, MS 39701

The diet of *Thamnophis melanogaster*, the Mexican black-bellied garter snake, has been shown to be mainly fish, but also may include leeches, tadpoles, earthworms, and anuran. Edible prey is recognized by the vomeronasal system, but is also aided by vision which is acute in this species of snake. Subjects were 24 *T. melanogaster* placed in one of four groups of six based on age ranging from 1 to 9 years old and maintained on a diet of minnows. They were tested for acceptance or refusal of the novel prey items tadpoles and earthworms, with earthworms presented in varying media: dry dish, water, and soil. Tadpoles were accepted more frequently than earthworms, as expected for an aquatic foraging specialist like *T. melanogaster*. Worms presented in soil had the lowest acceptance rate of prey offered- although soil is the natural habitat of earthworms, it is neither the usual foraging site for aquatic snakes nor a medium conducive to visual foraging. The group of oldest snakes had the lowest acceptance rate to test prey items, demonstrating an effect of experience in their reluctance to accept novel prey.

FRIDAY AFTERNOON

Room 606

1:00 SPECIES SPECIFIC AQUATIC FORAGING BEHAVIOR OF GARTER SNAKES, GENUS *THAMNOPHIS*

Dana Roberts* and Lani Lyman-Henley, Mississippi University for Women, Columbus, MS 39701

Across the wide North American range of the 22 species of garter snake there is natural variation in preferred habitat, prey selection, and foraging behaviors. While most species of *Thamnophis* will eat fish (along with a variety of other small prey), there are some, such as the Mexican black-bellied garter snake *(T. melanogaster*), that specialize in aquatic foraging While studies of the aquatic foraging behaviors of this species have been relatively well documented, the same behaviors may appear in other, less aquatic species, if given the same conditions. To make species comparisons possible, observations on several species are conducted in a semi-natural habitat arena, with minnows used as prey species. Dietary generalists, such as *T. sirtalis*, are expected to be more flexible in their behavior patterns than those species that are specialized to aquatic prey, while the foraging specialist *T. melanogaster* is expected to show more limited and stereotyped behavior.

1:15 CARDIAC AND VENTILATORY RESPONSE IN DIGESTING PYTHONS

Stephen M. Secor [l]*, James W. Hicks[2], Albert F. Bennett[2], and Jared Diamond[1], [1]University of California at Los Angeles, Los Angeles, CA 90095, and [2]University of California, Irvine, CA 92697

During the digestion of a meal, pythons experience tremendous increases (up to 45-fold) in metabolic rate, accompanied by a 40% increase in heart mass. Interested in their integrated card io-ventilatory response during digestion, we simultaneously measured O_2 consumption, CO_2 production, ventilation, heart rate, and blood flow from fasted, exercising (traveling at 0.4 km/hr), and digesting pythons. We measured blood flow through the right and left systemic arteries using surgically-implanted Transonic Systems flow probes. We found O_2 consumption, CO_2 production, and ventilation to increase 5 to 9-fold above fasting levels during digestion. Gas exchange while exercising was similar to that during digestion, whereas ventilatory rates increased 20-fold during exercise. Blood flow through the systemic arteries increased 4-fold after feeding matched with a 2.5-fold increase in heart rate. During exercise, pythons experienced similar cardiac responses as during digestion. Although, pythons exhibited equivalent metabolic and cardiac responses during digestion and exercise, elevated rates during exercise were only maintained for a few minutes, whereas elevated rates during digestion were maintained for days. These findings suggest that the functional capacity of the cardio-pulmonary system has tremendous endurance and is apparently not a factor in

limiting exercise-induced energy expenditure.

1:30 EFFECTS OF AN ANIONIC ALKYLETHOXYSULFATE (AES) SURFACTANT ON FATHEAD MINNOW AND BLUEGILL SUNFISH IN STREAM MESOCOSMS

Richard E. Lizotte, Jr., University of Mississippi, University, MS 38677

Effects of anionic alkylethoxysulfate (AES) surfactant (C12-15 AE-3S) concentrations on fathead minnow (*Pimephales promelas* Rafinesque) survival, growth and reproduction and juvenile bluegill sunfish (*Lepomis macrochirus* Rafinesque) survival and growth were examined in stream mesocosms. Measured active AES surfactant concentrations examined were 0.00, 0.70, 1.27, 2.20, 4.31 and 10.18 mg/L. The 30-day median lethal surfactant concentrations (LC50's) for adult fathead minnow and juvenile bluegill sunfish were 4.68 and 6.86 mg AES/L. Lowest observed effects concentrations for fathead minnow survival, growth and reproduction were 4.31, 4.31, and 1.27 mg AES/L, respectively, after 30 days exposure. Lowest observed effects concentrations for juvenile bluegill sunfish survival and growth were 10.18 and 4.31 mg AES/L, respectively, after 30 days exposure. Results of the present study indicated 1) fathead minnow reproduction was the most sensitive response to AES surfactant exposures; and 2) AES surfactant effects concentrations for the two fish species examined were well above measured environmental AES concentrations observed in receiving waters from wastewater treatment facilities in the United States which range from 0.004 to 0.164 mg AES/L.

1:45 Divisional Business Meeting

SPECIAL PRESENTATIONS THURSDAY

PHILOSOPHY OF SCIENCE SYMPOSIUM

Imperial Room

Kenneth J. Curry and Paula Smithka, Organizers

8:30 WHAT IS THE DIFFERENCE BETWEEN SCIENCE AND PSEUDOSCIENCE?

John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Distinguishing science and pseudoscience is really not that hard. Science does not succeed because of induction or proving theories but in proposing theories that can be disproved. We will consider several examples of pseudoscience, including cold fusion, alien abduction, the Shroud of Turin and see how the claims made are in principle impossible to test and thus not scientific.

9:00 THE PHILOSOPHY OF SCIENCE—A LIFE

SCIENCE PERSPECTIVE

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

The bulk of literature associated with the philosophy of science has been devoted to analyses of the physical sciences, particularly physics. Modern science, however, is dominated by life sciences. Life sciences require analyses of phenomena that are not as easy to universally classify or quantify as the phenomena associated with the physical sciences. As a result, the descriptions of scientific theories as closed systems based on universal statements is being replaced by descriptions of theories as open systems based on non-universal statements that may or may not be modified as new knowledge emerges. This presentation will outline the classical philosophical view of scientific theories, its inadequacies when faced with phenomena associated with modern life sciences, and the manner in which a philosophy of science more closely associated with the life sciences attempts to resolve some of the inadequacies of the classical view. A major theme of this presentation will be the problem of induction.

9:30 Break

9:45 OBSERVATIONS ON THE SPECIES CONCEPT: BIOLOGICAL PERSPECTIVE

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

Throughout history we have recognized natural assemblages of plants and animals and considered their nature in the elusive concept of species. Our understanding of biology has matured and the concept of species has changed but still remains biologically and philosophically just beyond reach. Early concepts included the essentialist view that characterized species with unchanging essences (universals) and the nominalist view that characterized species as a human construct existing in name only. The paradigm shift of the nineteenth century that brought us to understand organisms as changing with time also changed, but did not resolve or even clarify, our views of species. The principal view of the twentieth century, the biological species concept, espouses interbreeding populations delimited by reproductive isolation. Variants of this address problems of phyletic lineages versus species. The problem of nonsexual reproductive populations continues to confound concepts of species. The species is apparently a cohesive genetic and historic unit, but how can we recognize its limits?

10:15 OBSERVATIONS ON THE SPECIES CONCEPT: PHILOSOPHICAL PERSPECTIVE

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

Throughout history, the biological classifications of natural assemblages of plants and animals has centered on the use of the elusive category called ‘species.’ The philosophical foundations of the category of ‘species’ has not remained static. Rather, the philosophical foundations of this category have “evolved” from essentialism, where the essences of ‘species’ are universal and eternal, toward a nominalist approach, beginning in the Medieval period, where the category of ‘species’ is merely a human concept,—a name constructed in order to aid humans in our ability to classify and categorize plants and animals. More recently in the twentieth century, the category of ‘species’ has been reconsidered in more “biological terms.” The “biological species concept,” where populations are delimited by reproductive isolation, and recent variations thereof, is the predominant working paradigm for both biologists and philosophers today. We focus on some of the interesting ontological and epistemological consequences of the various historical views of the category of ‘species.’ We further argues that the current limitations of the present working paradigm of the biological species concept, namely with respect to the species classifications of nonsexual reproductive populations, must be revised in order to provide a more accurate and comprehensive biology.

10:45 Business meeting to discuss establishment of a division for the History and Philosophy of Science

1:00 A CRITIQUE OF A RECENT DEFENSE OF REALISM IN PHYSICS

Robert Hensley, University of Southern Mississippi, Hattiesburg, MS 39406

“Realism is dead.”–Arthur Fine, “The Natural Ontological Attitude”

“Is the dragon of anti-realism finally dead?”–Aronson, Harré, Way, *Realism Rescued*

We can safely say that neither realism nor anti-realism is dead. Rather, the realist/anti-realist controversy continues in new forms and attracts new participants. Aronson, Harré, and Way’s (henceforth, AHW) book, *Realism Rescued* (1995), provides a compelling new argument for realism by recasting scientific progress based on Quine’s thesis of “natural kinds.” They argue that science does not produce and compare **propositions**, as many philosophers of science have historically maintained; rather, science is about the construction and manipulation of **models**. The shift is away from the “perennial problem of adequately characterizing propositional truth” and toward the analysis of the verisimilitude of models–“the root idea is that of pictorial truth” (AHW, p.4). AHW offer a pictorial comparison of two models of an atom, one model being that of a race car circling a track, and the other being a solar system. AHW **assume** that the latter is the superior model because both atoms and solar

systems are "complex physical systems which are instances of a central force field." (AHW, p. 108). AHW maintain that both the atom and the solar system are subtypes of a common supertype, or a "natural kind," and that the justification for the use of the solar system model over the race car model is that it is more verisimilar to the atom than is the race car model. I argue, however, that AHW's assumption regarding the solar system model is mistaken, which I think can be demonstrated by a careful analysis of atoms, solar systems, and race car driving. Using the logical argument structure called *Modus Tollens*, I embark upon the difficult (or fun!) task of determining which of AHW's premises are false.

1:30 A NEW CONCEPTUAL MODEL FOR A UNIFIED FIELDS THEORY

Marvin Vining, University of Southern Mississippi, Hattiesburg, MS 39406

The big goal of theoretical physicists in the last half of the twentieth century has been to offer one unified explanation for all the forces of nature. This was not only Einstein's dream, but the dream of those before him such as Mach and the father of field concept himself, Farraday. In this paper, there is presented a radically new conceptual model by which a unified fields theory might be realized, provided we redefine the very notion that there are constant field structures in space and time and all. Here is presented the idea that there are no universal scalar constants, even for the localized observer. Epistemology speaking, the measurement of all three scalar units in the Newton, the unit by which we measure force, are interdependent, such that universal changes in all three units at once (i.e., new standards for the kilogram, the meter, the second in every moment) can escape casual observation. Once it is shown that notions of "congruence," etc., are philosophically indefensible to establish the constancy of scalar units, the paper will look to Dirac's Large Number Hypothesis in defense of its new concepts.

2:00 Break

2:15 FROM SOUP TO GOD: PHILOSOPHY AND ORIGINS

Robert Waltzer, Belhaven College, Jackson, MS 39202

The subject of origins generates a lot of heat. In my presentation I will consider the contributions from both science and philosophy. I will first examine the philosophical foundation for present-day science. In particular, I will look at the role of naturalism, which is the position that matter in motion is all that exists. I will try to establish that present-day science is built upon naturalism and question the validity of this assumption. Naturalism claims to eventually explain all matters related to the natural world. But this position is based on the unknown and therefore cannot be established. Because of uncertainties related to naturalism, we need to reexamine our exclusion of the supernatural. I will address possible objections to supernaturalism. Opening science to the supernatural does not mean that we reject the majority of what we have learned. The best aspects of what we have learned can still be kept. However, some areas may be significantly affected and should be reexamined, including origins. I will show that the naturalistic approach, in excluding the supernatural, eliminates viable alternatives. In conclusion, I will seek to open dialogue on origins for the purpose of promoting the improvement of science and increasing our understanding of how we came into existence.

2:45 AN HISTORICAL VIEW OF THE EFFECT OF BELIEF SYSTEMS ON THE PRACTICE OF SCIENCE

Raymond N. Westra, Belhaven College, Jackson, MS 39202-1789

Since the early years of our millennium when science, superstition, myth and religion were freely mixed, until today there has been a growing effort to separate science from the metaphysical. It is the intent of this paper to consider some of the effects on the practice of science by individuals holding varying levels of religious commitment. I will present some selected historical examples of the engagement of religion and science, as well as some examples of disengagement. Some men of science were inspired to pursue certain studies because of their commitment to their religious beliefs while others pursued their research driven by their antagonism to religion.

3:15 AN OPEN CALL TO OPEN OPEN QUESTIONS

Robert J. Allen, University of Southern Mississippi, Hattiesburg, MS 39406-5015

The same fundamental philosophical questions that mankind has asked throughout time and throughout all cultures continue to be asked today. In western culture the fundamental question "what is real (possesses objective independent existence)?," has acquired great emphasis. The three answers proposed throughout time and culture for this question are: Materialism (only the physical [matter and energy] is real), Idealism (only the nonphysical [ideas] is real = the physical is only illusory), and Dualism (both physical and nonphysical entities are real). Since it is uncertain which of these answers is "correct," the question is an "open" question (without a demonstrably correct or confirmed answer). It would seem that educational institutions (which impart truth), and scientific institutions (which pursue truth), should be receptive to all fundamental answers, that have not been demonstrated to be false, to open questions they choose to teach and to pursue. Yet in western cultures, in these institutions in particular, some answers have been "shut" out of consideration of the question, "What is real?" and of other

open questions. Any answer that has not been demonstrated to be false may actually be the "correct" answer. Profound error will surely be produced and perpetuated by failing even to present an answer that is correct. An appeal to open open questions to all potentially correct answers, in order to avoid or minimize the damage that would surely result by leaving a correct answer unconsidered, is made.

SOCIAL SCIENCES
Room 604

9:15 EXPLORATIONS IN SOCIAL SCIENTIFIC RESEARCH
James G. Flanagan and Ann Marie Kinnel, University of Southern Mississippi, Hattiesburg, MS 39406

1:00 MISSISSIPPI RESEARCH INITIATIVES IN THE SOCIAL SCIENCES
Emmanuel C. Nwagboso[1]*, Curlew Thomas[2], Garry Jennings[3], and J. Reid Jones[3], [1]Jackson State University, Jackson, MS 39217;[2]Mississippi Valley State University, Itta Bena, MS 38941; and [3]Delta State University, Cleveland, MS 39733

2:45 SOCIAL SCIENCES DISCUSSION ON MINORITIES IN MISSISSIPPI HIGHER EDUCATION: FOCUS ON SCIENCE AND MATHEMATICS MAJORS
Caryl M. Abrahams[1]*, Watson L. Jackson[2], and J. Reid Jones[2], [1]Delta State University, Cleveland, MS 38733, and [2]Mississippi Valley State University, Itta Bena, MS 38941

CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY
Room 3

1:30 Invited speaker

INVESTIGATING THE REGULATION OF FLAVONOID PRODUCTION IN MAIZE
Brian Scheffler[1]*, Regina Rojek[2], Inka Pusch[2], Natascha Techen[2], Susan Watson[1], and Udo Wienand[2], [1]USDA-ARS-NPURU, University, MS 38677, and [2]Universität Hamburg, 22609 Hamburg, Germany

HEALTH SCIENCES
Room 2

Neuropsychiatry Symposium

1:15 Introduction, Dr. John Piletz and Ms Zelma Cason

1:20 **Mood Disorders**, Dr. Gregory Ordway, Associate Professor of Psychiatry and Pharmacology, UMC

1:50 Questions and Answers

1:55 **Schizophrenia**, Dr. Henry Nasrallah, Professor of Psychiatry and Neurology, UMC and Associate Chief of Staff, VAMC, Jackson

2:25 Questions and Answers

2:30 Break

2:40 **Dementias**, Dr. Garth Bissette, Professor of Psychiatry and Pharmacology, UMC

3:20 **Drug Abuse**, Dr. Bill Woolverton, Professor of Psychiatry and Pharmacology, UMC

3:50 Questions and Answers

3:55 **Overview of the Research Program in the Department of Psychiatry at UMC**, Dr. Angelos Halaris, Professor and Chairman, Department of Psychiatry and Human Behavior, UMC

4:25 Questions/Answers/Concluding Remarks/Evaluation

4:30 Adjourn

5:00 DODGEN LECTURE: THE FACE OF HIV/AIDS IN MISSISSIPPI
Harold Henderson, University of Mississippi Medical Center, Jackson, MS 39216