MISSISSIPPI
ACADEMY OF SCIENCES

SEVENTY-FIRST ANNUAL MEETING

February 21-23, 2007

Mississippi State, Mississippi

Hunter Henry Center and Bost Extension Center

Hosted by

Mississippi State University

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Julius Ikenga, MS Valley State University

GENERAL SCHEDULE

WEDNESDAY, FEBRUARY 21, 2007

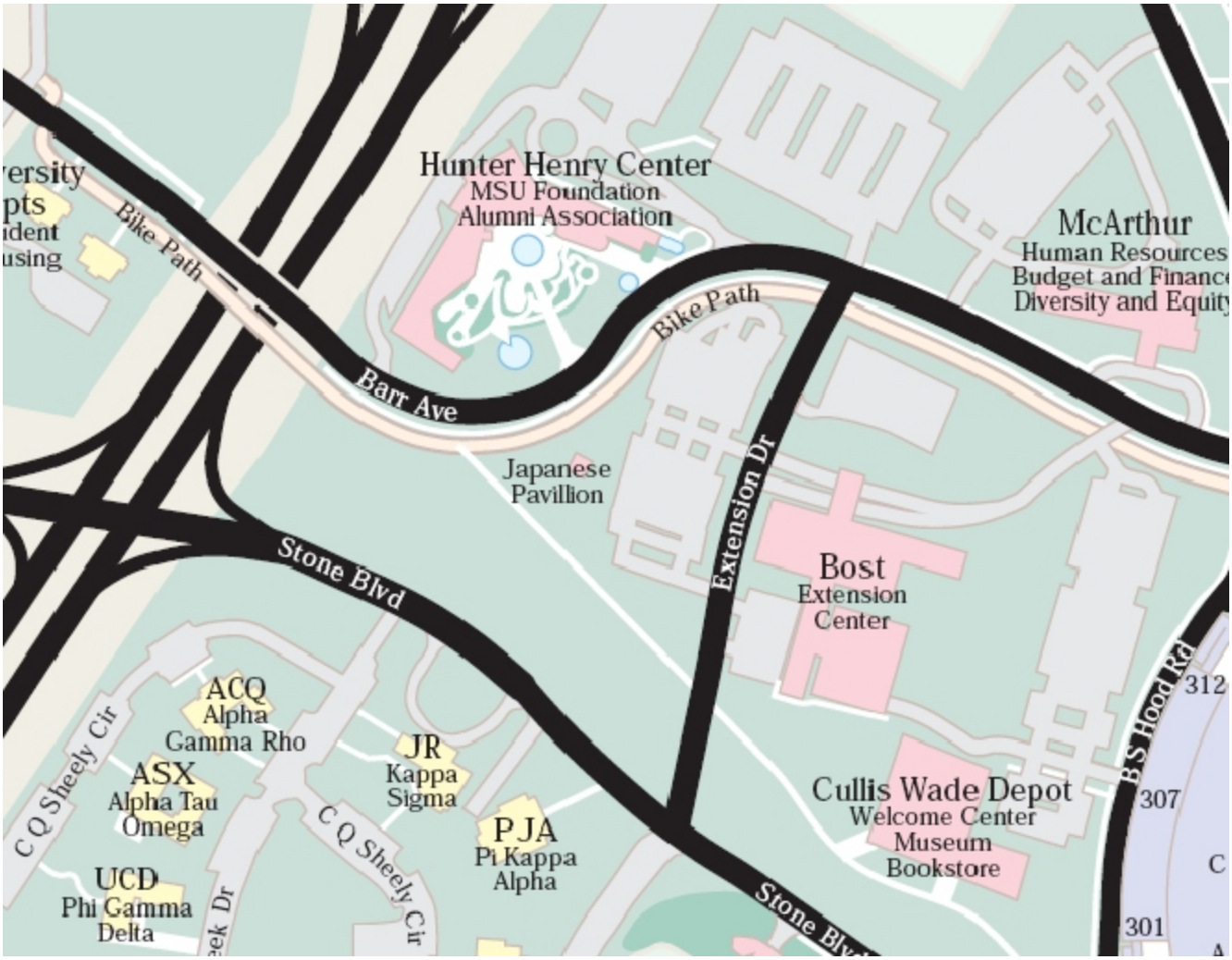
TIME	EVENT	LOCATION
4:00 PM to 6:00 PM	Board of Directors Meeting	TBA

THURSDAY, FEBRUARY 22, 2007

TIME	EVENT	LOCATION
7:30 AM to 5:00 PM	Registration	Bost Lobby
9:00 AM to 7:00 PM	Exhibits	
8:00 AM to 4:00 PM	Divisional Programs	See Pages 11-29
4:00 PM to 4:30 PM	Set up for 6:00 PM Poster Session	Bost Auditorium North
5:00 PM to 6:00 PM	2007 Dodgen Lecture & Presentation of Awards	Bost Auditorium South
6:00 PM to 7:00 PM	Reception and Poster Session Chemistry and Chemical Engineering Ecology and Evolutionary Biology Mathematics, Computer Science, and Statistics Physics and Engineering Science Education	Bost Auditorium North

FRIDAY, FEBRUARY 23, 2007

TIME	EVENT	LOCATION
7:15 AM	Past-Presidents' Breakfast	To Be Announced
7:30 AM to 2:00 PM	Registration	Bost Lobby
8:00 AM to 12:00 PM	Exhibits	
8:00 AM to 5:00 PM	Divisional Programs	See Pages 11–29
8:30 AM to 10:30 AM	Health Fair	Bost Auditorium North
10:30 AM to 11:30 AM	Poster Session II Health Sciences Marine and Atmospheric Sciences	Bost Auditorium North
11:45 AM to 12:30 PM	General Lecture: Obesity and the Reshaping of America	Bost Auditorium South
12:30 PM to 1:15 PM	MAS Business Meeting	Bost Auditorium South
1:15 PM to 2:45 PM	Mississippi Center for Supercomputing Research	Bost Auditorium South
3:00 PM to 4:15 PM	Poster Session III Agriculture and Plant Sciences Cellular, Molecular, and Developmental Biology	Bost Auditorium North



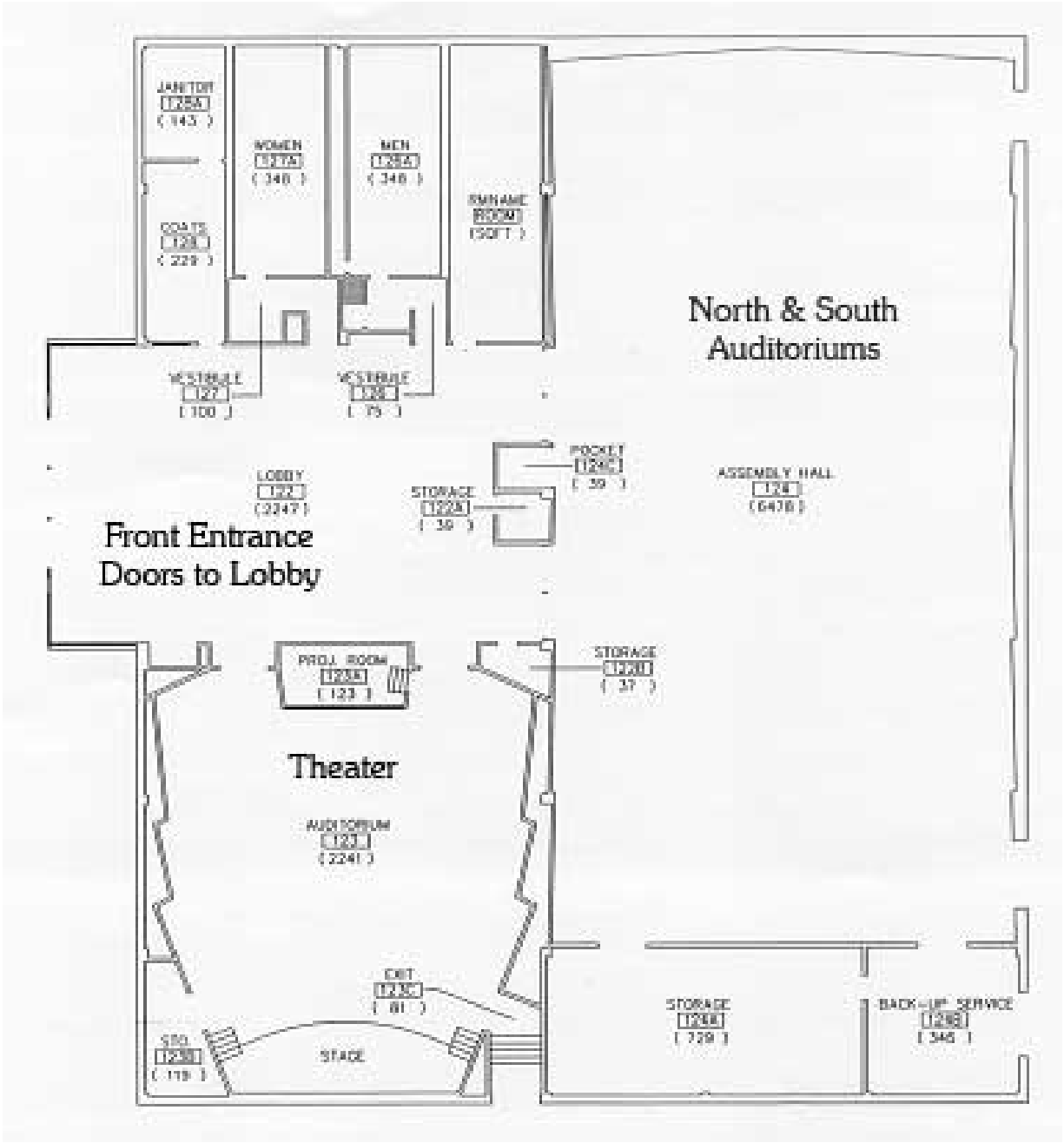
Directions to Bost Conference Center

From Highway 12 – Stay on Highway 12 until the light at Spring Street. After the light, the highway divides. Stay right to the Columbus 82 lanes. Do not go left to the MSU lanes. Turn right at the next light (Russell Street.) Turn left at the first road. The Bost Conference Center is in front of you. Parking is available all around Bost.

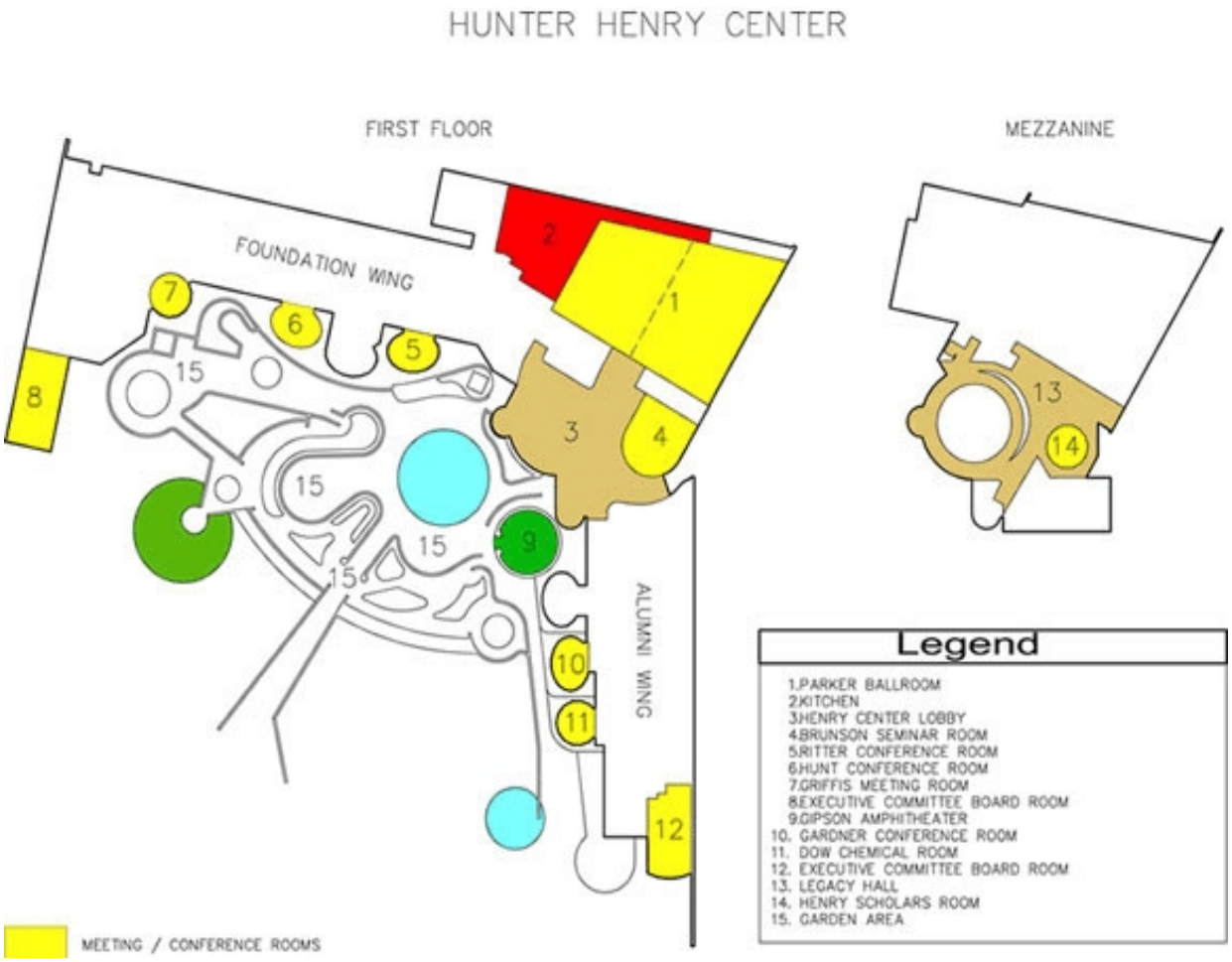
From Highway 25 – Follow Highway 25 to Highway 12 and follow directions from Highway 12 above.

From Highway 82 - Take the Highway 12 West/Mississippi State University Exit. Do not take the 182/MSU Exit. Turn left at the first light which is Creelman Street. Turn left again at the first road. The Bost Conference Center is in front of you. Parking is available all around Bost.

Bost Convention Center Floor Plan



Hunter Henry Center Floor Plan



Dodgen Lecture 2007
Annual Meeting of the Mississippi Academy of Sciences

5:00 pm Thursday
February 22, 2007

Speaker: To Be Announced

The Dodgen Lecture is the premiere public lecture of the Mississippi Academy of Sciences. It was created to honor one of the key figures in the history of the Academy. Dr. Charles Dodgen was Executive Officer from 1972 to 1980. This period was one of outstanding growth. Dr. Dodgen led membership drives that increased membership from fewer than 300 to almost 1000. He solidified the Journal and helped to greatly improve the quality of the annual Meetings.

In recent years the lecture has had a history of outstanding speakers including the head of NASA, the President of the National Academy of Sciences, and the President's Science Advisor. Public attendance is encouraged.

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OVERVIEW OF DIVISIONAL PROGRAMS

GENERAL SYMPOSIUM

Friday, February 23
Location: Bost Auditorium South

11:45 OBESITY AND THE RESHAPING OF AMERICA
SPONSORED BY: DIVISION OF AGRICULTURAL AND PLANT SCIENCES AND DIVISION OF HEALTH SCIENCES

AGRICULTURE AND PLANT SCIENCE

Friday, February 23

Friday Morning
LOCATION: Hunter Henry Ballroom B
Abstracts pp 30-33

8:15 ENHANCING SUSTAINABLE PRODUCTION OF MEDICINAL PLANTS IN MISSISSIPPI
8:30 REOCCURRENCE OF ANGULAR LEAF SPOT OF COTTON IN MISSISSIPPI AND EVALUATION OF CURRENTLY GROWN VARIETIES FOR IMMUNITY OR RESISTANCE TO THE DISEASE.
8:45 EVALUATION OF DIFLUBENZURON (DIMLIN®) TO CONTROL *CERCOSPORA SOJINA*, THE FROGEYE LEAFSPOT PATHOGEN OF SOYBEAN
9:00 IDENTIFYING ISOLATES OF *PHYTOPHTHORA CINNAMOMI* FOR CHALLENGING BLUEBERRY (*VACCINIUM* SP.) CULTIVARS TO DEVELOP A GREENHOUSE SCREENING TECHNIQUE FOR IDENTIFYING RESISTANT BLUEBERRY GERMPLASM
9:15 ESTABLISHMENT OF BLACKBERRIES AND DETECTION AND MANAGEMENT OF RASPBERRY CROWN BORER
9:30 BIOAVAILABILITY OF MERCERY IN SOIL AND WATER AND ITS EFFECTS ON PLANT STRUCTURE AND REFLECTANCE
9:45 Break
10:00 ROOT AND FOLIAR RESPONSES OF MARIGOLD TAGETES PATULA, ZINNIA ZINNIA ELEGANS AND VINCA CATHARANTHUS ROSEUS GROWN IN 288 PLUG TRAYS COATED WITH ZINC CHLORIDE COMPOUNDS.
10:15 MANAGEMENT OF HIGH PHOSPHORUS SOILS IN MISSISSIPPI: FORAGE PRODUCTION AND AGGREGATE STABILITY
10:30 PLANT DENSITY EFFECT ON YIELD AND BIOMASS DEVELOPMENT OF ORGANIC EGGPLANT (SOLANUM MELONGENA L)
10:45 FATE OF FUNGAL SPORE INOCULA APPLIED TO STRAWBERRY LEAVES FOR FUNGICIDE SCREENING EXPERIMENTS
11:00 THE EFFECTS OF PLOT SIZE AND MOWING HEIGHT ON PESTICIDE RUNOFF FROM MISSISSIPPI PRIDE BERMUDAGRASS (*CYNODON DACTYLON* [L] PERS. × *CYNODON TRANSVALENSIS* BURTT-DAVY
11:15 GRAZING PREFERENCE FOR BERMUDAGRASS CULTIVARS INTERSEEDED WITH CHICORY

Friday Afternoon
LOCATION: Hunter Henry Ballroom B
Abstracts pp 33-39

1:15 PERFORMANCE EVALUATION OF NEW RYEGRASS VARIETIES AT ALCORN STATE UNIVERSITY: NUTRITIONAL VALUE, DRY MATTER, GROWTH AND MATURITY
1:30 FACILITATING FUNCTIONAL GENOMICS ANALYSIS IN MISSISSIPPI: THE AGBASE DATABASE
1:45 INHIBITION OF PPO ACTIVITY WITH ADDITIVES AND THEIR INFLUENCE ON ANTHOCYANINS EXTRACT IN RABBITEYE BLUEBERRY MASH

2:00 SYSTEMS ANALYSIS OF *PASTEURELLA MULTOCIDA* RESPONSE TO SUB-MINIMUM INHIBITORY CONCENTRATIONS OF ANTIBIOTICS
2:15 EFFECT OF COOKING AND PACKAGING METHODS ON CONSUMER ACCEPTABILITY AND SHELF-LIFE OF READY-TO-EAT GULF BROWN SHRIMP
2:30 AG ACADEMY: BUILDING AGRICULTURE IN THE HEARTS OF CHILDREN IN SOUTHWEST MISSISSIPPI

3:00 DIVISIONAL POSTER SESSION
LOCATION: Bost Auditorium North

POSTHARVEST APPLICATION OF ANTIMICROBIALS IN CATFISH- A REVIEW
CHARACTERIZATION OF THE AROMA IMPACT COMPOUNDS OF FISH SAUCES BY GC-MS BASED ON SPME-OSME-GCO WITH DILUTION METHODS
SANITATION TREATMENT TO DECREASE MICROBIAL LOAD OF PROCESSING BLUEBERRIES
CADMIUM BIOACCUMULATION IN COLLARD AND INDIAN MUSTARD PLANTS
RAPID PURIFICATION OF INTERNALIN B FOR DETECTION OF LISTERIA MONOCYTOGENES
BRINE ABSROPTION AND RETENTION IN CATFISH FILLET STRIPS
EFFECT OF EXOGENOUS JASMONIC ACID APPLICATION ON *ASPERGILLUS FLAVUS* KERNEL INFECTION AND AFLATOXIN PRODUCTION IN TWO MAIZE HYBRIDS (*ZEA MAYS* L.)
MISSISSIPPI MASTER GARDENER TRAINING CURRICULUM COMPACT DISC: A MULTI-DISCIPLINE TWO-YEAR PROJECT
MONITORING *HENNEGUYA ICTALURI* INFECTION IN CHANNEL CATFISH, BLUE CATFISH AND CHANNEL X BLUE BACKCROSS HYBRIDS USING HISTOPATHOLOGY, REAL-TIME PCR AND IN SITU HYBRIDIZATION
CHELATE-MEDIATED CHANGES IN METAL SOLUBILITY AFFECT UPTAKE AND TRANSLOCATION OF CADMIUM BY WHEAT (TRITICUM AESTIVUM L.): IMPLICATIONS IN THE PHYTOREMEDIATION OF METAL-CONTAMINATED SOIL
OPTIMIZATION OF FERMENTATION MEDIUM AND CONDITIONS FOR MYCELIAL GROWTH AND WATER-SOLUBLE EXO-POLYSACCHARIDES PRODUCTION BY *ISARIA FARINOSA* B05
GENETIC RESISTANCE TO SALMONELLA IN CHICKENS: A PROTEOMIC PUZZLE
DETECTION AND DISTRIBUTION OF GEOSMIN IN CHANNEL CATFISH TISSUE USING SPME/GC/MS
ENHANCING PHYTOEXTRACTION: THE EFFECTS OF ACIDIFICATION AND CHELATING AGENTS ON THE BIOAVAILABILITY, UPTAKE AND TRANSLOCATION OF LEAD BY COFFEEWEED (SESBANIA EXALTATA RAF.)
ANTAGONISTIC EFFECT OF YOGURT LACTIC ACID BACTERIA AGAINST ENTEROBACTER SAKAZAKII THROUGH A SIMULATED GASTROINTESTINAL SYSTEM

4:00 DIVISIONAL BUSINESS MEETING
LOCATION: Hunter Henry Ballroom B

CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY

Thursday, February 22

Thursday Morning
Location: Bost Auditorium South
Abstracts pp 40-43

8:00 BIOLOGY OF PREIMPLANTATION PORCINE EMBRYOS IN VITRO
8:15 A COMPARATIVE ANALYSIS OF THE EARLY EMBRYONIC RESPONSES OF THE GIANT DANIO (DANIO AEQUIPINNATUS) AND ZEBRAFISH (DANIO RERIO) TO RETINOIC ACID
8:30 DELETION OF P38AA MAP KINASE IN MOUSE EMBRYONIC STEM CELLS RESULTS IN UP-REGULATION OF SMOOTH MUSCLE CELL MARKERS DURING DIFFERENTIATION
8:45 CHARACTERIZATION OF CANDIDATE TUMOR SUPPRESSORS RIN AND CCK IN NEUROBLASTOMA CELLS
9:00 OVEREXPRESSION AND PURIFICATION OF NEURAL CADHERIN

9:15 Break

9:30 ROLE OF COMPLEX FORMATION OF ANGIOTENSIN II RECEPTOR AT1 WITH INSULIN RECEPTOR BETA- SUBUNIT IN THE DEVELOPMENT OF INSULIN RESISTANCE

9:45 MULTIPLE CYSTEINE RESIDUES ARE CRITICAL TO JAK2-MEDIATED CATALYSIS

10:00 REGULATION OF MATRIX METALLOPROTEINASES BY P38 MAP KINASE DURING VESSEL FORMATION IN A THREE-DIMENSIONAL CELL CULTURE SYSTEM

10:15 CHARACTERIZATION AND FUNCTIONAL ANALYSIS OF A COTTON FIBER GENE ENCODING A RING-TYPE UBIQUITIN LIGASE

10:30 Break

10:45 CDC20 LINKS NUCLEOTIDE EXCISION REPAIR TO CELL CYCLE PROGRESSION IN SACCHAROMYCES CEREVISIAE

11:00 THE *S. CEREVISIAE KIN3* GENE INTERACTS WITH A DNA DAMAGE REPAIR GENE

11:15 DNA MICROARRAY BASED TRANSCRIPTIONAL PROFILE OF *MSA* MUTANT OF S.AUREUS

11:30 MULTIDIMENSIONAL PROTEIN IDENTIFICATION TECHNOLOGY-BASED PROTEOGENOMIC MAPPING OF CHANNEL CATFISH VIRUS GENOME

11:45 KNOCKING OUT CHAPERONE PROTEIN GENES IN [URE3] STRAINS OF *SACCHAROMYCES CEREVISIAE*

Thursday Afternoon
Location: Bost Auditorium South
Abstracts pp 44-46

1:30 RATES OF SPONTANEOUS FORMATION OF THE [URE3] PRION IN CULTURES OF *SACCHAROMYCES CEREVISIAE*

1:45 MODELLING OF $CD30^{HIGH}$ LYMPHOMAS USING MAREK'S DISEASE IN CHICKEN AS A NATURAL ANIMAL MODEL

2:00 DELETION AND EPITOPE-TAGGING OF CELL CYCLE GENES USING UNCLONED PCR FUSION PRODUCTS AND HOMOLOGOUS RECOMBINATION IN *ASPERGILLUS NIDULANS*

2:15 MSU'S INSTITUTE FOR DIGITAL BIOLOGY: A MISSISSIPPI RESOURCE FOR POST GENOMIC BIOLOGY

2:30 A JACKPOT TEST OF THE SPONTANEOUS FORMATION OF THE [URE3] PRION IN *SACCHAROMYCES CEREVISIAE*

2:45 Break

3:00 ROLE OF *MSA* IN REGULATING BIOFILM FORMATION IN STAPHYLOCOCCUS AUREUS

3:15 SITE SPECIFICITIES OF HENNEGUYA EXILIS IN CHANNEL CATFISH (ICTALURUS PUNCTATUS)

3:30 EXPRESSION ANALYSIS OF THE MOLD-SPECIFIC M46 GENE IN FIVE STRAINS OF THE PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*

3:45 THE CO-EXPRESSION OF AMPKA, AMPKB, AND AMPKΓ FROM *TRYPANOSOMA BRUCEI*

Friday, February 23

Friday Morning
Location: Bost Auditorium South
Abstracts pp 46-48

8:30 THE ROLE OF CSOS2 PROTEIN IN THE CARBOXYSOME OF HALOTHIOBACILLUS NEAPOLITANUS

8:45 REGULATION OF ANTIBIOTIC RESISTANCE IN *STAPHYLOCOCCUS AUREUS*

9:00 SITE DIRECTED MUTAGENSIS OF THE *CSOS3* GENE OF *HALOTHIOBACILLUS NEAPOLITANUS*

9:15 FLUORESCENCE STUDY OF THE INTERACTION BETWEEN THE TAT-PTD PEPTIDE AND THE LIPID BILAYER

9:30 CONSTRUCTION AND MODIFICATION OF A SINGLE-CHAIN FV ANTIBODY BIOSENSOR FOR THE DETECTION OF SELECTED BACTERIA

9:45 CHARACTERIZATION OF THE SHELL PROTEINS OF MICROCOMPARTMENTS INVOLVED IN ETHANOLAMINE CATABOLISM IN SALMONELLA ENTERICA

10:00 CLONING AND EXPRESSION OF THE EUTN GENE PRODUCT FROM SALMONELLA ENTERICA

10:15 DIVISIONAL BUSINESS MEETING

Friday Afternoon
Location: Bost Auditorium North
Abstracts pp 48-63

3:00 **DIVISIONAL POSTER SESSION**

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THE CSOS1 PROTEINS AND ORFA/B: MAJOR AND MINOR COMPONENTS OF THE CARBOXYSOME SHELL.

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LIPID SPECIFICITY OF THE BT TOXIN/MEMBRANE INTERACTIONS

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CYP2B1/2 MESSENGER RNA WITHIN THE LIVER

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SEQUENCE AND EXPRESSION ANALYSIS OF THE AAT1 AND SOX1 GENES FROM THE CYSTEINE PATHWAY OF THE DIMORPHIC PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*

THE ROLE OF THE SIDE DOOR OF CARBOXYLESTERASES IN THE HYDROLYSIS OF ESTERS

CHRONIC DEVELOPMENTAL EXPOSURE TO ORGANOPHOSPHATES ELEVATES DOPAMINE LEVELS AND ALTERS NICOTINIC ACETYLCHOLINE SUBUNIT RNA EXPRESSION

EMBRYONIC GENOME ACTIVATION IN BOVINE

EFFECTS OF LEAF EXTRACT OF NIGERIAN BASIL, *OCIMUM GRATISSIMUM*, ON THE GROWTH OF HUMAN PROSTATE CANCER CELLS (PC-3) *IN VITRO*

PHOTOCHEMICAL & REDOX CONTROL OF HYDROGEN GAS PRODUCTION IN CYANOBACTERIA

KAPPA-OPIOID RECEPTOR (KOR) INVOLVEMENT IN HYPOTHALAMIC ACTIVATION OF HYPOTHALAMO-PITUITARY-ADRENAL (HPA) AXIS: ROLE FOR BUTORPHANOL?

ENGINEERING OF A NOVEL INHBITOR OF BIOFILM-ENCAPSULATED PATHOGEN

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ASSEMBLY OF THE LANTIBIOTIC MUTACIN 1140 IN MEMBRANES
AN ADDITIONAL BIOCHEMICAL MECHANISM FOR PERTUSSIS TOXIN-MEDIATED NEURONAL DAMAGE
QUANTITATIVE SERUM PROTEOMICS OF A TRYPTOPHAN DEPLETED DIET USING ^{18}O LABELING AND A RUBISCO INTERNAL STANDARD
SITE DIRECTED MUTAGENESIS OF THE CARBOXYSOME CARBONIC ANHYDRASE OF *HALOTHIOBACILLUS NEAPOLITANUS*
IDENTIFICATION OF WOOD DECAY FUNGI BY FUNGAL AND BASIDIOMYCETE INTERNAL TRANSCRIBED SPACER PRIMERS
BOVINE GERMINAL VESICLE OOCYTE : A SYSTEMS APPROACH
REGULATION OF DBF4-DEPENDENT KINASE IN SACCHAROMYCES CEREVISIAE
ERYTHROMYCIN BLOCKS NON-SELECTIVE CATION CHANNELS IN THE AIRWAY MUCUS GLAND CELLS
COMPARATIVE STUDIES OF VERNONIA AMYGDALINA AND TAMOXIFEN IN MCF- 7 TUMORAL CELLS
ROLE OF NIFH GLU112 IN BINDING TO NIFK OF NITROGENASE COMPLEX
CONSTRUING THE ROLES OF ETHYLENE AND JASMONIC ACID IN THE EXPRESSION OF THE MAIZE HERBIVORE DEFENSE PROTEIN ¨C MIR1
THE ROLE OF DETOXICATION ENZYMES IN THE AGE-RELATED TOXICITY DIFFERENCES OF ORGANOPHOSPHATE INSECTICIDES
THE MOLECULAR MECHANISMS FOR THE EXPRESSION, SECRETION, AND UNIPOLAR LOCALIZATION OF ICSA IN SHIGELLA FLEXNERI
FUNCTIONAL ANALYSIS OF A *MODC* HOMOLOG IN THE *AZOTOBACTER VINELANDII NIF*-GENE CLUSTER
THE ROLE OF *NIF*-SPECIFIC CLPX IN *AZOTOBACTER VINELANDII*

CHEMISTRY AND CHEMICAL ENGINEERING

Thursday, February 22

Thursday Morning
LOCATION: Hunter Henry Ballroom A
Abstracts pp 64-66

8:00 DIVISIONAL BUSINESS MEETING
8:30 THE SITE-DIRECTED MUTAGENESIS OF NEURAL CADHERIN BETWEEN DOMAIN 1 AND DOMAIN 2
8:45 PREPERATION OF HOMOCHIRALLY SIMILAR TYROSINE AND SERINE ANALOGS FROM A COMMON INTERMEDIATE
9:00 A NOVEL METHOD TO SYNTHESIZE UNNATURAL CYSTEIN ANALOGS
9:15 GRUBBS-TYPE METATHESIS CATALYSTS WITH FUNCTIONALIZED CARBENES FOR APPLICATIONS IN AQUEOUS MEDIA
9:30 REVERSIBILE INHIBITION/ACTIVATION OF GRUBBS' CATALYST
9:45 SYNTHESIS OF UNNATURAL ISOLEUCINE ANALOGS FROM A COMMON INTERMEDIATES
10:00 Break

10:15 NEW SYNTHETIC APPROACHES TO WATER-SOLUBLE RUTHENIUM-BASED SECOND GENERATION OLEFIN METATHESIS CATALYSTS
10:30 SPECIFIC DELIVERY OF ANTI-SURVIVIN SIRNA TO KB CELLS BASED ON FOLATE RECEPTOR
10:45 DOWN REGULATION OF VEGF AND VEGFR BY RNAI THROUGH CANCER-SPECIFIC DELIVERY
11:00 THE EFFECT OF ROTATIONAL ACCELERATION ON DIFFUSION BETWEEN MISCIBLE FLUIDS
11:15 THE USE OF SQUARAINE DYES AS MOLECULAR SENSORS
11:30 INVESTIGATION OF CLAY INTERCALATION/EXFOLIATION MECHANISMS IN EPOXY RESINS

Thursday Afternoon
LOCATION: Hunter Henry Ballroom A
Abstracts pp 67-77

1:30 ACYLATION OF 2-PROPENYL-2-OXAZOLINE AND SUBSEQUENT DIELS-ALDER REACTIONS
1:45 DETERMINATION OF ANTIOXIDANT CAPACITY OF HYDROXYFLAVONES AND HYDROXYCHROMONES TO FURTHER UNDERSTAND THE MECHANISM FOR PROTECTION OF WOOD AGAINST FUNGAL DECAY
2:00 DIELECTROPHORETIC FIELD AND FREQUENCY DEPENDENCE ON RED BLOOD ABO CELL TYPES
2:15 SNELL'S LAW OF REFRACTION OBSERVED IN THERMAL FRONTAL POLYMERIZATION
2:30 POLYAMMONIUM CRYPTANDS FOR ANION BINDING
2:45 PROS AND CONS OF MICROWAVE OVEN USE IN ORGANIC SYNTHESIS
3:00 Break
3:15 SMALL-ANGLE NEUTRON SCATTERING STUDY ON A STRUCTURAL CHANGE IN THE POLYMERIZATION OF THE DODECYL ACRYLATE MICROEMULSION
3:30 ELECTROCHEMICAL FORC: A NEW CYCLIC VOLTAMMETRY METHOD FOR EXAMINING PHASE TRANSITIONS
3:45 THE USE OF LASER LINE DEFLECTION TO DETERMINE THE DIFFUSIVE BEHAVIOR OF METHYL METHACRYLATE AND POLY(METHYL METHACRYLATE) FOR ISOTHERMAL FRONTAL POLYMERIZATION MODELS
4:00 EVALUATION OF PYRENE-BASED STATIONARY PHASES FOR METALLIC NITRIDE FULLERENE HPLC SEPARATIONS
4:15 THE CONTROLLED POLYMERIZATION OF NEW CATIONIC EXO-7-OXA-NORBORNENE DERIVATIVES USING COMMERCIALLY AVAILABLE GRUBB'S CATALYSTS

6:00 DIVISIONAL POSTER SESSION
LOCATION: Bost Auditorium North
Posters May Be Set up Between 4:00p and 4:30p

SOLUBILITY OF OLEIC ACID OXIDATION PRODUCTS IN SUPERCRITICAL CARBON DIOXIDE
SYNTHESIS AND CHARACTERIZATION OF SOME SCHIFF BASE COMPLEXES OF VANADIUM(V)–SIGNS OF SOME EXCITING EFFECTIVE INSULIN-LIKE PROPERTIES.
OXIDATIVE STABILITY OF CATFISH AND SOYBEAN BIODIESEL
MULTILAYER KERATIN FILMS VIA LAYER-BY-LAYER ASSEMBLY TECHNIQUE
THE REACTIONS OF 2-METHYL-4,5-DIHYDROIMIDAZOLES AND 2-METHYL-1,4,5,6-TETRAHYDROPYRIMIDINES WITH ACID CHLORIDES
THE ROLE OF SUPERACIDS IN CATALYTIC CRACKING OF OLEIC ACID
SYNTHESIS OF NATURALLY OCCURING POLYPHENOLS WITH ANTITUMOR POTENTIAL
INSPIRATION THROUGH CHEMISTRY EDUCATION
ELECTRIC-ARC PLASMA SYNTHESIS OF METALLIC NITRIDE FULLERENES
COLLOIDAL DISPERSIONS OF POLY-(METHYL METHACRYLATE/N-BUTYL ACRYLATE)
ANION BINDING BY TREN-BASED AMINE LIGAND
SYNTHESIS AND CHARACTERIZATION OF FUNCTIONAL IRON OXIDE FERROFLUIDS
ABSENCE OF AUTOACCELERATION IN AROMATIC SULFONYL AZIDES AS FREE-RADICAL INITIATORS FOR PHOTOPOLYMERIZATION
VOMM SYNTHESIS AND WATERBORNE INDUSTRIAL COATINGS
PERSISTENCE: COMPLETION OF STEM DEGREES AT AN HBCU
STUDY OF CHEMICAL COMPOSITIONS OF A NIGERIAN EDIBLE PLANT *VENONIA AMYGDALINA (VA)*

SYNTHESIS AND CHARACTERIZATION OF PHENOLIC RESIN/OCTA(AMINOPHENYL-T_8-POLYHEDRAL OLIGOMERIC SILSEQUIOXANE (POSS) HYBRID NANOCOMPOSITES
COMPARISON OF C^{13}–NMR CHEMICAL SHIFTS WITH QUANTUM CALCULATIONS
SOLUBILITY INVESTIGATIONS OF (K+, NA+, CS+)-NO3--OH-H2O SYSTEMS
MECHANISTIC STUDIES OF FREE RADICAL AZIDATION
PHOTOCHEMICAL CLEAVAGE OF DNA WITH NITROGEN ONIUM SALTS
INVESTIGATION OF THE PERFORMANCE OF COATINGS FORMULATED WITH THE REACTIVE DILUENT TETRA(2,7-OCTADIENYL) TITANATE
DEVELOPMENT OF INHIBITORS OF AGMATINASE: SYNTHESIS OF AGMATINE ANALOGUES, PIPERAZINECARBOXAMIDINE
TREATMENT OF SAWDUST WITH IONIC LIQUID: SEPARATION OF CELLULOSIC MATERIAL FROM LIGNIN
SYNTHESIS AND CHARACTERIZATION OF PH-RESPONSIVE POLYMER BRUSHES
INTERCALATIONS OF ORGANIC MOLECULES INTO CLAY MIMICS
IDENTIFICATION OF PEPTIDES THAT BIND TO ESTROGEN RESPONSE ELEMENTS: USING PEPTIDE PHAGE DISPLAY LIBRARY
PRODUCTION OF RARE-EARTH METALLIC NITRIDE FULLERENES
MISCIBILITY STUDIES OF SOLUTION BLENDED POLYPHENYLSULFONE AND POLYPHENYLENE
INTERCALATION OF THE SNI_2 LAYERED PEROVSKITE INORGANIC-ORGANIC HYBRIDS
PREPARATION AND TREATMENT OF HANFORD TANK WASTE SLUDGE
3D-QSAR ANALYSIS OF FARNESYLTRANSFERASE INHIBITION FOR ANTIMALARIAL DIAMINOBENZOPHENONES
PRODUCTION OF GREEN DIESEL THROUGH CATALYTIC CRACKING OF PHOSPHOLIPIDS
SYNTHESIS OF A SELF-ASSEMBLED, NANOSTRUCTURED POLYMER FOR ORGANIC PHOTOVOLTAIC (OPV) CELLS
INVESTIGATING THE EFFECT OF SODIUM CHLORIDE CONCENTRATION ON COMPLEX COACERVATE FORMATION WITHIN A CONCENTRATED REGIME

Friday, February 23

Friday Morning
LOCATION: Hunter Henry Ballroom A
Abstracts pp 77-80

8:00 NANO-ENCAPSULATION OF TRACE METAL IMPURITIES IN BIODIESEL
8:15 A MICROFLUIDIC STUDY OF TRANSIENT INTERFACIAL PHENOMENA IN MISCIBLE AND PARTIALLY MISCIBLE SYSTEMS
8:30 INTERCALATIONS OF LEWIS BASES INTO INORGANIC/ORGANIC HYBRID CLAY MIMICS
8:45 POST TRANSLATIONAL REGULATION OF PROLYLCARBOXYPEPTIDASE (PRCP) IN CHINESE HAMSTER OVARY (CHO) CELLS
9:00 AN ELECTROCHEMICAL STUDY OF A SCHIFF BASE COMPLEX OF VANADIUM(V) AND ITS INTERACTIONS WITH CALF THYMUS DNA IN DMSO- A SEARCH FOR NEW ANTI-CANCER AGENT
9:15 SEPARATION AND ISOLATION OF NEW METALLIC NITRIDE FULLERENES
9:30 STUDIES OF ELECTROCHEMICALLY PREPARED ION-SELECTIVE MEMBRANES WITH SECM
9:45 SCALABILITY ASSESSMENT OF THE SAFA TECHNIQUE FOR ISOLATING METALLIC NITRIDE FULLERENES
10:00 Break
10:15 SYNTHESIS OF INTERCALATIVE DNA CLEAVING REAGENTS
10:30 BINDING STUDIES OF POTENTIAL DNA INTERCALATORS
10:45 KINETIC AND MECHANICAL ANALYSIS OF NANO-GOLD-THIOL-ENE COMPOSITE FILMS
11:00 MECHANISM OF LIGHT-RESPONSIVE POLYMER-FULLERENE ADHESIVES
11:15 PEEL AND TACK FORCE ANALYSIS OF RUBBER-BASED PRESSURE SENSITIVE ADHESIVES

Friday Afternoon
LOCATION: Hunter Henry Ballroom A
Abstracts pp 80-82

1:15 STUDY OF DEGRADATION OF ORGNAOPHOSPHORUS PESTICIDES IN NATURAL W ATERS AND TOXICITY OF TRANSFORMATION PRODUCTS

1:30 HAZARD ASSESSMENT OF DRINKING WATER IN THE DELTA
1:45 SELECTIVE PHOSPHATE ESTER CLEAVAGE IN PHOSPHOLIPIDS
2:00 DEVELOPMENT OF RENEWABLE POLYMERS FROM 1,3-PROPANE DIOL AND MALONIC ACID
2:15 Break
2:30 COMPARISON OF STORAGE STABILITY OF CATFISH BIODIESEL WITH AND WITHOUT ANTIOXIDANT
2:45 SYNTHESIS, CHARACTERIZATION OF TRIS(2,2'-BIPYRIDYL)RUTHENIUM(II)-LOADED MICROCAPSULES AND THEIR BI0-RELATED APPLICATIONS BASED ON ELECTROGENERATED CHEMILUMINESCENT (ECL) DETECTION
3:00 ADVANCES TOWARD BIOLOGICALLY ACTIVE CORE-SHELL FERROFLUIDS
3:15 DIVISIONAL AWARDS PRESENTATION

ECOLOGY AND EVOLUTIONARY BIOLOGY

Thursday, February 22

Thursday Afternoon
LOCATION: Hunter Henry Executive Room 8
Abstracts pp 82-84

1:30 AVIAN RESPONSES TO PRESCRIBED FIRE AND SELECTIVE HERBICIDES IN INTENSIVELY MANAGED PINE OF MISSISSIPPI
1:45 CYTOTOXICITY AND GENOTOXICITY OF BENZO[A]PYRENE AND ITS ENZYMATIC DEGRADATION INTERMEDIATES IN HACAT AND A3 CELLS
2:00 DO ABUNDANCE AND DISTRIBUTION EXPLAIN YEAR-TO-YEAR INCONSISTENCIES IN BIRD-LANDSCAPE RELATIONS?
2:15 Break
2:30 FERAL HOGS IN MISSISSIPPI: HABITAT SELECTION AND SURVIVAL
2:45 PARASITISM OF SABAL MINOR BY CARYOBRUCHUS GLEDITSIAE IS INTRODUCED IN MISSISSIPPI.
3:00 THE EFFECT OF NUTRIENT LEVELS ON GENDER EXPRESSION IN GAMETOPHYTES OF CERATOPTERIS RICHARDII.
3:15 COMPARATIVE POPULATION DYNAMICS OF *PEROMYSCUS LEUCOPUS* IN NORTH AMERICA: A SPATIAL GRADIENT OF CLIMATE, ACORN PRODUCTION, AND DENSITY DEPENDENCE
3:30 **DIVISIONAL BUSINESS MEETING**

6:00 **DIVISIONAL POSTER SESSION**
LOCATION: Bost Auditorium North
Posters May Be Set up Between 4:00p and 4:30p

CAMPUS LANDSCAPING CAN BE MORE ENVIRONMENTALLY SOUND
SOCIAL BEHAVIOR OF SMILISCA BAUDINII

GEOLOGY AND GEOGRAPHY

Friday, February 23

Friday Morning
LOCATION: Hunter Henry Brunson
Abstracts pp 85-86

9:00 HYDROGEOLOGIC ASSESSMENT OF A PROPOSED RESERVOIR SITE, SMITH COUNTY, MISSISSIPPI
9:20 DETERMINING THE POTENTIAL FOR DIRECT RECHARGE IN THE MISSISSIPPI RIVER ALLUVIAL AQUIFER USING SOIL CORE ANALYSES, WASHINGTON CO., MS
9:40 NON-POINT SOURCE CONTAMINATION OF WETLAND SEDIMENT, LEFLUER'S BLUFF STATE PARK, JACKSON, MS

10:00 THE GEOLOGY AND HYDROLOGY OF A PROPOSED IMPOUNDMENT OF THE UPPER SAND CREEK, CHOCTAW COUNTY, MISSISSIPPI
10:20 Break
10:40 THE TOMBIGBEE RIVER TERRACE SYSTEM
11:00 PRE- POST KATRINA BACTERIAL POLLUTION OF THE MISSISSIPPI SOUND
11:20 POSTER: LOESS CAVES OF VICKSBURG

Friday Afternoon
LOCATION: Hunter Henry Brunson
Abstracts pp 87-88
1:30 HOUSING THE STATE GEOLOGICAL SURVEY
1:50 THE GEOLOGY OF MISSISSIPPI; A DVD PUBLICATION STATUS REPORT
2:10 THE DEFINING OF CITRONELLE SURFACES IN SOUTH MISSISSIPPI AND THE SURFACE EXPRESSION OF RUTH SALT DOME
2:30 GRAVEL PETROLOGY OF THE PRE-LOESS TERRACE DEPOSITS
3:10 LATE CRETACEOUS ECHINODERMS IN THE CENTRAL GULF STATES: AN UPDATE
3:30 EARLY CENOMANIAN PALEOCLIMATOLOGY AND PEDOGENIC PROCESSES IN THE NORTH AMERICAN WESTERN INTERIOR BASIN
3:50 DIVISIONAL BUSINESS MEETING

HEALTH SCIENCES

Thursday, February 22

Thursday Morning
LOCATION: Bost Auditorium North
Abstracts pp 89-97
Session I: Oncology Research
8:00 Opening Remarks
8:15 PHENOXAZINES INHIBIT AKT AND INDUCE APOPTOSIS IN CANCER CELLS
8:30 COMPARISON OF POTENTIAL CHEMOTHERAPEUTIC AGENTS, 5-FLUORURACIL, GREEN TEA, AND THYMOQUINONE ON COLON CANCER CELLS
8:45 POTENTIAL EFFECT OF Â-ESTRADIOL IN HUMAN JURKAT T-CELLS
9:00 COMPARISON OF GENE EXPRESSION IN MALIGNANT GASTRIC AND ENDOMETRIAL TUMORS
9:15 PHARMACOPHORE MODEL FOR ANTIMALARIAL FARNESYLTRANSFERASE INHIBITION
9:30 Break
9:45 Session II: Posters
THE EFFECTS OF H2O2 ON CELL VIABILITY, CELLULAR MORPHOLOGY AND CELLULAR MEMBRANE DAMAGE USING TYPE II PNEUMOCYTES
THE EFFECTS OF SUSTAINED DELIVERY OF IGF-1 ON KIDNEY AND TESTICULAR TISSUES USING ADULT MALE RATS AS A MODEL
PASSIVE IMMUNIZATION WITH PNEUMOLYSIN ANTISERUM AS TREATMENT FOR *STREPTOCOCCUS PNEUMONIAE* KERATITIS
INFLUENCE OF TERMINALIA CHEBULA ON PHARMACODYNAMIC AND PHARMOCOKINETICS OF GLICLAZIDE IN NORMAL AND DIABETIC RATS
SYNTHESIS AND CHARACTERIZATION OF DIORGANOTIN(IV) COMPLEX OF 2-ACETYLPYRAZINE N(4) –3-THIOSEMICARBAZONE
SURVIVAL RESPONSES OF A549 AND MRC-5 CELLS TO D- GLUCOSE AND D-FRUCTOSE DIPHOSPHATE EXPOSURE
AGE-RELATED DIFFERENCES IN DETOXICATION AND ACUTE TOXICITY LEVELS OF THREE ORGANOPHOSPHATE COMPOUNDS IN RATS
SEX DIFFERENCES IN ANGIOTENSIN-II INDUCED HYPERTENSION
INFLUENCE OF GENDER, ETHNIC, AND SOCIOECONOMIC FACTORS ON PATIENTS WITH EPILEPSY
THE OZONE LAYER - EARTH'S NATURAL SUNSCREEN
THE EFFECTS OF CORTISOL ADMINISTRATION ON PHOSPHOLIPID PROFILES, CELLULAR VIABILITY, AND CELLULAR MORPHOLOGY USING TYPE II PNEUMOCYTES

THE ROLE OF CAV 1.3 IN MECHANOTRANSDUCTION
INDUCTION OF VESTIBULAR DAMAGE IN THE RATS VIA INTRA-TYMPANIC OR TRANS-BULLAR APPLICATIONS OF AMINOGLYCOSIDES
IMPACT OF ALF-1 AND IL-18 GENE POLYMORPHISMS ON REJECTION EPISODES AND CORONARY VASCULOPATHY AFTER CARDIAC TRANSPLANTATION
INTERFERON-B ANTI-VIRAL THERAPY INDUCED TYPE II DIABETES
NEUTRALIZATION OF *STREPTOCOCCUS PNEUMONIAE* PNEUMOLYSIN BY ANTI-PNEUMOLYSIN IMMUNO-GLOBULIN G
CHARACTERIZATION OF PEDIATRIC PNEUMOCOCCAL OTITIS MEDIA ISOLATES
IDENTIFICATION OF RRP2-CONTROLLED MAMMALIAN INFECTION ASSOCIATED PROTEINS IN BORRELIA BURGDORFERI
EFFECTS OF CHLORPYRIFOS AND METHYL PARATHION ON CHOLINESTERASE AND MUSCARINIC ACETYLCHOLINE RECEPTOR IN YOUNG RAT BRAINS
SURVIVAL RESPONSES OF A549 AND MRC-5 CELLS TO SODIUM ASCORBATE AND SODIUM BICARBONATE EXPOSURE
THE ROLE OF VISUAL CUES IN THE LINEAR ACCELERATION-INDUCED BLOOD PRESSURE CHANGES IN RATS
CHRONIC BLOCKADE OF VEGFR-2 REVEALS NEGATIVE FEEDBACK REGULATION OF VEGF IN EXERCISING MUSCLES OF MICE

Session III: Nursing Education

11:15 Introduction
11:30 GENERATIONAL AGE DIFFERENCES IMPACT THE COLLEGE CLASSROOM
11:45 PREDICTORS OF SUCCESS AND ATTRITION RATES IN AN ASSOCIATE DEGREE NURSING PROGRAM IN MISSISSIPPI

Thursday Afternoon
LOCATION: Bost Auditorium North
Abstracts pp 97-99

Session IV: Drug Delivery Symposium

1:15 EFFECTS OF SUSTAINED DELIVERY OF EPIGALLOCATECHIN-3-GALLATE, THYMOQUINONE, AND TANNIC ACID ON LNCAP CELLS
1:45 THE EFFECTS OF SUSTAINED ADMINISTRATION OF GROWTH FACTORS ON TRAUMATIZED DISC USING THE ADULT MALE RAT AS A MODEL
2:15 COMPARATIVE EFFECTS OF CORTISOL ON KIDNEY TUBULE EPITHELIAL CELL USING CELL CULTURE AND ANIMAL STUDIES
2:45 Break

Session V: Health Research

3:00 BLOOD PRESSURE IS NOT SALT SENSITIVE IN OBESE DOGS
3:15 TB DIAGNOSTIC USING EPITOPE PEPTIDE COUPLED WITH SPACER TECHNOLOGY IN AN ENHANCED ELISPAC DETECTON SYSTEM
3:30 THE EFFECT OF ELLAGIC ACID ADMINISTERED INTRAPERITONEALLY AND ORALLY IN *TRYPANOSOMA LEWISI* INFECTED RATS
3:45 OZONE DEPLETION AND ITS POTENTIAL EFFECTS

Friday, February 23

Friday Morning
LOCATION: Bost Auditorium North
Abstracts pp 100-101
8:30 HEALTH FAIR
10:30 Poster Session

TISSUE TRANSGLUTAMINASE DEPENDENT AND INDEPENDENT INTERACTION OF CALCIUM BINDING PROTEIN CALBINDIN D28K WITH ATAXIN-1
METABOLIC EFFECTS OF FRUCTOSE 1,6-BISPHOSPHATE IN NORMOXIC AND HYPOXIC STATES OF MG63 OSTEOSARCOMA CELLS

ANALYSIS OF MULTIPLE MEDWATCH AND ADDEERS FORMS OF CLINICAL RESEARCH TRIALS AND ADVERSE EVENT OUTCOMES OF STUDY DRUGS AND DETERMINATION OF RELATIONSHIP TO STUDY DRUG

COMPARISON OF TWO DIFFERENT FIXATION TECHNIQUES FOR A SEGMENTAL DEFECT IN A RAT FEMUR MODEL

EXPERIMENTAL RESEARCH FOR DEVELOPING A NOVEL BANDAGE ADHESIVE THAT DEGENERATES UNDER WHITE LIGHT

Friday Afternoon
LOCATION: Bost Auditorium North
Abstracts pp 101-109
1:15 Poster Session

HISTOPATHOPHYSIOLOGICAL COMPARISON OF MALE AND FEMALE HEART TISSUE FOLLOWING SUSTAINED RELEASE OF SUPRAPHYSIOLOGICAL LEVELS OF CORTICOSTEROID

IDENTIFICATION AND APPLICATION OF EFFECTIVE EARLY LITERACY PRACTICES FOR DEAF CHILDREN

ARTERIAL STIFFNESS IN ADOLESCENTS EITH TYPE II DIABETES AT RISK FOR CARDIOVASCULAR DISEASE (CVD)

EXAMINING TRAUMA-INDUCED CLINICAL COMPLICATIONS IN THE CONTEXT OF SOCIAL AND HEALTH DISPARITIES

THE EFFECTS OF SYNTHETIC BONE GRAFTING MATERIALS ON THE VIABILITY AND MORPHOLOGY OF MG-63 OSTEOBLAST LIKE CELLS

MONITORING FLEA CONTROL INSECTICIDE (CHLORPYRIFOS, TETRACHLORVINPHOS, AND PERMETHRIN) EXPOSURE LEVELS FROM THE FUR OF TREATED DOGS

SEASONAL VARIATION IN ANTI-CCV SERUM ACTIVITY IN CHANNEL CATFISH: IMPLICATION FOR BROOD-STOCK SCREENING

BUTORPHANOL-INDUCED NEURONAL ACTIVATION WITHIN THE PARAVENTRICULAR NUCLEUS (PVN) OF THE HYPOTHALAMUS AND RESULTING ACTIVATION OF THE HYPOTHALAMIC-PITUITARY-ADRENAL (HPA) AXIS

SELECTIVE HUMAN MELANIN-CONCENTRATING HORMONE RECEPTOR 1 AND MELANIN-CONCENTRATING HORMONE RECEPTOR 2 ANTAGONISTS FOR THE TREATMENT OF METABOLIC DISEASES

DEVELOPMENT OF A MODEL FOR ALCOHOLIC LIVER DISEASE

INTRAOPERATIVE EVALUTION OF FEMORAL HEAD VASCULARITY DURING OPEN REDUCTION AND INTERNAL FIXATION OF ACETABULAR FRACTURES

COMPARISON OF WATER SOLUBLE AND LIPID SOLUBLE ANTIOXIDANTS AS SCAVENGERS IN A HYPOXANTHINE-XANTHINE-OXIDASE AND LIPID RADICAL GENERATING SYSTEMS

HISTOLOGICAL AND RADIOGRAPHIC COMPARISON OF ALLOGRAFT SUBSTITUTES USING A CONTINUOUS DELIVERY MODEL IN SEGMENTAL DEFECTS

COMPARISON BETWEEN THE EFFECTS OF MEVINOLIN, ALENDRONATE, AND PARATHYROID HORMONE ON MG63 OSTEOBLAST-LIKE CELLS

ANALYSIS OF PESTICIDE EXPOSURE AND RISK OF BREAST CANCER MORTALITY IN MISSISSIPPI

ASSOCIATION OF MRI-DEFINED SUBCLINICAL CEREBROVASCULAR DISEASE AND TRANSIENT ISCHEMIC ATTACK-STROKE SYMPTOMS: THE ARIC STUDY

THE EFFECTS OF SUSTAINED DELIVERY OF CORTICOSTEROIDS ON THE ADRENAL GLAND OF FEMALE RATS

DOES YOUR IMMUNE SYSTEM HAVE STIPES? INVESTIGATING THE SIMILARITIES AND DIFFERENCES BETWEEN THE IMMUNE SYSTEM OF MAN AND ZEBRAFISH

THE EFFECTS OF FRUCTOSE-1,6-BISPHOSPHATE ON CELLULAR ATP LEVEL AT REDUCED OXYGEN LEVELS

THE EFFECT OF DAKIN'S SOLUTION ON COLLAGEN AND CELL MIGRATION

ANALYSIS OF THE 16S-23S INTERGENIC SPACER REGION OF FLAVOBACTERIUM COLUMNARE

THE EFFECTS OF DEFEROXAMINE ON THE SURVIVAL OF FREE FLAPS USING THE ADULT MALE RAT AS A MODEL

THE EFFECTS OF MULTIPLE RADIATION EXPOSURE TO MRC-5 FIBROBLAST CELLS IN CULTURE

IMMUNIZATION WITH PSPA INCORPORATED INTO A POLY(ETHYLENE OXIDE) MATRIX ELICITS PROTECTIVE IMMUNITY AGAINST *STREPTOCOCCUS PNEUMONIAE*

2:15 DIVISIONAL BUSINESS MEETING

HISTORY AND PHILOSOPHY OF SCIENCE

Friday, February 23

Friday Morning
LOCATION: Hunter Henry Executive Room 8
Abstracts pp 109-110

8:30 DOES SCIENCE CONTRIBUTE TO PEACE?
9:00 CAN MATHEMATICS, COMPUTER SCIENCE, AND STATISTICS HELP US UNDERSTAND WHETHER FAITH AND REASON CAN INTERACT
9:30 THE STRUCTURE OF PHYSICAL OBJECTS AND THE *DESCARTES-MINUS* ARGUMENT
10:00 Break
10:15 THE *DAUBERT* TEST AND THE EVOLUTION OF AMERICAN LAW: MELDING LEGAL PRECENDENT WITH SCIENTIFIC DEVELOPMENT
10:45 CLEMENTS VS GLEASON REVISITED
11:15 WHAT IS AN 'ORGANISM'? ENTIFICATION AND DELINEATION IN BIOLOGY

Friday Afternoon
LOCATION: Hunter Henry Executive Room 8
Abstracts pp 111-112

1:15 DIVISIONAL BUSINESS MEETING
1:30 PHYLOCODE: A CONTROVERSIAL ALTERNATIVE TO THE LINNAEAN SYSTEM.
2:00 PHILOSOPHICAL AND PRACTICAL IMPLICATIONS OF TRADITIONAL LINNAEAN NOMENCLATURE AND THE RECENTLY PROPOSED PHYLOCODE
2:30 HIERARCHICAL APPROACHES TO SYSTEMATICS
3:00 BIOLOGICAL SPECIES CONCEPTS: PHILOSOPHICAL AND BIOLOGICAL APPROACHES
3:30 ESSENTIALISM RECAST: DELINEATING BIOLOGICAL SPECIES
4:00 BIOLOGICAL IDENTITY AND PERSISTENCE: THE THESIS OF SORTAL DEPENDENCY OF INDIVIDUATION

MARINE AND ATMOSPHERIC SCIENCES

Friday, February 23

Friday Morning
LOCATION: Bost Auditorium North
Abstracts pp 113-115

10:30 Poster Session

MEASUREMENTS OF SOLAR IRRADIANCE WITH A MULTIFILTER ROTATING SHADOWBAND RADIOMETER (MFRSR)
CHRONIC ACCUMULATION PROFILE OF CADMIUM, LEAD, AND MERCURY IN GOLDFISH
FALL POST-LARVAL PENAEID SHRIMP IMMIGRATION INTO A MISSISSIPPI ESTUARY
THE POTENTIAL OF MISSISSIPPI MESONET DATA TO DETECT CERTAIN TYPES OF FOG BASED ON MULTI-PARAMETER PROXIES
MAPPING A NEW ENERGY SOURCE
AGE AND GROWTH OF BOTTLENOSE DOLPHIN (TURSIOPS TRUNCATUS) IN MISSISSIPPI AND ADJACENT GULF OF MEXICO WATERS
COMPARISON OF SAMPLE DISSOLUTON METHODS FOR ANALYSIS OF SOIL AND SEDIMENTS FOR HEAVY METALS
COMPARATIVE EVALUATION OF METAL CONCENTRATIONS IN VARIOUS PONDS IN MISSISSIPPI

Friday Afternoon
LOCATION: Hunter Henry Executive Room 12
Abstracts pp 115-117

1:00 TRACE ELEMENT BEHAVIOR IN THE MISSISSIPPI RIVER PLUME AFTER HURRICANES KATRINA AND RITA
1:20 SUDDEN NOCTURNAL WARMING EVENTS AS OBSERVED BY THE MISSISSIPPI MESONET
1:40 PERFORMANCE OF COLLISION CELL ICP-MS FOR DETERMINATION OF IRON FROM FISH OTOLITHS
2:00 DIEL CYCLING IN IRON SPECIATION IN THE PEARL RIVER, MISSISSIPPI
2:20 Break
2:40 DETECTION OF HYPOXIC CONDITIONS IN THE MISSISSIPPI BIGHT IN THE SUMMER OF 2006
3:00 EFFECTS OF SITE, SEASON, AND DEPTH IN SEDIMENT ON THE ABUNDANCE OF LIVE FORAMINIFERA IN TWO NORTHERN GULF OF MEXICO MARSHES
3:20 DEPTH-INDUCED VARIATION IN HYPERSPECTRAL REFLECTANCE SIGNALS OF AQUATIC VEGETATION
3:40 GUT MICROBIAL COMMUNITIES IN THE ESTUARINE BIVALVES *GEUKENSIA DEMISSA* AND *CRASSOSTREA VIRGINICA*
4:00 DIVISIONAL BUSINESS MEETING

MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Thursday, February 22

Thursday Morning
LOCATION: Hunter Henry Executive Room 12
Abstracts pp 117-118

9:30 COMPILED ENGLISH
10:00 SUITABILITY OF ENVIRONMENTS FOR NOVICE JAVA PROGRAMMERS
10:30 NETWORK ROUTING AND THE IMPLEMENTION OF UNIT/TASK SCHEDULING SOLUTIONS
11:00 NETWORK FIREWALLS SECURITY
11:30 A CREDIBILITY-BASED SECURE SOURCE ROUTING PROTOCOL FOR WIRELESS AD HOC NETWORKS

Thursday Afternoon
LOCATION: Hunter Henry Executive Room 12
Abstracts pp 119-120

1:00 THE USE OF LIMITERS IN STOCHASTIC INTERPOLATION
1:30 EFFICIENT SUPPORT VECTOR MACHINES THROUGH PARALLEL COMPUTING
2:00 THE SECOND DERIVATIVES OF THE CHEBYSHEV POLYNOMIALS, T_N, IN TERMS OF T_N
2:30 OBSERVING STATISTICS FROM A SCIENTIFIC DATA STANDPOINT
3:30 SOLUTION OF MAXWELL'S' EQUATIONS WITHIN A 3 DIMENSIONAL MULTI-BLOCKED CURVILINEAR DOMAIN
4:00 EXISTENCE THEOREM OF ELLIPTIC SYSTEMS WITH SINGULARITIES INVOLVING SOBOLEV OR SOBOLEV-HARDY CRITICAL EXPONENTS

6:00 **DIVISIONAL POSTER SESSION**
LOCATION: Bost Auditorium North
Posters May Be Set up Between 4:00p and 4:30p

GESTALT PRINCIPLES APPLIED TO SOFTWARE- ENGINEERING DIAGRAMS: AN INITIAL STUDY
ONTOLOGY ENGINEERING: METADATA MANAGEMIENT IN A RAPID PROTOTYPING CAPABILITY FOR NASA EARTH SCIENCES
AN ANALYSIS OF TEST COVERAGE FOR THE RULE BASED SYSTEM, LOCI

Friday, February 23

Friday Morning
LOCATION: Hunter Henry Executive Room 12
Abstracts pp 120-121

9:00 USING ALICE TO DECREASE ATTRITION IN CS1
9:30 E-SERVICING: THE USES AND IMPORTANCE OF THE NEW IEEE STANDARD
10:00 A BLUEPRINT FOR AN RFID SMART FLOOR FOR EFFICIENT SHIPYARD ASSEMBLY YARD INVENTORY TRACKING
10:30 WIRELESS SENSOR-BASED LOCATION FOR MANUFACTURING
11:00 **BUSINESS MEETING**

Friday Afternoon
LOCATION: Bost Auditorium South
Abstract p 121

1:15 MISSISSIPPI CENTER FOR SUPERCOMPUTING RESEARCH (MCSR) USER ADVISORY GROUP MEETING, POSTER SESSION, AND SPECIAL SUBSESSION ON SUPERCOMPUTING

PHYSICS AND ENGINEERING

Thursday, February 22

Thursday Morning
LOCATION: Bost Theater
Abstracts pp 122-125

8:00 SURPRISED! SURPRISED! CT SCANS IN MANUFACTURING PLANTS
8:15 COMPARISON OF GENETIC ALGORITHM VERSUS PARTICLE SWARM OPTIMIZATION IN THE ADAPTIVE NULLING OF PHASED ARRAY ANTENNAS
8:30 WHY WE NEED STRING THEORY FOR THE UNIVERSE?
8:45 SUPERSTRING THEORY AND THE UNIVERSE
9:00 EFFECTS OF NONPLANARITY ON SECONDARY FLOWS IN THE SMALL BRONCHIAL TUBES
9:15 PARTICIPATING IN DOD RESIDENTIAL PROTON EXCANGE MEMBRANE (PEM) FUEL CELL(FC) PROJECT BY ALCORN STATE UNIVERSITY AND THE PARAMETRIC STUDY OF PEM-FC OPERATION
9:30 MECHANISM OF DYNAMIC RECRYSTALLIZATION DURING THE FRICTION STIR WELD PROCESS
9:45 Break
10:00 THE DIPOLE VORTEX
10:15 SIMULATION AND PERFORMANCE EVALUATION OF BEST HOPPING SEQUENCE SELECTION PROTOCOL FOR INCREASING BATTERY LIFE OF UNMANNED AIRBONE VEHICLES
10:30 CIRCUIT MODEL AND FULL WAVE ANALYSIS OF A COMPACT WIDEBAND QUARDARTUE HYBRID
10:45 LASER-INDUCED FLUORESCENCE SPECTROSCOPY INVESTIGATION OF URANYL COMPOUNDS
11:00 A PARTITIONED LOOP ANTENNA WITH OMNIDIRECTIONAL PERFORMANCE AT 5.8 GHZ
11:15 MODAL ANALYSIS OF METAMATERIAL SLAB WAVEGUIDES
11:30 POWER GENERATION WITH A LOW TEMPERATURE DIFFERENCE STIRLING ENGINE
11:45 THE STATISTICS OF ACOUSTIC BACKSCATTER FROM THE SEAFLOOR

Thursday Afternoon
LOCATION: Bost Theater
Abstracts pp 126-131

1:15 DESIGN OF SINGLE AND DUAL BAND CIRCULARLY POLARIZED MICROSTRIP PATCH ANTENNAS
1:30 PERMITTIVITY MEASUREMENT IN CUSTOM-SIZED WAVEGUIDE FIXTURES

1:45 WIDEBAND DESIGNS OF ARTIFICIAL MAGNETIC CONDUCTORS USING FREQUENCY SELECTIVE SURFACES FOR LOW PROFILE ANTENNA APPLICATIONS
2:00 STUDY OF ARRAY CHARACTERISTICS OF A 2D PHASED ARRAY ANTENNA USING DIGITAL PHASE SHIFTERS
2:15 COMPETITIVE GROWTH PROCESSES AND ITS APPLICATIONS
2:30 COMPACT ARTIFICIAL MAGNETIC CONDUCTOR DESIGN USING SPIRAL GEOMETRIES
2:45 Break
3:00 TAGUCHI'S METHOD FOR OPTIMIZING MICROWAVE FILTERS
3:15 DETERMINATION OF WALKING HUMAN BACK FREQUENCY USING BAYESIAN PARAMETER ESTIAMTION
3:30 RADIATING CHARACTERISTICS OF DIPOLE ANTENNAS IN THE PRESENCE OF OBSTACLES USING THE ITERATIVE MULTRI-REGION TECHNIQUE
3:45 SCATTERING OF OBLIQUELY INCIDENT PLANE WAVE FROM AN ARRAY OF CIRCULAR DIELECTRIC CYLINDERS
4:00 THE QWEAK EXPERIMENT AND SEARCH FOR PHYSICS BEYOND THE STANDARD MODEL
4:15 SPECTROSCOPIC METHODS FOR IDENTIFYING BACTERIA CELLS

6:00 **DIVISIONAL POSTER SESSION**
LOCATION: Bost Auditorium North
Posters May Be Set up Between 4:00p and 4:30p

INVESTIGATION OF RFID SYSTEM PERFORMANCE IN MULTIPLE-TAG ENVIRONMENTS
DYNAMIC FOCUSING OF AWARENESS IN ADAPTIVE FUZZY CONTROL SYSTEMS
SEARCH FOR WOBBLING AND TRIAXIAL STRONGLY DEFORMED(TSD) STRUCTURES IN ^{171}HF AND ^{172}HF
MULTISCALE ANALYSIS OF A MAGNESIUM CORVETTE ENGINE CRADLE
DESIGN AND FABRICATION OF A MICROSTRIP TRL CALIBRATION KIT FOR MEASUREMENT OF RF COMPONENTS
DESIGN AND MEASUREMENT OF MICROWAVE CIRCUITS FOR A 2.45 GHZ RECEIVER
THE USE OF GRAPHICS PROCESSING UNITS TO ACCELERATE LINEAR ALGEBRA OPERATIONS FOR ELECTROMGNETICS SIMULATION
PERMITTIVITY AND LOSS TANGENT EXTRACTION OF COMPOSITE MATERIALS USING OPTIMIZATION TECHNIQUES
DESIGN, FABRICATION AND TESTING OF AN RF POWER AMPLIFIER
CAN FLOW CONTROL DEVICES SIGNIFICANTLY REDUCE DRAG?
THE ROLE OF MACROMOLECULES AND FIBRILS IN TENDON MECHANICS

Friday, February 23

Friday Morning
LOCATION: Bost Theater
Abstracts pp 132-135

8:00 QUANTITATIVE DESCRIPTION AND PERFORMANCE ANALYSIS OF A RECTANGULAR LOOP NANOWIRE ANTENNA
8:15 NANO- BIO OPTICAL FIBER SENSORS FOR HUMAN BREAST CANCER CELLS AND DNA DETECTION BASED ON LASER INTUCED FLUORESCENCE
8:30 SLURRY PRODUCT ANALYSIS WITH LASER INDUCED BREAKDOWN SPECTROSCOPY
8:45 TEMPERATURE SENSING USING FIBER GRATING LOOP RINGDOWN TECHNIQUE
9:00 SOOT MEASUREMENT IN A HYDROCARBON ROCKET ENGINE WITH LASER INDUCED INCANDESCENCE
9:15 ADAPTIVE POWER CONTROL PROTOCOL FOR MULTI¬CARRIER WIRELESS COMMUNICATION SYSTEMS
9:30 PASSIVE MICROSTRIP RESONATOR FOR CHIPLESS RFID TAGS
9:45 Break
10:00 SUPERHEAVY NUCLEI: A SEARCH FOR ISLAND OF STABILITY
10:15 SMALL WORLD CARBON NANOMATERIALS: DENSITY FUNCTIONAL THEORY SIMULATIONS

10:30 PROBABILITY OF ERROR BASED CHANNEL STATE DETECTION PROTOCOL FOR UPDATING CHANNEL STATE INFORMATION IN WIRELESS COMMUNICATION SYSTEMS
10:45 THE SEARCH FOR A COSMOLOGICAL STANDARD CLOCK IN GAMMA-RAY BURST TIME PROFILES
11:00 SMALL-SIZE DOUBLE SIDED ROUNDED BOW-TIE ANTENNA ARRAYS FOR UWB APPLICATIONS
11:15 LASER RAMAN OPTICAL SENSOR FOR MONITORING QUALITY OF LIQUID OXYGEN
11:30 METALLIC PHASES IN ONE DIMENSIONAL MOLECULAR CONDUCTORS
11:45 PERFORMANCE ANALYSIS OF WIDEBAND MULTI-STANDARD SOFTWARE DEFINED RADIO BASE STATION RECEIVERS WITH INTER MODULATION DISTORTION

Friday Afternoon
LOCATION: Bost Theater
Abstracts pp 135-139

1:00 EFFECTS OF MECHANICAL STRAIN ON RAT BONE MARROW CELLS GROWN ON TITANIUM VERSUS THERMANOX
1:15 VERY SMALL ULTRA-WIDEBAND DOUBLE-SIDED EXPONENTIALLY TAPERED SLOT ANTENNA ARRAYS
1:30 SEAWULF: DESIGN OF A BEOWULF CLUSTER FOR THE PROCESSING OF SEISMIC DATA
1:45 STUDY ON THE WALL INSULATION IN INVERTER-FED DRIVE
2:00 SIMULATION AND PERFORMANCE EVALUATION OF PATH LOSS RECOVERY PROTOCOL FOR UNMANNED AIRBONE VEHICLE
2:15 DEVELOPMENT AND TESTING OF MEAM POTENTIAL FOR AL-MG ALLOYS
2:30 LIGHT FROM A DOPPLER-BROADENED GAS OF ATOMS
2:45 MOLECULAR DYNAMICS SIMULATIONS OF CRACK NUCLEATION NEAR NANOPARTICLE INCLUSIONS
3:00 Break
3:15 GAMMA RAY BURST HARDNESS AS A FUNCTION OF TIME AND INTENSITY
3:30 HIGH-K BANDS AND GAMMA-RAY DIRECTIONAL ANGULAR CORRELATION MEASUREMENTS IN ^{168}HF
3:45 IMPROVING THE VARABILITY-LUMINOSITY CORRELATION FOR GAMMA-RAY BURSTS
4:00 MOLECULAR DYNAMICS SIMULATION OF SINTERING OF NANOPOWDERS
4:15 DC PROTECTION FOR NAVAL SHIPBOARD POWER SYSTEMS
4:30 DEVELOPMENT OF AN ADAPTIVE PROTECTION SCHEME FOR NAVAL SHIPBOARD POWER SYSTEMS
4:45 INTELLIGENT PLACEMENT OF METERS FOR SHIPBOARD SYSTEM ANALYSIS
5:00 DIVISIONAL BUSINESS MEETING

PSYCHOLOGY AND SOCIAL SCIENCES

Thursday, February 22

Thursday Morning
LOCATION: Hunter Henry Brunson
Abstracts pp 139-141
Session 1: the Psychological and Social Impacts of Hurricane Katrina

8:30 HURRICANE KATRINA AS A NATURAL EXPERIMENT OF 'CREATIVE DISTRUCTION' : THE LONG-TERM SOCIOECONOMIC IMPACTS TO THE GULF COAST
8:50 COLLEGE STUDENTS' EXPERIENCES WITH HURRICANE KATRINA: A COMPARISON BETWEEN STUDENTS FROM MISSISSIPPI STATE UNIVERSITY AND THREE NEW ORLEANS UNIVERSITIES
9:10 THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN THE RESILIENCE OF EDUCATIONAL INSTITUTIONS IN THE WAKE OF HURRICANE KATRINA
9:30 Discussion
9:45 Break

Session 2: Factors Affecting Student Performance

10:00 HOW DOMESTIC VIOLENCE AFFECTS A STUDENT'S ABILITY TO MAINTAIN AN ACADEMIC PROGRAM
10:20 CORPORAL PUNISHMENT, PARENTAL ACCEPTANCE AND PSYCHOLOGICAL ADJUSTMENT OF YOUNG ADULTS
10:40 EFFECTS OF INTIMATE PARTNER ACCEPTANCE AND PARENTAL ACCEPTANCE ON PSYCHOLOGICAL ADJUSTMENTS OF COLLEGE STUDENTS
11:00 ACADEMIC SUCCESS AND PERSONALITY TRAITS IN UNDERGRADUATES
11:20 Discussion

Thursday Afternoon
LOCATION: Hunter Henry Brunson
Abstracts pp 141-143
Session 3: Internal and External Factors Affecting Behavior

1:30 A SURVEY OF TOBACCO USAGE AND INFLUENCE PATTERNS IN A HIGH SCHOOL AND COMMUNITY COLLEGE
1:50 DEMOGRAPHICS AND LOCAL UNDERGRADUATE NORMS FOR THE 'BIG 5' PERSONALITY TRAITS AND IPIP SCALES
2:10 PERSONALITY TRAITS ASSOCIATED WITH POOR IMPULSE CONTROL IN UNDERGRADUATES
2:30 SOCIAL SKILLS AND PERSONALITY TRAITS IN UNDERGRADUATES
2:50 Discussion
3:00 Break
3:20 Poster Session

REVIEW OF CAREGIVER BURDEN INTERVENTIONS FOR CAREGIVERS OF PATIENTS WITH PTSD
SURVIVING "JUNGLE FEVER": AN EXPLORATION OF INTERRACIAL COUPLES' STRATEGIES FOR COMBATING RACISM
RELEASE OF ENDOGENOUS CYTOKINES IN RESPONSE TO FOOD RESTRICTION

3:50 Divisional Business Meeting

SCIENCE EDUCATION

Thursday, February 22

Thursday Morning
LOCATION: Hunter Henry Ballroom B
Abstracts pp 143-146

8:00 EMERGING INFECTIOUS CURIOSITY IN HIGH SCHOOL SCIENCE STUDENTS
8:15 A REVIEW OF THE CENTRAL GULF COAST REGIONAL OCEAN SCIENCES BOWL KNOWN AS THE *HURRICANE BOWL*
8:30 ESTABLISHMENT OF A VOLUNTARY COLLEGE EXERCISE PROGRAM
8:45 RURAL BIOMEDICAL INITIATIVE (RBI): RURAL STUDENTS BECOMING CONFIDENT SCIENTIFIC THINKERS
9:00 Break
9:15 IS IT A CRIME WHEN SCHOOL IS MAKING ME SICK
9:30 YES, VIRGINIA, THERE ARE NUMBERS THAT ARE NOT RATIONAL NUMBERS
9:45 DEVELOPING A GUIDE BOOK FOR DEER ISLAND, MISSISSIPPI
10:00 THE MEDICINE WHEEL GARDEN AS AN INTEGRATED PROJECT FOR CROSS CURRICULUM EDUCATION
10:15 Break
10:30 MIDDLE SCHOOL MATHEMATICS AND SCIENCE FEATURING APPLICATIONS TO HURRICANES AND OTHER NATURAL DISASTERS

10:45 CREATING AN EDUCATIONAL PODCAST FOR THE GULF COAST RESEARCH LABORATORY
11:00 RESTORATION OF FOSSIL COLLECTIONS FOR J.L. SCOTT MARINE EDUCATION CENTER (MEC) PROGRAMS
11:15 TECHNOLOGY AND SCIENCE EDUCATION ISSUES IN THE NEW MILLENIUM
11:30 CENTRAL GULF OF MEXICO OCEAN OBSERVING SYSTEMS (CENGOOS) K-12 PROGRAM DEVELOPMENT
11:45 DIVISIONAL BUSINESS MEETING

Thursday Afternoon
LOCATION: Hunter Henry Ballroom B
Abstracts pp 146-150
1:15 THE MISSISSIPPI STATE UNIVERSITY "CHALLENGE X" EXPERIENCE
1:30 DESCRIPTION FOR 3-D LEARNING AND BEYOND: DIRECTION, DEVELOPMENT, DELIVERY
1:45 TEACHING BIOINFORMATICS: STRATEGIES AND MATERIALS
2:00 MONTASTREA ANNULARIS AS A CORAL REEF HEALTH INDICATOR AT HALF MOON CAYE, BELIZE
2:15 BECOMING MORE ACQUAINTED WITH "HANDS-ON" OCEAN-RELATED LESSON PLANS AND OCEAN LITERACY STANDARDS
2:30 Break
2:45 PROBLEM-SOLVING IN INTRODUCTORY PHYSICS COURSES: A COMPARISON BETWEEN ONLINE AND TRADITIONAL METHODS
3:00 A CRITICAL EVALUATION OF PUBLIC OPPORTUNITIES TO LEARN GEOBIOLOGY AT THE MISSISSIPPI PETRIFIED FOREST IN FLORA, MS
3:30 THE ROLE OF OCEAN OBSERVING SYSTEMS IN K-12 EDUCATION: EXPLAINING THE CONCEPTS, DEVELOPING THE CURRICULA AND APPLYING THE TECHNOLOGY
3:45 *MISSISSIPPI SCIENCE FRAMEWORK* AND *NATIONAL SCIENCE EDUCATION STANDARDS* BASED PROGRAMS AT J. L. SCOTT MARINE EDUCATION CENTER
4:00 TECHNOLOGICAL ENHANCEMENTS TO J.L. SCOTT MARINE EDUCATION CENTER'S SEA TV PROGRAM

6:00 **DIVISIONAL POSTER SESSION**
LOCATION: Bost Auditorium North
Posters May Be Set up Between 4:00p and 4:30p
ENHANCING HANDS ON SCIENTIFIC EXPERIENCES OF SECOND GRADE STUDENTS VIA THE SCIENTIFIC METHOD
INTRODUCING ENGINEERING THROUGH A PROJECTS-BASED COURSE TO HIGH SCHOOL STUDENTS AND TEACHERS, AND PROVIDING COLLEGE STUDENTS INTERESTED IN ENGINEERING THE OPPORTUNITY TO MEET ENGINEERING PROFESSORS AND STUDY SIX DISCIPLINES OF ENGINEERING
EXCITING AND INCREDIBLE CRYPTOGRAPHY
THE HISTORY OF STUDENT RESEARCH AT THE GULF COAST RESEARCH LABORATORY (GCRL)
CREATING AN ARTIFICIAL BOG TO TEACH STUDENTS ABOUT CARNIVOROUS PLANTS
TEACHING SECOND GRADERS ABOUT SCIENTIFIC CONVENTIONS AND EXPERIMENTATION
ADDRESSING THE NEED FOR APPROPRIATE SCIENCE COURSES FOR GRADUATE SECONDARY EDUCATION PROGRAMS
INTERGRATING POLYMER SCIENCE INTO MIDDLE/HIGH SCHOOL CURRICULUM
EDUCATING ELEMENTARY SCHOOL STUDENTS ON CHEMICAL PROPERTIES
DEVELOPING A CROSS CURRICULUM SCIENCE REFERENCE GUIDE FOR ELEMENTARY LEVEL STUDENTS FOCUSING ON THE ASPECTS OF SCIENCE

ZOOLOGY AND ENTOMOLOGY

Thursday, February 22

Thursday Morning
LOCATION: Hunter Henry Executive Room 8
Abstracts pp 151-153

9:00 PHYLOGENY OF LARGE WOLF SPIDERS FROM THE SOUTHEASTERN UNITED STATES.
9:15 WATER QUALITY STUDIES ON FRESHWATER BODIES IN NEW ORLEANS, LOUISIANA AFTER HURRICANE KATRINA
9:30 PREVALENCE OF TUBERCULOSIS (TB) AND HIV INFECTION IN IMO STATE, NIGERIA
9:45 WORKSHOP
ANIMAL TISSUE PREPARATION FOR MICRO- AND ULTRAMICRO-ANATOMY STUDIES

Poster Session: 10:15a to 11:30a (in room)

10:15 A PHYLOGENY OF GENERA IN TRIBE TELEIODINI (LEPIDOPTERA: GELECHIIDAE) IN THE HOLARCTIC REGION
10:30 USE OF MICROCOSM STUDIES TO ASSESS THE RELATIONSHIP BETWEEN AQUATIC PLANTS AND SOIL MICROORGANISMS
10:45 ANTS IN MISSISSIPPI STATE PARKS
11:00 A PRELIMINARY LIST OF THE ORTHOPTEROID INSECTS OF THE GREAT SMOKY MOUNTAINS NATIONAL PARK
11:15 ACENTROPINAE (CRAMBIDAE) OF MISSISSIPPI AND ALABAMA
11:30 DIVISIONAL BUSINESS MEETING

GENERAL SESSION

FRIDAY MORNING

Bost Auditorium South

11:45 OBESITY AND THE RESHAPING OF AMERICA

Mary K. Schmidl is the former President of the Institute of Food Technologists. Dr. Schmidl received her BS from the University of California Davis and her MS and Ph.D. from Cornell University in food chemistry with minors in biochemistry and human nutrition. For more than 30 years, she had worked and published extensively in the food sector having held management and teaching positions for AG Bayer, Novartis and the University of Minnesota.

She has received numerous awards including IFT Fellow, IFST Fellow of the United Kingdom, IUFoST Fellow, the IFT Babcock-Hart Award in Nutrition and the Award of Distinction from the University of California-Davis. Most recently she has served on the Board of the Council of Scientific Society Presidents, an organization representing over 1.5 million scientists and science educators worldwide. Dr. Schmidl is currently principal for NFNC, a food and drug consulting firm in St. Paul, MN and assistant adjunct professor in the Department of Food Science and Nutrition at the University of Minnesota.

AGRICULTURE AND PLANT SCIENCE

Chair: Evelin J. Cuadra, Alcorn State University
Vice-chair: Gregorio B. Begonia, Jackson State University

FRIDAY MORNING

Hunter Henry Ballroom B

8:15 ENHANCING SUSTAINABLE PRODUCTION OF MEDICINAL PLANTS IN MISSISSIPPI

Patrick Igbokwe*, Liang Huam, Franklin Chukwuma, and Magid Dagher, Alcorn State University, Alcorn State, MS 39096

Field studies were used to determine the effect of 3 cropping systems and 3 row preparations on purple coneflower (Echinacea purpurea) survival, growth, yield and quality. The study was conducted on a Memphis silt loam soil in southwest Mississippi. A split plot arrangement in a randomized complete block experiment design was used for this study. The 3 cropping systems made up the main-plot, whereas the 3 row preparations made up the sub-plot. Each of the 3 row preparations was replicated 4 times. Cropping systems influenced plant survival, canopy height, root dry weight and root volatile soil during both 2004 and 2005 study periods. Row preparations also influenced plant survival, canopy height and root volatile oil during the same period.

8:30 REOCCURRENCE OF ANGULAR LEAF SPOT OF COTTON IN MISSISSIPPI AND EVALUATION OF CURRENTLY GROWN VARIETIES FOR IMMUNITY OR RESISTANCE TO THE DISEASE.

G. L. Sciumbato*, P. S. Thaxton, and Jim Nichols, Delta Research and Extension Center, Mississippi State University, Stoneville, MS 38776

Angular leaf spot or bacterial blight was a major disease of cotton (Gosspyium hursitum) in Mississippi prior to the use of acid delinted cotton. The bacterium is mostly transmitted on the surface of the seed and the acid delinting process eliminated the bacterium. There was also genetic resistance to the disease. However, the major source of resistance was Tamcot SP-37 and varieties with a SP-37 background were very susceptible to bronze wilt and were discontinued. In addition, environmental concerns about acid delinting have resulted in newer methods of removing the lint from cotton which do not use acid. These new methods allow the bacterium to survive the delinting process. The bacterium has been isolated by us from several locations in Mississippi in recent years. The race of the bacterium is primarily race 18 and not a new race. We have screened 52 varieties for resistance to the disease using a high pressure sprayer in field plots. Thirteen varieties were immune and eleven varieties had a high degree of resistance to the disease. The other twenty-three varieties were susceptible to very susceptible.

8:45 EVALUATION OF DIFLUBENZURON (DIMLIN®) TO CONTROL *CERCOSPORA SOJINA*, THE FROGEYE LEAFSPOT PATHOGEN OF SOYBEAN

C. Wells [1,2*], R.E. Baird [1], and G. L. Sciumbato [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Delta Research and Extension Center, Stoneville, MS 38776

Diflubenzuron, a benzamine chitin-inhibitor commonly used as an insecticide, has been reported to have fungicidal activity in Mississippi against, *Cercospora sojina*, the frogeye leaf spot (fls) pathogen of soybean. Chemical applications for control of both insects and fls would result in reduced costs for soybean producers and less potentially harmful chemicals in the environment. To further investigate diflubenzuron's fungicidal activity, two field trials were established during the 2006 growing season in two locations in Mississippi. Within each trial, one determinate and one indeterminate variety were planted in a randomized complete block design with four replications per

treatment. Four treatments consisting of diflubenzuron (2.0 and 4.0 oz/A), pyraclostrobin (Headline®)(4.7 oz/A) and an untreated control were repeated, one set was artificially inoculated with *C. sojina* and one set using natural inoculum. Within the artificially inoculated plots, one set received inoculum 24 h prior to and one 24 h after chemical treatments. Disease ratings were performed two and four weeks after inoculation. Yield data were also recorded. The excessively dry environmental conditions in 2006 were unfavorable for disease development. Therefore, no significant differences in disease ratings or yield were seen between the eight treatments according to the Waller-Duncan K ratio t Test at the $P<0.05$ level. Field trials will be repeated in 2007.

9:00 IDENTIFYING ISOLATES OF *PHYTOPHTHORA CINNAMOMI* FOR CHALLENGING BLUEBERRY (*VACCINIUM* sp.) CULTIVARS TO DEVELOP A GREENHOUSE SCREENING TECHNIQUE FOR IDENTIFYING RESISTANT BLUEBERRY GERMPLASM

Melinda Miller-Butler [1]*, Kenneth J. Curry [1], and Barbara J. Smith [2], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]USDA-ARS Southern Horticultural Laboratory, Poplarville, MS 39470

The production of blueberries (*Vaccinium* sp.) in Mississippi, occupies over 2000 acres as of 2006. *Phytophthora cinnamomi* causes severe root rot on many woody plant species including blueberries. Soil samples were collected from symptomatic blueberry plants at several farms in Mississippi. Successful isolations were made using a floating leaf technique and placing the leaf pieces on media amended with antibiotics and fungicides. Unidentified isolates were confirmed with a Phytophthora-genus specific ELISA test. Known isolates of *Phytophthora cinnamomi* were obtained from an outside source. Seedlings with little or no resistance to phytophthora root rot were challenged with all isolates. Unidentified isolates causing premature senescence in the seedlings will be used to challenge young blueberry plants for developing a greenhouse technique to identify blueberry germplasm resistant or at least tolerant to phytophthora root rot. Ultimately this will lead to the development of resistant cultivars that offer a means of controlling this disease in commercial blueberry fields.

9:15 ESTABLISHMENT OF BLACKBERRIES AND DETECTION AND MANAGEMENT OF RASPBERRY CROWN BORER

Edward Heard, Frank Matta*, Blair Sampson, John Braswell, and Juan Silva, Mississippi State University, Mississippi State, MS 39762

Field evaluations of new tactics for early detection and management of raspberry crown borer, RCB, Pennisettia marginata (Harris) (Lepidoptera: Sesiidae) on blackberries, Rubus L. subgenus Rubus Watson, were performed at the Mississippi Agriculture and Forestry Experiment Station North Farm from December 2004 to July 2006. RCB is the primary limiting factor for blackberry production in Mississippi. Borer damage to canes and crowns underground can increase and go undetected until a crop is devastated by infestation. A randomized field plot with 3 adjacent rows was planted with infested blackberries and certified nursery stock of two recommended cultivars, thorny 'Chickasaw' and thornless 'Apache'. Insect pest management tactics targeting RCB included the following soil drenches: chemical insecticide bifenthrin, recently registered and labeled for RCB management; experimental pesticide E2Y45, being evaluated in association with USDA IR-4 Program; entomopathogenic nematodes Steinernema feltiae, beneficial organisms effective against several species of clearwing-borer moths including limited success against RCB. Before application of S. feltiae, unknown effects of pesticides on nematode viability and infectivity were evaluated in laboratory bioassays with late instar host greater wax moth larvae, Galleria mellonella (L.). Pesticides evaluated include the fungicides captan, pyraclostrobin + boscalid, lime-sulfur and the insecticide acetamiprid. Bioassays tested two entomopathogenic nematode species, S. feltiae and Heterorhabditis bacteriophora. Results indicated that lime-sulfur severely limited nematode movement and infectivity at 100% and 10% application rate. Pyraclostrobin + boscalid decreased movement of both nematode species and infectivity of S. feltiae at 100% and 10% rate. Lower rates are not significant. Methods for early detection of RCB include placement of sticky traps baited with variable amounts of insect pheromones (E,Z)3-13-octadecadien-1-ol and/or (E,Z)3-13-octadecadien-1-yl acetate at 4 sites within the plot.

9:30 BIOAVAILABILITY OF MERCERY IN SOIL AND WATER AND ITS EFFECTS ON PLANT STRUCTURE AND REFLECTANCE

Safwan Shiyab, Frank Matta*, F. X. Han, Yi Su, and D.L. Monts, Mississippi State University, Mississippi State, MS 39762

There is great concern regarding the clean up of toxic pollutants from the environment. Phytoremidiation is a process, environmentally friendly, and cost-effective to clean up heavy metals and the other toxic compounds from contaminated environments. Mercury contamination is ubiquitous in the Y-12 watershed of Oak Ridge, TN and has been identified as a key contaminate in soil, sediment, surface water, and ground water. The objectives of this study were to apply phytoremidiation to mercury contamination in soil and to study the phytoremidiation process, including metal uptake, complexation, and translocation by microscopy, chemical analysis, and spectral reflectance. Indian mustard (Brassica juncea), Long standing and Florida broadleaf were used to phytoremidiate soils contaminated with various forms of mercury (mercury chloride, mercury nitrate, mercury sulfide). Indian mustard had a high uptake capacity and translocation of Hg from contaminated soils. Physiological changes in Indian mustard plants due to uptake and accumulation of Hg were investigated. Result of this study indicate that Hg at higher concentrations had a profound impact on the physiology and internal structure of plants which in turn, affected the

spectral reflectance. Leaves, stems and roots were harvested to study leaf anatomy and metal accumulation. The majority of Hg accumulated in the root and the remaining Hg was translocated to the shoot.

9:45 Break

10:00 ROOT AND FOLIAR RESPONSES OF MARIGOLD TAGETES PATULA, ZINNIA ZINNIA ELEGANS AND VINCA CATHARANTHUS ROSEUS GROWN IN 288 PLUG TRAYS COATED WITH ZINC CHLORIDE COMPOUNDS.

Frank Matta, Mississippi State University,Mississippi State, MS 39762

The objective of this research was to determine the effects of zinc chloride on root and foliar growth of three bedding plant species (Marigold Tagetes patula, Zinnia Zinnia elegans and Vinca Catharanthus roseus). Plug trays were treated with anhydrous zinc chloride at 0, 3.5, 7, and 14 percent using 2 separate paints as the source of zinc (white latex and athletic field marking paint). Plants were grown in a greenhouse at 85º F/65º F (day/night temperature) for 3 weeks. Plants were harvested and dried to obtain plant tissue analysis of accumulated nutrients. Nutrient levels were statistically analyzed to determine the level at which zinc chloride applications become phytotoxic. Results are reported.

10:15 MANAGEMENT OF HIGH PHOSPHORUS SOILS IN MISSISSIPPI: FORAGE PRODUCTION AND AGGREGATE STABILITY

Anserd Foster*, W.L. Kingery, and M.S. Cox, Mississippi State University, Mississippi State, MS 39762

In Mississippi there is a need for management of pasture land with elevated phosphorus levels. On pastures, offsite phosphorus movements may be reduced by improving soil structure via increased aggregate stability. A study was conducted to determine the influence of different forage systems on forage production and aggregate stability. Crops grown in study were “Jackson” annual ryegrass (RG) (Lolium multiflorum Lam.), “Kentucky 31” tall fescue (TF) (Festuca arundinacea Schreb.),” Redland Max” red clover (RC) (Trifolium pratense L.), “Chickasaw” white clover (WC) (Trifolium repens L.) and “Common” bermudagrass (BG) (Cynodon dactylon (L.). Cool season forage systems were TF+ Nitrogen (N), RG+N, TF+WC, TF+RC, RG+WC, RG+RC and warm season forage systems were BG +N, BG+WC and BG+RC. The soil used in the experiment was a Savannah silt loam with a 25-year history of poultry litter application. Forage yield was highest in BG compared to that of RG and TF systems. Aggregate stability measurements showed TF and RG systems with greatest percentage of stable aggregates. The results also suggested a decreasing trend in the percentage of stable soil aggregates with the combination of RC and WC and grasses. Phosphorus removal was highest in RG and BG systems. Our findings suggest that different forage systems will influence both forage production and soil aggregate stability on high-P soils in Mississippi.

10:30 PLANT DENSITY EFFECT ON YIELD AND BIOMASS DEVELOPMENT OF ORGANIC EGGPLANT (Solanum melongena L)

Sixto A Marquez*, Girish K Panicker, Om P Vadhwa, and Patrick Igbokwe, Alcorn State University, Lorman MS 39096

Eggplant (Solanum melongena L) is a native of India and is widely cultivated for its fruits in the southern United States. As a part of the conservation research being carried out on vegetable crops in Mississippi, a study was conducted to determine the plant density effects on yield and biomass development at various growth stages. A common cultivar Black Beauty was raised on Memphis Silt Loan soil (Typic Hapludalf, silty, mixed, thermic) at low density planting (LDP), 0.760 m x 0.912 m; and high density planting (HDP), 0.609 m x 0.912 m. Worm castings and composted cow manure were applied equally to each plant. No chemicals were sprayed on the crop. Destructive harvest studies were conducted at various stages of growth and analysis of variance was run. Plant height, rhizosphere width, and root length were higher for HDP compared with LDP. Total dry biomass, leaf area index (LAI) and yield were higher for LDP. There was no difference in canopy width, stem diameter, canopy cover and fruit length and diameter. LDP is more advisable for farmers because it was higher in yield, total dry biomass and LAI.

10:45 FATE OF FUNGAL SPORE INOCULA APPLIED TO STRAWBERRY LEAVES FOR FUNGICIDE SCREENING EXPERIMENTS

Maritza Abril [1], Kenneth J. Curry [1], and Barbara J. Smith [2], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]USDA-ARS Southern Horticultural Laboratory, Poplarville, MS 39470

Fungicide screening experiments for germplasm in strawberry and other plants are frequently conducted by spraying the plants with inocula composed of a spore suspension of the appropriate pathogenic fungus and scoring the plants for symptoms at a reasonable interval after the spraying. We have determined that spraying as a method of delivering inoculum results in a spore concentration on the leaf that is one order of magnitude less than the starting inoculum. We collected leaf runoff expecting to find the lost spores, but the runoff is also less concentrated than the original inoculum. We have subsequently devised a carefully controlled series of experiments in which the inoculum is delivered to a glass slide in very small, precisely measured volumes from which exhaustive counts can be taken and compared back to the initial inoculum. The loss of spores between the original inoculum and the slide is one order of magnitude just as with the leaf. We can confidently compare the leaf/spray and slide/direct inoculum experiments in order to

determine the mechanism by which spores from the original inoculum are lost. We have traced the loss of spores back to the inoculating pipette where they form a thick crust on the inside of the pipette. The final step in our analysis will be a return to the spraying device to examine the delivery tube and the spray head itself. Understanding this loss of spores can contribute significantly to creating well-designed fungal screening experiments where a fungal inoculum must be delivered by spray.

11:00 THE EFFECTS OF PLOT SIZE AND MOWING HEIGHT ON PESTICIDE RUNOFF FROM MISSISSIPPI PRIDE BERMUDAGRASS (*Cynodon dactylon* [L] Pers. × *Cynodon transvalensis* Burtt-Davy

Peter Ampim [1]*, J. H. Massey [1], B. R. Stewart [1], M. C. Smith [1], K. L. Armbrust [2], A. B. Johnson [3], and A. A. Andrews [1], [1]Mississippi State University, Mississippi State, MS 39762, [2]Mississippi State Chemical Laboratory, Mississippi State, MS 39762, and [3]Alcorn State University, Lorman, MS 39096 and

We investigated the effect of plot size on pesticide runoff from Mississippi Pride bermudagrass (*Cynodon dactylon* [L] Pers. x *Cynodon transvalensis* Burtt-Davy) maintained as golf course fairways and residential lawns on a hydrologic class D soil. The four plot sizes investigated were 1.8 x 1.8 m, 3.7 x 9.1 m, 6.1 x 24.4 m and 12.2 x 38.1 m. The plots had 3 % slope with minimal cross slope. The experimental design was a randomized complete block design with split plot arrangement of treatments. The main plot factor was plot size while the subplot factor was mowing height (1.5 and 5.0 cm). Following a standardized protocol, 2, 4-D herbicide, flutolanil fungicide and chlorpyrifos insecticide were co-applied at 1.12 kg ai/ha, 2.24 kg ai/ha and 2.24 kg ai/ha, respectively. A conservative tracer (KBr) was also separately applied at 15 kg/ha to allow tracking of water movement in the turfgrass systems. Simulated rainfall was applied at 38.1 mm/h to the plots 24 h after pesticide application. Pesticide concentrations in runoff and application monitors were analyzed by high performance liquid chromatography using UV-Vis detection. The limit of quantification for the three pesticides was approximately 10 ppb. Plot size and grass mowing height effects on pesticide runoff and several hydrological parameters will be discussed.

11:15 GRAZING PREFERENCE FOR BERMUDAGRASS CULTIVARS INTERSEEDED WITH CHICORY

Vitalis Temu* and David Lang, Mississippi State University, Mississippi State, MS 39762

Bermudagrass (Cynodon dactylon L.) is a perennial, subtropical warm season grass that can be difficult to force animals to graze. Chicory (Cichorium intybus L.) is a highly palatable and nutritious forb. The objective was to determine if addition of chicory to bermudagrass would increase the acceptance of bermudagrass by grazing animals. Chicory was seeded into six replicated bermudagrass cultivars on 7 October 2005 that had been grazed by cows or steers (Bos taurus) during the previous five summers. Grazing preference among bermudagrass was observed by taking plate meter readings, height and herbage measurements before and after each grazing interval as well by visual estimation of the portion of each plot that had its leaves chewed or "grazed". Prior to planting chicory grazing preferences were observed to be the following order: 'Alicia' < 'McDonald' < 'Coastal' < 'Lott' < 'Tifton 44' = 'Sumrall'. There was a distinct difference with Alicia bermudagrass. It was not only grazed the least grazed but it was obviously rejected by cows or steers given a choice of bermudagrass cultivars. Addition of chicory in 2005 did not alter the grazing animal's preference among bermudagrass cultivars. Even though chicory is highly palatable it was also not readily grazed when it was growing in a bermudagrass cultivar that was not preferred by cattle, i.e in Alicia or McDonald. Chicory was readily grazed in bermudagrass plots that were heavily grazed by cattle, i.e. in Tifton 44 or Sumrall. There was a strong negative influence by the least grazed bermudagrass cultivars on chicory palatability. The addition of highly palatable chicory was not able to enhance palatability of bermudagrass.

FRIDAY AFTERNOON

Hunter Henry Ballroom B

1:15 PERFORMANCE EVALUATION OF NEW RYEGRASS VARIETIES AT ALCORN STATE UNIVERSITY: NUTRITIONAL VALUE, DRY MATTER, GROWTH AND MATURITY

Evelin J. Cuadra [1], Ricky Johnson [1], Jason Jones [1]*, Bisoondat Macoon [2], and Victor Njiti [1], [1]Alcorn State University, Lorman, MS 39096 and [2]Brown Loam Experiment Station, Raymond, MS 39154

Ryegrass is perhaps the best quality forage grown for cattle feeding in Mississippi and the southern states. Nevertheless, it has the inconvenience that harvesting time for high quality ryegrass takes place during raining, cool and humid conditions. Therefore, evaluation of new varieties capable of maintaining a high nutritional quality over an extended season and into the early summer conditions is routinely performed. Thus, a study was conducted at Alcorn State University to evaluate 3 varieties, Passerel Plus (*lolium multriflorum*), Tetralite II (*lolium hybridum*), and Zorro (*lolium multiflorum*) for nutritional content and adaptability to early summer conditions in a Memphis silt loam soil. Seeds were planted in October of 2004 and, grass samples were collected every 4 weeks starting in February and through May of 2004; chemical analysis was performed after collection and drying of samples. Average monthly temperature and rain were also recorded. DM yield was higher for Passerel Plus (54340.1± 182.3) when compared to Zorro (4086.2 ± 609); however, it did not show any difference with Tetralite II (4522.3±405.3). The same trend was observed for TDN content (4087.9±206.7; 3224.5±510.5; 3513.6±352),

and NDF (2443.9±39; 1817±196.9; 2121.6±127.5). There was no significant difference in CP between the three varieties. Nevertheless, a higher content in ADF was observed in Passerel Plus (1349.9±32.6) when compared to Zorro (985.6±108.7) and Tetralite II (1125.9±66.6). Data was analyzed using the general linear model of SAS. Responses are reported as different at the $P< 0.05$ level. Means were separated using Duncan's multiple range test.

1:30 FACILITATING FUNCTIONAL GENOMICS ANALYSIS IN MISSISSIPPI: THE AGBASE DATABASE

Fiona McCarthy*, Nan Wang, Bindu Nanduri, Shane C. Burgess, and Susan M. Bridges, Mississippi State University, Mississippi State, MS 39762

Analysis of functional genomics (transcriptomics and proteomics) datasets is hindered in agricultural species because agricultural sequences have poor structural and functional annotation. To facilitate systems biology in these species we have established the curated, web-accessible, public resource "AgBase" (www.agbase.msstate.edu). We have improved the structural annotation of agriculturally important genomes by experimentally confirming the in vivo expression of electronically predicted proteins and by proteogenomic mapping. The de facto standard for functional annotation is Gene Ontology (GO) and we use the gene ontology to associate function with agricultural genes. Via the AgBase database we contribute GO annotations and provide a mechanism for researchers to request GO annotations or submit their own GO annotations. We have also established a two tier system of GO annotations for users. This system gives researchers the initial breadth required for functional modeling, leading to experiments that test the function of these gene products, which in turn leads to higher quality GO annotations. In addition to providing structural and functional annotation for agricultural species, AgBase also provides tools for functional analysis of proteomics and gene expression datasets. The tools are provided online and can be used individually or as components of a pipeline. The AgBase suite of tools has been used for functional modeling of both proteomics and gene expression datasets from chicken, maize, cow, and a number of microbes.

1:45 INHIBITION OF PPO ACTIVITY WITH ADDITIVES AND THEIR INFLUENCE ON ANTHOCYANINS EXTRACT IN RABBITEYE BLUEBERRY MASH

Jelena Stojanovic* and Juan Silva, Mississippi State University, Mississippi State, MS 39762

Antioxidant properties of blueberries are contributed by their high concentration of anthocyanins and phenolics that are readily destroyed by blueberry polyphenol oxidase (PPO). Inactivation of PPO by heating to 90?C for 1 min destroys blueberry antioxidant properties. Addition of PPO inhibitors in the maceration step may eliminate heat pretreatment Anthocyanins were extracted using acetone/chloroform and concentration determined using the pH differential method. Activity of PPO without and with presence of inhibitors was determined in citrate/phosphate buffer (pH =3.6) using 4-methylcatechol as a substrate and monitoring change in absorbance at 420 nm. Disappearance of anthocyanins in presence of PPO and inhibitors was monitored at 520nm for 20 min. Activity of PPO was 3.36 Units/ml. Addition of 0.1% sodium benzoate decreased PPO activity to 0.48 U/ml. Other inhibitors reduced PPO activity with EDTA heaving the least influence (2.88 U/ml). Concentration of anthocyanins was 237mg/ml. Destruction of anthocyanins was most evident in the first 5 min with 20% loss. Sodium benzoate decreased that loss to only 10%. These results suggest that sodium benzoate would be the best choice as an inhibitor of PPO during the maceration treatment of blueberry mash. These findings can eliminate heat pretreatment allowing further pasteurization of juice with a nonthermal process.

2:00 SYSTEMS ANALYSIS OF *PASTEURELLA MULTOCIDA* RESPONSE TO SUB-MINIMUM INHIBITORY CONCENTRATIONS OF ANTIBIOTICS

Bindu Nanduri*, Mark Lawrence, and Shane C. Burgess, Institute for Digital Biology , Mississippi State University, Mississippi State, MS 39762

Antibiotic therapy is based on achieving a minimum inhibitory concentration (MIC) for a sufficient amount of time in the infected tissue. However, with antibiotic resistant bacterial strains, it may not be possible to achieve MIC in the target tissue and the only remaining therapeutic option could be treatment with a sub-MIC of antibiotic. In this study we evaluated sub-MIC antibiotic effects on a bovine respiratory pathogen *Pasteurella multocida* using systems approaches. *P. multocida* was grown in the absence or in the presence of a quarter MIC of amoxicillin, chlortetracycline and enrofloxacin that differ in their mode of action and the proteins were isolated, trypsin digested and analyzed by 2D-LC-ESI-MS/MS. The predicted proteome of *P. multocida* has 2015 proteins of which 996 were identified in our dataset. Non-isotopic quantification method was used to determine significant changes in protein expression in response to antibiotics. A total of 150, 122, and 114 proteins were differentially expressed in response to amoxicillin, chlortetracycline, and enrofloxacin, respectively. We mapped experimental data onto *P. multocida* protein interaction network using PathwayStudio (Ariadne genomics). All three antibiotics led to lowered expression of proteins involved in energy metabolism, DNA synthesis. Expression of DNA repair proteins *recN*, *recA* and *recG* increased in response to enrofloxacin, which is likely an adaptive response to the quinolone-mediated DNA replication block by double strand DNA break repair. We also identified key regulatory elements in the network (*ddl* with amoxicillin) whose expression could be modulated (gene knockouts, RNAi etc) for favorable use of sub-MIC antibiotics.

2:15 EFFECT OF COOKING AND PACKAGING METHODS ON CONSUMER ACCEPTABILITY AND SHELF-LIFE OF READY-TO-EAT GULF BROWN SHRIMP

V.V. Kamadia [1], M. W. Schilling [1], D. L. Marshall [1], L.S. Andrews [2]*, and Y. Yoon [1],[1]Mississippi State University, Mississippi State, MS 39762 and [2]Mississippi State University, Biloxi, MS 39532.

The objectives of this study were to evaluate the influence of various cooking and packaging methods on consumer acceptability and shelf-life of ready-to-eat shrimp. Fresh Gulf of Mexico Brown shrimp (*Penaeus aztecus*, Medium) tails (shell-on) were individually quick frozen on the day of harvest and kept frozen until used. Shrimp (0.45 kg/treatment) were peeled and then cooked at three temperature and time combinations (63°C for15 s, 85°C for 5 min, and 93°C for 5 min) and packaged under air, carbon dioxide, and vacuum conditions. The samples were stored from 1 to 50 days at 2°C. Odors were evaluated using a nine point hedonic scale to determine consumer acceptability and descriptive sensory analysis to determine shelf-life. Agglomerative hierarchical clustering was utilized to group consumers together based on their preference of packaging treatment. Air, carbon dioxide, and vacuum packaged treatments had shelf-lives of 5-9, 20-25, and 20-30 days, respectfully, and the 63°C for 15 s cooking method had a shorter shelf-live than its 85 and 93°C counterparts for all packaging methods. On an average, vacuum packaged samples were liked moderately and were preferred ($p<0.05$) over samples packaged in carbon dioxide and air (liked slightly). Panelists were grouped into four consumer clusters in which greater than 70 % of consumers determined that all treatments were acceptable, with greater than 90 % acceptability in vacuum packaged samples. This reveals the potential to produce vacuum packaged Ready-to-eat shrimp if processed under conditions that will prevent ingestion of botulinum toxin.

2:30 AG ACADEMY: BUILDING AGRICULTURE IN THE HEARTS OF CHILDREN IN SOUTHWEST MISSISSIPPI

Gwendolyn D. L. Boyd, Alcorn State University, Alcorn State, MS 39096

Agriculture has become a high-tech, computerized world. The study of Agriculture is not just about farming anymore. A bachelor's, masters', or even a doctorate in Agriculture can give students the opportunity to become a biosystem engineer, a plant pathologist, or even an animal scientist. Students may work for governmental agencies, private sectors, seed companies, floriculturist, landscaper, agricultural economist, sales representative, or go into private practice. There are so many ways to combine Agriculture with just about anything. AG ACADEMY is a program designed to education children in Southwest Mississippi about the importance of Agriculture. The children get the opportunity to see Agriculture first hand. They learn about flowers, soil, money, plants, trees, water, animals, and clothing. All of these things are directly associated with Agriculture. The ages of this academy ranges from 6-9. The reason for this age group is to encourage the interest in Agriculture before their mind is set to other sciences or other disciplines. Agriculture is a dying discipline, and this is one way to bring life to Agriculture. Exposing young minds to the various educational aspects of Agriculture with help ensure a future generation of forest managers, forest rangers, veterinarians, horticulturists, plant patho1ogjsts, farmers, botanist, and other Agricultural-related professionals.

3:00 Divisional Poster Session
Location: Bost Auditorium North

POSTHARVEST APPLICATION OF ANTIMICROBIALS IN CATFISH- A REVIEW

Bang-Yuan Chen*, Juan Silva, and Taejo Kim, Mississippi State University, Mississippi State, MS 39762

Catfish as other fish muscle has a structure low in collagen and high in protein/amino acids that makes it very easy for microbial attachment and growth. Fresh catfish production accounts for one third of sales, requiring long shelf life to compensate for long distribution distances and retail case duration. After harvesting, catfish can be contaminated by processing equipment, surfaces and solutions. In order to enhance keeping quality, catfish should be processed rapidly; temperature should be decreased rapidly, and held at low temperature. Ice helps maintain the temperature of the fish low but it also melts and contributes to microbial growth. Antimicrobials added during processing or after can aid in maintaining optimum quality and extending shelf life of catfish. Some of the antimicrobials studied include chlorine based compounds, acids, oxidizers, salt, irradiation, natural or derived substances, and combinations in conjunction with packaging. The effectiveness of antimicrobials varies according to microflora, growth stage, and conditions of the fish. Single antimicrobial treatment can result in 0.4 to 1.0 log CFU reduction. Combination treatments can result in over 2 log CFU reduction, resulting in an extended shelf life. In addition, antimicrobials can have different impacts on catfish appearance and odor. Therefore, the choice of antimicrobial and the quality of catfish needs to be considered.

CHARACTERIZATION OF THE AROMA IMPACT COMPOUNDS OF FISH SAUCES BY GC-MS BASED ON SPME-OSME-GCO WITH DILUTION METHODS

Y. Yoon, A. J. Pham, M. W. Schilling, V.V. Kamadia, and D. L. Marshall, Mississippi State University, Mississippi State, MS 39762

The objectives of this study were to characterize volatile compounds and to determine aroma impact compounds in various fish sauces using gas chromatography coupled with an ion trap mass selective detector (GC-MSD) and a solid phase microextraction-OSME-gas chromatography olfactometry (SPME-OSME-GCO) technique that was coupled with dilution methods. This methodology was also utilized to determine the

relationship between sample concentration and odor intensity using Stevens' Power Law. Aroma impact compounds that were present in all four fish sauce samples included 3-methyl-2-butanamine (fishy), butanoic acid (pungent or dirty socks), dimethyl pyrazine (buttery popcorn), and benzaldehyde (sweet and cotton candy). Based on the results of this study, it is apparent that SPME-OSME-GCO with serial dilutions is a rapid technique with very little sample preparation that can be utilized to differentiate between aroma intensities and impact compounds in foods that contain both a high concentration of water and aroma compounds. SPME-OSME-GCO coupled with serial dilution methods also revealed the potential for the determination of Stevens' exponents for key odorants in four fish sauces.

SANITATION TREATMENT TO DECREASE MICROBIAL LOAD OF PROCESSING BLUEBERRIES

Wei-Chun Chen* and Juan Silva, Mississippi State University, Mississippi State, MS 39762

Processing blueberries are washed prior to freezing and storage. The wash treatment can serve as a partial sanitation treatment. Southern blueberries can have high counts of bacteria and yeast and molds due to high humidity and temperature. Some of these blueberries are used in unheated products like yogurt. The market is demanding lower microbial counts in order to prevent spoilage of further-processed products made with them. The objective of this study was to evaluate some sanitation treatments on blueberry microbial load. The blueberries were divided into fresh and frozen (-20C for seven days). The berries were subject to a 30 sec dip with each of the treatments, followed by draining. Microbial load was determined by massaging in peptone buffer at a 1:10 dilution. Chlorine at 400 ppm lowered APC by 2-3 log CFU/g and YMC by only less than 1 log. Other treatments such as 200 ppm chlorine, a fungicide, and water were not effective. Acidified sodium chloride at 600 ppm for 30 sec was effective, lowering APC and YMC to below detectable levels. These results were similar for fresh and frozen fruit. Panelists did not detect any differences between the treated and untreated samples.

CADMIUM BIOACCUMULATION IN COLLARD AND INDIAN MUSTARD PLANTS

M. Zaman*, Cherry N. Lockett, Cynthia A. Addae, Shenika B. Poindexter, and Brandon J. Riley, Alcorn State University, Lorman, MS 39096

The tolerance of *Brassica oleracea* var: *viridis* L. (Collard) and *Brassica juncia* (Indian Mustard) plants to soil cadmium (Cd) and bioaccumulation of Cd in plant tissues were evaluated. Plants were grown in the laboratory under color corrected lights in soils containing 0 ppm, 250 ppm, 500 ppm, and 1000 ppm Cd. Plants were harvested on day 30 of the experiment. Dried plant samples were acid digested for tissue Cd analysis. Tissue Cd analysis was performed using an atomic absorption spectrophotometer. Data were analyzed for biomass production and tissue Cd accumulation. Results indicated that *B. juncia* plants were able to tolerate higher Cd concentration in soil as compared to *B. oleracea* plants. And bioaccumulation of Cd was dose related. Plant biomass was greatly reduced in some Cd treated plants. *B. oleracea* plants treated with 500 ppm and 1000 ppm Cd, did not survive the metal toxicity. Overall data indicated that *B. juncia* is a better Cd accumulator as compared to *B. oleracea* and can be used for remediation of Cd contaminated soil.

RAPID PURIFICATION OF INTERNALIN B FOR DETECTION OF LISTERIA MONOCYTOGENES

Taejo Kim [1]*, Y. S. Jung [1], Juan Silva [1], and Supanee Danviriyakul [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Chandrakasem Rajabhat University, Bangkok, Thailand

Conventional immunological methods for the detection and identification of bacteria in food are greatly restricted by initial enrichment (up to 24h) for detection of pathogens, including Listeria monocytogenes, which are initially present in low numbers. Sensitivity and specificity of antibodies are critical for immunodetection of biomolecules in antibody-based assay. Since clinical and food strains of L. monocytogenes express InternalinB (InlB) without polymorphism, it could be a good candidate as a protein marker to detect Listeria monocytogenes. Listeria grayii and Listeria innocua did not express InlB without inlB gene while all tested Listeria monocytogenes possess inlB gene and expressed InlB. Listeria monocytogenes 19115 had the lowest band intensity, which required an enrichment step of InlB. Spin-ion exchange chromatography was a simple and rapid method to enrich and purify InlB within 20 min. This study suggests that rapid purification of InlB could be used as a rapid and sensitive detection method of Listeria monocytogenes.

BRINE ABSROPTION AND RETENTION IN CATFISH FILLET STRIPS

Youkai Lu, and Juan Silva*, Mississippi State University, Mississippi State, MS 39762

Liquid absorption and retention are important in fresh muscle foods processing. The objectives of this research were to study the diffusion and retention of brine solution in fresh catfish strips and its influence on their sensory profile. Fresh catfish strips were immersed in either 2% (2B) or 1% (1B) brine ice slurry solutions or tap water (0B) ice slurry solution (1:1 ratio of water to ice) for up to 24 hours. They were then tested for liquid absorption, while retention was measured after 24 h in refrigerated storage. Fillet strips immersed in 2B absorbed the same amount of liquid than strips immersed in tap water ice slurry solution, but they lost only one fourth of the absorbed water/brine in the following 24 h refrigerated storage, about one third less than those in fillets strips immersed in either 1% brine ice slurry or tap water ice slurry solution. As immersion time beyond 8 h increased, absorption increased. The maximum absorption rate occurred in the first 4 h immersion, with the rate

abruptly decreasing thereafter. Compared to the 0B, strips immersed in 1B neither promoted absorption nor enhanced retention. Even though 2B did not promote water/brine absorption, it did enhance water/brine retention. The 2% brine extracted more proteins and resulted in a slimy appearance on the fillet surface. Brine chilled fish enhanced overall flavor, enhanced juiciness, tenderness and improved mouthfeel of baked fillet strips.

EFFECT OF EXOGENOUS JASMONIC ACID APPLICATION ON *Aspergillus flavus* KERNEL INFECTION AND AFLATOXIN PRODUCTION IN TWO MAIZE HYBRIDS (*Zea mays* L.)

Leigh Hawkins [1]*, Dawn S. Luthe [2], Gary L. Williams [3], and W. Paul Williams [3], [1]USDA-ARS, [2]Pennsylvania State University and [3]United States Department of Agriculture

Jasmonic acid (JA), produced by the octadecanoid pathway, is a phytohormone that triggers induced resistance against certain pathogens and arthropod herbivores. The octadecanoid pathway has been implicated in playing a role in the *Aspergillus flavus*-maize seed interaction. In field studies, the effect of exogenous applications of nonphytotoxic levels of JA at 8 and 13 days after midsilk were evaluated in two maize hybrids differing in resistance to *A. flavus* infection (Mo18W x Mp313E and GA209 x Mp339) for any effect on kernel infection by A. flavus, subsequent aflatoxin accumulation and a natural infection of *Fusarium verticillioides*. As a parent in single crosses, Mp313E has been effective in reducing aflatoxin contamination levels in other studies. An application of 71.5 ìg JA•plant^{-1}, whether applied topically to silks or injected directly into the side of the ear, did not have a significant effect on reducing aflatoxin production. There were significant differences in aflatoxin accumulation and kernel infection by *A. flavus* and *F. verticillioides* between the two hybrids. GA209 x Mp339 tended to have higher levels of *A. flavus* kernel infection (7%) and aflatoxin (477 ng•g^{-1}); yet, lower levels of *F. verticillioides* (14%) than Mo18W x Mp313E with 2% *A. flavus* kernel infection , 145 ng•g^{-1} aflatoxin, and 26% *F. verticillioides* infection. This concentration of jasmonic acid is ineffective in reducing *A. flavus* kernel infection and aflatoxin accumulation in an agronomical setting.

MISSISSIPPI MASTER GARDENER TRAINING CURRICULUM COMPACT DISC: A MULTI-DISCIPLINE TWO-YEAR PROJECT

Lelia Kelly* and Julie Sexton, Mississippi State University Extension Service, Mississippi State, MS 39762

The Master Gardener program is one of the most popular and effective Extension programs. Budget cutbacks and a decreasing pool of personnel have warranted a reappraisal of how Extension trains these volunteers. The purpose of this project was to develop an up-to-date, complete, user-friendly, training program that could be used by agents or selected Master Gardeners with a minimum of training and advance preparation. Eleven subject matter specialists, 35 Extension agents, hundreds of Master Gardeners, and three curriculum specialists were involved in this project. In addition to updating of material a sampling of objectives that were addressed in the process follows: (1) format the curriculum into a lesson plan with step-by-step instructions; (2) remove all questionable copyrighted pictures, graphs, drawings, etc.: (3) align the student manual to the material presented in the PowerPoint lessons; (4) incorporate a resource list of hands-on activities to support each lesson; (5) provide a reference list for each lesson; (6) provide a standardized test with answer key for curriculum; (7) place the entire training curriculum on a compact disc. This project was completed in the summer of 2005. Publication and copyrighting of a compact disc which represented the training resources for the Master Gardener program was a first for Mississippi State University Extension Service.

MONITORING *HENNEGUYA ICTALURI* INFECTION IN CHANNEL CATFISH, BLUE CATFISH AND CHANNEL X BLUE BACKCROSS HYBRIDS USING HISTOPATHOLOGY, REAL-TIME PCR AND IN SITU HYBRIDIZATION

Matt J. Griffin [1]*, David J. Wise [2], and Linda M. Pote [1], [1]Mississippi State University, Mississippi State, MS 39762, and [2]Mississippi Agricultural and Forestry Research Station, Thad Cochran National Warmwater Aquaculture Center, Stoneville, MS 38776

Proliferative gill disease (PGD) caused by the myxozoan parasite *Henneguya ictaluri* is one of the most devastating parasitic infections in channel catfish aquaculture. Currently, there is no effective treatment for *H. ictaluri* and outbreaks can result in >50% mortality in catfish. Challenge studies have shown that blue catfish (*Ictalurus furcatus*) exposed to *H. ictaluri* exhibit a less severe inflammatory response and significantly lower mortalities than channel catfish. Using histopathology, real-time PCR (QPCR) and *in situ* hybridization (ISH) we observed the development and proliferation of *H. ictaluri* in channel catfish, blue catfish and channel x blue catfish backcross hybrids to elucidate factors attributing to the variation in host response. Sixty fish of each species were held in floating net pens and placed in a commercial catfish pond experiencing a clinical outbreak of PGD. Fish from each species (n=15) were sampled on days 1, 3, 5, and 7, and gills were examined for chondrocytic lysis and gross manifestation of the disease. Gill clips (~40-80 filaments) were taken for DNA analysis (QPCR) and whole gills were formalin fixed and processed for H & E staining and ISH. Our study showed *H. ictaluri* development and proliferation in all three species but confirmed channel catfish and channel x blue catfish hybrids experience a more damaging inflammatory response to *H. ictaluri* than observed in blue catfish.

CHELATE-MEDIATED CHANGES IN METAL SOLUBILITY AFFECT UPTAKE AND TRANSLOCATION OF CADMIUM BY WHEAT (TRITICUM AESTIVUM L.): IMPLICATIONS IN THE PHYTOREMEDIATION OF METAL-CONTAMINATED SOIL

Jennifer Ntoni*, Maria Begonia, Gregorio Begonia, Gloria Miller, and Juanquina Thomas, Jackson State University, Jackson, MS 39217

Phytoextraction is a cost-effective and environmentally friendly phytoremediation strategy for reducing toxic metal levels from contaminated soils. We hypothesized that the addition of synthetic chelates can increase the amount of bioavailable metal for root uptake, thereby improving the efficacy of phytoextraction. This study was conducted to determine whether the addition of synthetic chelates can enhance the root uptake and subsequent translocation of cadmium (Cd) to the shoots. Wheat (*Triticum aestivum* L. cv TAM-109) seeds were planted in plastic tubes containing topsoil and peat spiked with various levels (0, 250, 500 mg Cd/kg dry soil) of cadmium nitrate. At eight weeks after emergence, aqueous solutions (0, 250, 500 mg/kg dry soil) of [ethylenebis (oxyethylenenitrilo)]tetraacetic acid (EGTA) alone or in combination with acetic acid (HAc) were applied to the` root zone. Plants were harvested at 5 days after chelate addition to coincide with the duration of maximum Cd availability as determined from a corollary chelate-induced metal solubility study. Results revealed that wheat was tolerant to treatment combinations of Cd and chelates as shown by non-significant differences in root and shoot biomass among Cd/chelate-treated plants. Enhancements in root Cd uptake were attributed to chelate amendments especially at the highest Cd treatments. However, partitioning of the metal to the shoots was not significantly enhanced with chelate addition. This study demonstrated that the efficacy of phytoextraction can depend on the mobility of the metal in the soil especially at the growth stage when the plants have attained maximum biomass.

OPTIMIZATION OF FERMENTATION MEDIUM AND CONDITIONS FOR MYCELIAL GROWTH AND WATER-SOLUBLE EXO-POLYSACCHARIDES PRODUCTION BY *ISARIA FARINOSA* B05

Peng Wang [1]*, Xiaolu Jiang [2], Yanhua Jiang [3], Huey-Min Hwang [1], and Xiaoke Hu [1], [1]Jackson State University, Jackson, MS 39217, [2]Ocean University of China, and [3]Yellow Sea Fisheries Research Institute, China

Isaria farinose is an entomogenous fungus which has been regarded as a popular and effective folk medicine for a long time because they can treat many diseases such as hepatitis, hypercholesterolaemia, hypertension and gastric cancer. Polysaccharides, the maximal metabolites of entomogenous fungi, have been demonstrated lots of biological activities such as immunostimulating, antioxiditive, and antitumor activities. In this experiment, the optimal fermentation medium and conditions for mycelial growth and water-soluble exo-polysaccharides production by *Isaria farinose* B05 were investigated. The medium components and fermentation conditions were optimized according to the one-at-a-time method, while the concentration of medium components was determined by orthogonal matrix method. The results showed that the optimal fermentation medium was as follows: sucrose 3.5% (w/v), peptone 0.5%, yeast extract 0.2%, K_2HPO_4 0.1% and $MgSO_4$ 0.05%. The suitable fermentation conditions were as follows: initial pH 7.0, temperature 25°C, medium volume 75 ml/250 ml, inoculum volume 5% (v/v), time 5 d. In such optimal nutrition and environmental conditions, the maximal mycelial yield was 2.124g/100ml after 4 d¡¯s fermentation, while maximal water-soluble exo-polysaccharides production reached 2.144 g/l after 5 d¡¯s fermentation. Key word: Isaria farinosa B05; optimization; submerged fermentation; exo-polysaccharides Acknowledgement: This research was supported in part by DOE grant# DE-FG3605G0852002/07-08-001

GENETIC RESISTANCE TO SALMONELLA IN CHICKENS: A PROTEOMIC PUZZLE

Bart H. J. van den Berg [1]*, Susan J. Lamont [2], and Shane C. Burgess [3], [1]Mississippi State University, Mississippi State, MS 39762, Iowa State University, Ames, IA 50011, and [3]Digital Biology, Mississippi State University, Mississippi State, MS 39762

Despite current control methods Salmonella enteritidis (SE) infections in poultry remain a primary cause of human food-borne disease and a cost to poultry production. Evidence for genetic SE resistance in chickens exists, but the genetic mechanisms are unknown. We aim to identify and model differentially expressed proteins related to genetic resistance/susceptibility to SE. This will allow molecular genetic selection of resistance alleles as a novel means of SE control. We used proteomics to identify and model the differentially expressed gene-products in SE treated chicken lines. Two F8 intercross chicken lines (Leghorn and Fayoumi) were inoculated with SE and after 7 dpi, birds in the highest and lowest 10th percentile of the SE burden distribution were identified. The spleens of high burden (HB) and low burden (LB), as well as non-treated control spleens, were removed and frozen. The proteomes from 9 spleens (3x high, 3x low and 3x control) for each genetic line were identified by DDF-MuDPIT. Quantitative comparisons between the groups were done using our ProteinMapper computational tool. Statistical analyses included ANOVA with Bonferoni correction to identify differentially expressed proteins. From the Fayoumi line, we identified 2179, 2647 and 2687 proteins for control, high and low, respectively. From the Leghorn line, we identified 1914, 1797 and 2572 proteins for control, high and low, respectively. The results of this analysis will be discussed both in terms of biomarkers for SE control in chickens and also for using chicken as a pathogenesis model of human salmonellosis.

DETECTION AND DISTRIBUTION OF GEOSMIN IN CHANNEL CATFISH TISSUE USING SPME/GC/MS

Ryan J. Poythress [1], Justin E. James [3]*, William E. Holmes [2], and Juan Silva [3], [1]Johnson Service Group, Knoxville, TN 37922, [2]Mississippi State Chemical Laboratory, Mississippi State, MS 39762, and [3]Mississippi State University, Mississippi State, MS 39762

The off-flavor of catfish is due to two compounds, geosmin and 2-methylisoborneol which cause an estimated $23 million loss to producers annually. Detection of this compound could be cumbersome in a complex matrix like fish. The objective of this study was to see the efficacy of using solid phase microextraction coupled with gas chromatography/mass spectrometry to study the distribution of the off-flavor in the fish. Whole fish was harvested from a pond that had detectable levels of geosmin. The fish was divided into 11 sections, from the anterior to the posterior part. Samples from each section were taken and placed into vials (2 and 4 g in each). SPME was used for volatile sequestration. Prior to extraction, the fiber was conditioned for 30 min in the injection port of the GC at 250˚C. The fiber was allowed to absorb for 30 min at 60˚C. The fiber was allowed to desorb for 3 min at 240˚C in the injection port of the gas chromatograph. A Varian 3400 GC with helium as a carrier gas passing through a Phenomenex ZB5 (30m x 0.25mm, with a 0.25µm film) coupled with the Varian Saturn 2000 GC/MS with wave board technology, which has the NIST library installed and used for identification. Muscle in the peritoneal cavity contained 3-5X higher amount of geosmin than other parts. This suggests that this part of the catfish should be sampled when screening for off-flavor.

ENHANCING PHYTOEXTRACTION: THE EFFECTS OF ACIDIFICATION AND CHELATING AGENTS ON THE BIOAVAILABILITY, UPTAKE AND TRANSLOCATION OF LEAD BY COFFEEWEED (SESBANIA EXALTATA RAF.)

Gloria Miller*, Maria Begonia, Gregorio Begonia, Jennifer Ntoni*, Katrina Dunn, and KaShiris Walton, Jackson State University, Jackson, MS 39217

Phytoextraction has emerged as a cost-effective and environmentally benign phytoremediation alternative for reducing toxic metal levels from contaminated soils. We hypothesized that the efficacy of phytoextraction can be increased through chelate amendments. This study was conducted to a) evaluate the suitability of coffeeweed [*Sesbania exaltata Raf.*] as one of the potential crop rotation species for phytoextraction, and b)determine whether the addition of ethylenediaminetetraacetic acid [EDTA] alone or in combination with acetic acid [HAc] can enhance the phytoextraction of lead [Pb]. Seeds were planted in plastic tubes containing top soil and peat spiked with various levels [0, 1000, 2000 mg Pb/kg dry soil] of lead nitrate. At seven weeks after emergence, aqueous solutions [0, 1000 mg/kg] of EDTA and HAc were applied to the root zone. Plants were harvested at 6 days after chelate addition to coincide with the duration of maximum metal availability as determined from a corollary chelate-induced Pb solubility study. Results showed that coffeeweed was tolerant to moderate levels of Pb and chelates as shown by very slight reductions in root and no discernable effects on shoot biomass respectively. Root Pb concentrations increased with increasing levels of soil-applied Pb. Further increases in root Pb concentrations were attributed to chelate amendments. Translocation index was significantly enhanced with chelate addition especially when both EDTA and HAc were used. This study demonstrated that chelates can be added when phytoextractive plants have attained maximum biomass, then harvested less than a week later in order to improve phytoextraction efficacy.

ANTAGONISTIC EFFECT OF YOGURT LACTIC ACID BACTERIA AGAINST ENTEROBACTER SAKAZAKII THROUGH A SIMULATED GASTROINTESTINAL SYSTEM

Wei-Lien Weng* and Juan Silva, Mississippi State University, Mississippi State, MS 39762

Lactic acid bacteria are known to exhibit antagonistic activity against human pathogens and also maintain healthiness of the gastrointestinal system. Recently, Enterobacter sakazakii has been implicated in foodborne outbreaks, causing meningitis and enteritis. Since one portal of entry for Enterobacter spp. can be the gastrointestinal tract, yogurt lactic acid bacteria may exert an inhibitory effect on this pathogen. The objective of this research was to investigate the antagonism effect of commercial yogurt on E. sakazakii Fec39 through a simulated gastrointestinal system. Viable cell counts were determined on MRS and trypticase soy agar plates every hour of simulated gastrointestinal system. When an initial concentration of E. sakazakii as high as 108CFU/ml was used, both viable lactic acid bacteria and E. sakazakii counts were reduced by about 6-log during a three hour incubation in the gastric compartment. The counts increased to 106-107 CFU/m in the intestinal compartment after nine hours. But, when 104 ~105CFU/ml of E. sakazakii was initially applied to the simulated GI system; there was very little recovery of E. sakazakii in the intestinal compartment. Our results indicate that high amounts of yogurt lactic acid bacteria might have potential antagonistic effect on E. sakazakii in a simulated gastrointestinal system.

4:00 Divisional Business Meeting
Location: Hunter Henry Ballroom B

CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY

Chair: Barbara Graham-Evans, Jackson State University

Vice-chair: Lauren Brandon, Mississippi University for Women

THURSDAY MORNING

Bost Auditorium South

8:00 BIOLOGY OF PREIMPLANTATION PORCINE EMBRYOS IN VITRO

Hongfeng Wang*, Song-yi Jung, Nelida Rodriguez-Osorio, Kristen Faith Garrison, Kristi Wolgemuth, Laura Samantha Greer, Jean Magloire Nguekam Feugang, and Erdogan Memili, Mississippi State University, Mississippi State, MS 39762

Early mammalian development involves fascinating molecular and cellular programming events as the transition from maternal to embryonic control of development occurs during preimplantation embryogenesis. We aimed at determining transcriptional and translational controls of development in porcine preimplantation embryos using specific inhibitors of mRNA (alpha-amanitin) and protein (cycloheximide) synthesis. Following in vitro maturation and fertilization, presumptive zygotes were cultured in PZM-3 medium, at 39oC under 5% CO2 in a humidified environment. Starting at 24 hours or 84 hours post-insemination (hpi) embryos were transferred to culture drops containing 25 µg/ml alpha-amanitin or 2 µg/ml cycloheximide for a 60-hour exposure. The effects of inhibitors on cleavage (48 hpi) and blastocyst (144 hpi) rates were recorded. Data were analyzed by SAS 9.1, and $p>0.05$ were considered significant. None of the two inhibitors allowed blastocyst formation, irrespective of the period of exposure ($P>0.05$), while 16.5% of the cleaved embryos in the control group developed until the blastocyst stage. The early exposure (24hpi) to cycloheximide significantly reduced the cleavage rate compared to the control (20% vs. 36%; $P<0.01$). Cleavage rate in the alpha-amanitin treated-group was similar to the control one ($p>0.05$). We concluded that the novo-synthesis of mRNA transcripts is not necessary at the early stages of porcine embryo development, but is critical for later stages (after 84 hpi) and, the neo-synthesis of protein is a crucial event occurring throughout the porcine embryo development. Further investigations are needed to identify the relevant genes whose products are involved in cleavage and blastocyst formation.

8:15 A COMPARATIVE ANALYSIS OF THE EARLY EMBRYONIC RESPONSES OF THE GIANT DANIO (DANIO AEQUIPINNATUS) AND ZEBRAFISH (DANIO RERIO) TO RETINOIC ACID

Corretha Ingram*, Stephen D'Surney, and Michael Smith, University of Mississippi, University, MS 38677

Retinoic acid is one of the principal biologically active forms of Vitamin A. Even though retinoic acid is essential for development, excess amounts can cause abnormalities. In this experiment, the effects of retinoic acid on the early embryonic development of the zebrafish (Danio rerio) and giant danio (Danio aequipinnatus) were studied. These two fish are members of the Cyprinidae family. Various concentrations of retinoic acid were exposed to the embryos to monitor development. The concentrations were control, 700ng/L, 725ng/L, 750 ng/L, 775ng/L, and 800 ng/L. This experiment focuses to determine the effects of retinoic acid on early embryonic development in fish and compare these effects between the related species.

8:30 DELETION OF p38αa MAP KINASE IN MOUSE EMBRYONIC STEM CELLS RESULTS IN UP-REGULATION OF SMOOTH MUSCLE CELL MARKERS DURING DIFFERENTIATION

Jianming Ye*, Suja Rajan, Faqing Huang, and Yanlin Guo, University of Southern Mississippi, Hattiesburg, MS 39406

p38 mitogen-activated protein (MAP) kinase αa (p38αa) is a broadly expressed signaling molecule that regulates various cellular processes. Most studies of p38αa have been focusing on adult somatic cells, but little is known about its function in stem cells. Our previous study has shown that mouse embryonic stem (ES) cells isolated from embryos of p38αa knockout mice (p38αa-/- ES cells) have altered cell proliferation and adhesion properties from wild type cells (p38αa+/+). The objective of this study was to determine the role of p38αa in mouse ES cell differentiation. Using protocols that allow ES cells to differentiate into different types of cells, we investigated the role of p38αa in smooth muscle cell (SMC) differentiation from wild type ES cells (p38αa+/+) and p38αa deficient (p38αa+/- and p38αa-/-) ES cells. Although p38αa-/- ES cells were able to differentiate to SMC, deletion of p38αa resulted in an increase of expression of SMC markers, αa-actin (SMA) and SM22αa. However, SMC differentiated from p38αa-/-ES cells displayed disorganized SMA filament structures. Our results suggested that p38αa controls the organization of SMA and negatively regulates SMC marker expression. This is in contrast to adult SMC differentiation where in most cases the activation of p38αa is required for the expression of SMC markers, indicating that p38αa plays different roles in adult SMC and embryonic SMC differentiation. This work is supported by grants from the National Institutes of Heath R15HL081126 and R21HL08273 (YLG).

8:45 CHARACTERIZATION OF CANDIDATE TUMOR SUPPRESSORS RIN AND CCK IN NEUROBLASTOMA CELLS

Tamica Collins [1]*, William Weiss [2], and Chris Hackett [2], [1]Jackson State University, Jackson, MS

39217 and [2]University of California San Francisco, San Francisco, CA 94143

Neuroblastoma is a malignant tumor of neural crest origin and is the third most common cancer in children. Overexpression of MYCN in neural crest tissue causes neuroblastoma in mice. RIN and CCK were identified as underexpressed in a genetic screen in mouse neuroblastoma. Our research focused on the overexpression of RIN and CCK, possible tumor suppressors, in neuroblastoma cells. We hypothesized that if RIN and CCK are possible tumor suppressors that they will stop neuroblastoma cells from surviving and proliferating. We co-expressed RIN and CCK with Green Flourescent Protein (GFP) and in two neuroblastoma cell lines, Kelly and SKNBE2. Kelly expresses high levels of MYCN and SKNBE2's express low levels of MYCN. We transiently transfected a packaging cell line (Phx A) and produced retrovirus containing the possible tumor suppressors. We infected the neuroblastoma cells with retrovirus and observed no GFP. We found that the retroviral vectors are getting into the packaging cell lines and GFP is being expressed. We also tested to see if retrovirus was being produced by infecting a kidney cell line (293T) which has a high infection rate. GFP was not expressed which may also indicate that there is no retrovirus present in neuroblastoma cells. We tested a new cell line and obtained negative results. Based on these results we will clone an inducible RIN construct using a topo cloning kit and a pT -Rex-DEST Gateway vector allowing high-Ievel tetracycline-regulated expression of the gene of interest (RIN) in neuroblastoma cells.

9:00 OVEREXPRESSION AND PURIFICATION OF NEURAL CADHERIN

Bolanle Bukoye* and Susan D. Pedigo, Mississippi University for Women, Columbus, MS 39701 and University of Mississippi, University, MS 38677

Cadherins are acidic proteins involved in calcium dependent cell adhesion. Cell adhesion molecules are required to instruct particular cells to remain at one particular site to encourage association with neighboring cells or to prevent these associations and migrate directionally. Cadherins communicate adhesion with neighboring cell to actin cytoskeleton through catenin and other proteins. This adhesion process is homophilic, in which cadherins associate specifically with identical cadherins on neighboring cell surfaces. Cadherins are a large transmembrane protein difficult to study as a whole unit. As a result of this, we have simplified them into minimum functional units that are possible to study. We study a construct of Neural Cadherin with Domains 1 and 2 (NCAD12). Domains are 7 strand barrel structures capable of independent folding. NCAD12 is capable of calcium binding and assembly into dimeric structures. Calcium binding occurs at the interface between each domain. Each domain is made up of approximately 110 amino acid residues. The goal of the current research is to characterize the calcium binding properties of NCAD12. This protein contains two tryptophan residues, one in Domain 1 and one in Domain 2. This presentation reports studies of the change in CD signal as a function of calcium added to the cuvette. These are the first studies of this sort ever performed on NCAD12.

9:15 Break

9:30 ROLE OF COMPLEX FORMATION OF ANGIOTENSIN II RECEPTOR AT1 WITH INSULIN RECEPTOR BETA- SUBUNIT IN THE DEVELOPMENT OF INSULIN RESISTANCE

Ravindra Kolhe*, Nara Gavini, and Lakshmi Pulakat, Mississippi State University, Mississippi State, MS 39762

Angiotensin II (Ang II) hormone has been implicated in the pathogenesis of insulin resistance and inhibitors of Ang II receptor AT1 are shown to improve insulin sensitivity. Here we show that in the skeletal muscle tissue of SHR rats, Insulin Receptor (IR) beta- subunit forms a complex with the AT1 receptor and co-immunoprecipitates with IR-beta. Such strong AT1-IR association was not observed in normo-tensive rat tissue. To our knowledge this is the first report that shows AT1 can associate with IR-beta in mammalian tissue and that such association might play a role in the regulation of signaling by IR-beta. We further demonstrate that a 2-hour pre-incubation with Ang II (at concentrations 50pM to 1*f*ÝM) significantly inhibits 125I-insulin binding to IR in human cell line MCF-7. This effect was not seen when Ang II exposure was performed for shorter periods. The two-hour exposure to Ang II also led to the formation of a protein complex containing AT1 and IR-beta, similar to that seen in skeletal muscle tissue of SHR rats. Both AT1-IR association and differential tyrosine phosphorylation of IR-beta and associated proteins were inhibited when the cells were pretreated with the AT1 antagonist losartan. These observations suggest that continuous presence of Ang II would result in sequestering IR in the AT1-IR complex and prevent IR from binding insulin. It also coincided with differential tyrosine-phosphorylation of IR beta-subunit and associated proteins, than that generated when IR was activated by insulin. Therefore, we infer that conformational alterations in IR caused by AT1-IR-beta association underlie the development of Ang II-induced insulin resistance. Based on these data we propose a model for AT1-mediated insulin resistance that involves receptor level interaction between the AT1 and the IR.

9:45 MULTIPLE CYSTEINE RESIDUES ARE CRITICAL TO JAK2-MEDIATED CATALYSIS

John K. Smith [1], Naila M. Mamoon [1], Kiranam Chatti [2], Sheeyong Lee [1], Kanakadurga Kundrapu [1], and Roy Duhe [1]*, [1]University of Mississippi Medical Center, Jackson, Mississippi 39216 and [2]State University of New York , Stony Brook, New York 11794

The redox regulation of JAK2 is poorly understood, and there are contradictory reports as to whether the enzyme's activity is inhibited or stimulated by oxidizing conditions in the cell. Here we demonstrate that multiple cysteine residues within the JAK2 catalytic domain are crucial for enzymatic activity. The enzyme is catalytically inactive when oxidized; activity can be

restored via reduction to the thiol state. A series of recombinant variants of JAK2 were overproduced using the baculoviral expression vector system. A truncated variant of JAK2, GST/(Nδd661)rJAK2, provided evidence that the amino-terminal autoinhibitory domain was not essential for direct redox regulation and that only nine potentially reactive cysteine residues were involved. The effect of individually and combinatorially altering these nine cysteines was examined via cysteine-to-serine mutagenesis. This identified four cysteine residues in the catalytic domain (Cys866, Cys917, Cys1094 and Cys1105) that cooperatively maintain JAK2's catalytic competency. Our data are consistent with a direct mechanism for redox regulation of JAK2 via oxidation and reduction of critical cysteine residues. Seemingly contradictory reports of oxidative stimulation of JAK2 activity might be best explained through indirect mechanisms involving either the oxidative inhibition of JAK2-interacting biomolecules, such as phosphotyrosine phosphatases, or the oxidative activation of signal transduction pathways which intersect with JAK2.

10:00 REGULATION OF MATRIX METALLOPROTEINASES BY P38 MAP KINASE DURING VESSEL FORMATION IN A THREE-DIMENSIONAL CELL CULTURE SYSTEM

Suja Rajan*, Jianming Ye, Faqing Huang, and Yanlin Guo, University of Southern Mississippi, Hattiesburg, MS 39406

In a conventional culture dish (two-dimensional plastic surface), the major activity of endothelial cells is proliferation with limited morphological change. When cultured in a 3-dimensional (3D) collagen matrix, endothelial cells undergo a series of morphological changes starting with the development of intracellular vacuoles, followed by cell elongation, adjacent cells then coalesce to form tube-like structures. This process mimics the steps of vessel formation in angiogenesis. Using this cell culture as an in vitro angiogenesis model, our previous study has shown that p38 mitogen activated protein kinase (p38) plays multiple roles in controlling cell proliferation, viability and morphogenesis during tube formation. In this study, we investigated the role of p38 in the regulation of matrix metalloproteinases (MMPs). MMPs are secreted enzymes that hydrolyze extracellular matrix (ECM) proteins. Controlled degradation of ECM is critical for cell migration and invasion during blood vessel formation and tissue remodeling. Our results indicated that inhibition of p38 by a pharmaceutical inhibitor SB203580 significantly increased the enzymatic activity of MMP-1 and MMP-9 as determined by zymography analysis and the expression of MMP-1 and MMP-9 as determined by real-time quantitative PCR analysis. These results indicate that p38 plays an important role in the regulation of cell invasion and migration in the 3D cell culture. We are currently using RNA interference method to investigate specific roles of p38αa and p38β, two major p38 isoforms, in the regulation of the expression of MMP-1 and MMP-9. This work is supported by grants from the National Institutes of Heath R15HL081126 and R21HL08273 (YLG).

10:15 CHARACTERIZATION AND FUNCTIONAL ANALYSIS OF A COTTON FIBER GENE ENCODING A RING-TYPE UBIQUITIN LIGASE

Meng-Hsuan Ho* and Din-Pow Ma, Mississippi State University, Mississippi State, MS 39762

The ubiquitin-proteasome proteolysis pathway, responsible for the degradation of abnormal and short-lived proteins, regulates a wide variety of cellular processes in eukaryotes. The ubiqination of target proteins for degradation requires sequential action by three enzymes: an ubiquitin-activating enzyme (E1), an ubiquitin conjugating enzyme (E2), and an ubiquitin ligase (E3). In plants, the RING type ubiquitin E3s are classified into two groups, single subunits and multiple subunit E3s. The multiple SCF E3s contain four subunits: Skp1, cullin1, Rbx1, and an F-box protein. It has been reported that there are 469 RING type protein genes and about 700 F-box protein genes in the *Arabidopsis* genome. The presence of a large number of RING type and F-box proteins in *Arabidopsis* suggest that plant ubiquitin E3s have many specific target substrates. Using the cotton E2 (GhUBC1) as bait in a bacterial two-hybrid system, we have cloned two unique fiber cDNAs, *GhRIN1* and *GhRIN2*, encoding RING type ubiquitin ligases. The GhRIN1 protein derived from the full-length *GhRIN1* cDNA contains 338 aa and has the highest homologies with E3 homologs from *Arabidopsis* (AAN18152 encoded by AT3g19950) and rice (*Oryza sativa*) (BAD67937) by Blast searches. The real time RT-PCR data reveals that *GhRIN1* is highly expressed in fiber in a developmental manner. Our experimental results suggest that protein ubiquitination occurs in fiber cells and the ubiquitin-proteosome pathway may control fiber development and differentiation.

10:30 Break

10:45 CDC20 LINKS NUCLEOTIDE EXCISION REPAIR TO CELL CYCLE PROGRESSION IN SACCHAROMYCES CEREVISIAE

Lauren Rochelle, Mohamed Hajj, Kate Goodwin, and Bernadette Connors*, Millsaps College, Jackson, MS 39210

Considering the importance and universality of our genetic material, its accurate replication and transmission are vital to the survival of cells and the more complex organisms they compose. Faulty DNA replication and repair can lead to severe human diseases such as xeroderma pigmentosum, a disorder characterized by extreme photosensitivity and a greater than 1000-fold increased risk of cutaneous and ocular neoplasms. This study intends to identify the link between cell cycle progression and nucleotide excision repair (NER). NER mechanisms halt the cell cycle upon detection of single and double stranded DNA breaks caused by exposure to UV radiation. Our studies have suggested a link between cdc20p, a known regulator

of mitotic exit, and NER. Drug toxicity assays in *Saccharomyces cerevisae* revealed that selected NER-defective mutants with diminished cdc20p activity are more UV sensitive than either single mutant alone. Overexpression of cdc20p rescued the UV sensitivity of selected mutants, namely, *rad2*- and *rad4*-defective strains. Microscopic examination of rad2-GFP revealed that its expression is elevated in G1/S phases, while end-joining experiments demonstrated a novel role of cdc20p in the cell's ability to repair damaged DNA in *rad4*-defective mutants. Future work will involve a dissection of the physical relationship between NER proteins and cdc20p, as well as other proteins that regulate mitotic exit. The ultimate goal of this research is to come to a better understanding of mechanisms related to defects in nucleotide excision repair, defects that have direct implications on development of certain types of cancer.

11:00 THE *S. CEREVISIAE KIN3* GENE INTERACTS WITH A DNA DAMAGE REPAIR GENE

Terrel Sugar*, Yulon Stewart, and Sarah Lea McGuire, Millsaps College, Jackson, MS 39210

The *Saccharomyces cerevisiae KIN3* gene encodes a nonessential protein kinase whose function is not well understood in budding yeast. It is a member of a heterogeneous family of protein kinases, the NIMA family, most of which are involved in mitotic progression. To understand the functions of this protein kinase in budding yeast, we have generated a *KIN3* deletion strain and characterized the effects of this deletion on the cells. Deletion cells are larger, with nearly twice the cell volume compared to non-deleted cells. We are performing FACS analysis to determine if these cells are delayed during cell cycle progression, which could lead to larger cell size. The deletion strain exhibits a resistance to the microtubule poison benomyl, and sensitivity to the microtubule poison nocodazole, suggesting that *KIN3* may be involved in mitotic spindle function. In addition, we have completed synthetic genetic analysis and identified several genes that interact with *KIN3*. Most notably, a strain with a deletion in *MMS22*, a DNA repair gene, exhibits a synthetic defect in combination with a *KIN3* deletion. Deletion of *KIN3* abrogates the MMS sensitivity of an *MMS22* deletion, suggesting that *KIN3* may be involved in DNA damage repair or in the DNA damage checkpoint pathway.

11:15 DNA MICROARRAY BASED TRANSCRIPTIONAL PROFILE OF *MSA* MUTANT OF S.AUREUS

Vijayaraj Nagarajan* and Mohamed O.Elasri, University of Southern Mississippi, Hattiesburg, MS 39406

Staphylococcus aureus is an important pathogen that causes severe infections in humans. *S. aureus* produces a large number of virulence factors and possesses complex regulatory networks. Previously we identified a novel gene, *msa* that is involved in regulating several virulence factors. We also showed that *msa* modulates the activity of the global regulator *sarA*. In this report, we studied the effect of *msa* mutation at global level, by analyzing the DNA microarray based transcriptional profile of the *msa* mutant. Results showed that *msa* strongly regulates genes related to transport/binding and cell envelope. Several virulence factors including global regulators were also affected by *msa*. These results support our hypothesis that msa mediates interaction of *S.aureus* with its environment.

11:30 MULTIDIMENSIONAL PROTEIN IDENTIFICATION TECHNOLOGY-BASED PROTEOGENOMIC MAPPING OF CHANNEL CATFISH VIRUS GENOME

Dusan Kunec*, Bindu Nanduri, and Shane C. Burgess, Institute for Digital Biology, Mississippi State University, Mississippi State, MS 39762

Viruses have overlapping and spliced ORFs, small ORFs and often use alternate translational start sites meaning that accurate annotation of viral genomes using computational gene prediction not possible. Proteogenomic mapping, an independent and complementary experimental measure of ORF expression, can be used for improving genome annotation. Channel catfish virus (CCV) is a simple comparative model for understanding herpesvirus biology and evolutionary relationships within the family *Herpesviridae*. The canonical CCV genome sequence currently has 76 predicted ORFs. Here we have developed a novel statistical method for assigning probabilities to peptide identifications by mass spectrometry and produced a novel proteogenomic map of the canonical CCV genome sequence. This statistical method allows users to explore proteomics data at user-defined levels of confidence. Traditionally trypsin is used as a protease for proteomics. But many proteins when digested using trypsin do not produce peptides within the size limitations to be identified by mass spectrometry or to be useful as unique identifiers. Also tryptic peptides cannot overlap. To generate much greater proteome coverage, to yield overlapping peptides and to further improve confidence we used partial proteinase K digestion. At $P<0.05$ we identified 27/76 previously predicted ORFs using trypsin and 55/76 with proteinase K (25 were common to both enzymes). Furthermore, we identified 258 unpredicted peptides, which in turn identified 78 novel ORFs. Our data more than doubles the annotated protein coding capacity of the CCV genome.

11:45 KNOCKING OUT CHAPERONE PROTEIN GENES IN [URE3] STRAINS OF *SACCHAROMYCES CEREVISIAE*

Katie Brinkman* and Ross E Whitwam, Mississippi University for Women, Columbus, MS 39701

The [URE3] prion of baker's yeast, *Saccharomyces cerevisiae*, is a misfolded protein capable of misfolding properly-folded versions of the same protein in the same cell. Continued propagation of yeast prions requires the presence of several chaperone proteins in yeast cells, including the Hsp104 protein and the Ssa1 protein. We wish to investigate whether these chaperone proteins are also required for the establishment of the [URE3] state, as opposed to its propagation. We are knocking out the HSP104 and SSA1 genes in prion-free strains of yeast. Gene knock is being accomplished by targeting the nourseothri-

cin acetyl transferase (NAT) gene to the loci of interest and selecting for nourseothricin resistance in transformants. The knock-out strains will be used to investigate how the absence of those genes affects rates of spontaneous [URE3] formation in yeast.

THURSDAY AFTERNOON

Bost Auditorium South

1:30 RATES OF SPONTANEOUS FORMATION OF THE [URE3] PRION IN CULTURES OF *SACCHAROMYCES CEREVISIAE*

Michael Lee* and Ross E Whitwam, Mississippi University for Women, Columbus, MS 39701

The [URE3] prion of *Saccharomyces cerevisiae* is a misfolded form of the Ure2 protein that forms amyloid fibers and can be transmitted to mating partners and offspring. It serves as a useful model for mammalian prions and amyloidoses. We investigated how rates of spontaneous [URE3] formation in prion-free yeast varied during the growth of yeast cultures. Both prion-free yeast and isogenic [URE3] strains showed essentially identical growth curves in YPD medium, suggesting that the prion is not deleterious to growth under high-nutrient conditions. The rates of spontaneous [URE3] formation in prion-free yeast were highly variable throughout the growth curve of the yeast. Certain time points in the growth curve were consistently associated with the lowest rates of spontaneous prion formation, while other time points were consistently associated with the highest rates. These results suggest that other cellular factors whose levels vary during culture growth are necessary to establish the stable [URE3] state.

1:45 MODELLING OF $CD30^{HIGH}$ LYMPHOMAS USING MAREK'S DISEASE IN CHICKEN AS A NATURAL ANIMAL MODEL

Shyamesh Kumar*, Joram Buza, Bindu Nanduri, Shane C. Burgess, and Shyamesh Kumar*, Institute for Digital Biology, Mississippi State University, Mississippi State, MS 39762

Lymphomas are the 6th leading cause of human death due to cancer in the USA. A diverse range of Hodgkin's and many Non-Hodgkin's lymphoma over-express the CD30 antigen. The $CD30^+$cells are neoplastic transformed cells and control lymphoma formation. Marek's disease(MD) in chicken is the only naturally occurring model for $CD30^+$ lymphomas. All chickens are susceptible to MDV infection but MD develops only in susceptible genotypes. MD progression can be divided into cytolytic, latent, and tumor phases. The neoplastic-transformed cells ($CD4^+CD30^+$) develop during the cytolytic phase in both the susceptible and resistant genotypes but only in MD-susceptible genotypes do gross lymphomas develop. During the cytolytic and latent phases of MDV infection in both genotypes, most lymphoma-infiltrating cells are $CD4^+$ T cells. However, after this stage (21dpi) lymphomas increase in size only in susceptible genotypes and most infiltrating cells are $CD4^+$ T cells. Conversely, in resistant chicken genotypes lymphomas decrease in size and most infiltrating cells are $CD8^+$ T cells. We hypothesize that the proteome of MDV-transformed cells is altered resulting in aberrant signaling pathways. We also hypothesize that differences exist between the resistant and susceptible genotypes in 1) the profile of cytokine within lymphoma that promote either $CD8^+$ T-cell mediated immunity or proliferation of $CD4^+$ T and 2) peptides presented to cytotoxic T-lymphocytes (CTL) such that only resistant genotypes load lymphoma-protective epitopes that activate CTL killing of lymphomas. The $CD30^+$ and $CD30^-$ cells from gross lymphomas in susceptible genotypes will be isolated by magnetic cell sorting, fractionated by differential detergent fractionation (DDF) and proteins identified by 2D LC-MS/MS. Protein functional analysis will be performed using gene ontology (GO) and pathway analysis softwares. Tissue sections from microscopic lesions at 21 dpi will be sectioned by laser capture microdissection (LCM) and the mRNA will be assayed for Th1 and Th2 using RT-PCR to obtain information on possible role of cytokines in lymphoma progression or regression. MHC-I and the associated peptides will be co-immunoprecipitated and the peptides identified by 2D LC-MS/MS to facilitate comparison of peptides presented to CTL by susceptible and resistant chicken genotypes.

2:00 DELETION AND EPITOPE-TAGGING OF CELL CYCLE GENES USING UNCLONED PCR FUSION PRODUCTS AND HOMOLOGOUS RECOMBINATION IN *ASPERGILLUS NIDULANS*

Marlena Mattingly [1*], Megan Jackson [2], David Tuck [3], and P.M. Mirabito [4], [1]Belhaven College, Jackson, MS 39202, [2]Berea College, Berea, KY 40404, Western Kentucky University, Bowling Green, KY 42101, and [4]University of Kentucky, Lexington, Kentucky 40506

Three standard approaches to investigate gene function are 1) inactivate the gene (e.g. gene knockouts) and determine the effect on the organism; 2) determine the cellular and subcellular location of the protein; and 3) determine with which other proteins the protein of interest physically interacts. The key to all three approaches is the ability to replace the endogenous gene with altered forms created *in vitro* (gene replacement). Although gene replacements are the "industry standard", they have been laborious and time consuming in all eukaryotes except budding yeast (*Saccharomyces cerevisiae*). Recent technological advances have made gene replacements in several fungi as facile as with yeast. Here we apply this technology to initiate the investigation of six *Aspergillus nidulans* genes implicated in cell cycle regulation. Five are hypothesized to function with the Anaphase Promoting Complex/Cyclosome (aka APC/C), which is an ubiquitin ligase that regulates multiple cell cycle events.

Two, *afrA* and *afrB*, are implicated as cell cycle-stage-specific activators of the APC/C. Three, *ubc3*, *ubc4*, and *ubc11*, are implicated as ubiquitin conjugating enzymes required for APC/C function. The last, *sv9*, was originally identified as required for nuclear division but has since been implicated in lipid metabolism. We report the successful deletion (knock-out) of all six genes, three of which are essential (*afrA*, *ubc4*, and *sv9*). We also report the isolation of *A. nidulans* strains that probably contain epitope-tagged versions of the genes for use in future cytological localization and protein-interaction studies.

2:15 MSU'S INSTITUTE FOR DIGITAL BIOLOGY: A MISSISSIPPI RESOURCE FOR POST GENOMIC BIOLOGY

Shane C. Burgess* and Susan M. Bridges, Institute for Digital Biology, Mississippi State University, Mississippi State, MS 39762

The MSU Institute for Digital Biology (IDB) is a new multidisciplinary institute that combines MSU's strengths in post-genomic life sciences and computation. Supported from the "grassroots" we leverage our campus-wide expertise in multidisciplinary interdependent ways. We would like to expand our collaborations statewide to help to promote Mississippi's economic growth. The IDB aims to move the traditional academic triad of research, teaching and service to discovery, learning, and engagement. Discovery work at the IDB aims to improve the human condition by improving health, food safety, food production and quality, bio-fuels, and bio-security. Discovery work is funded by grants from the National Science Foundation, the National Institutes for Health, the United States Department of Agriculture, the Office of Naval Research, and the Department of Energy. We will discuss some examples of discovery work and our also our learning community.

2:30 A JACKPOT TEST OF THE SPONTANEOUS FORMATION OF THE [URE3] PRION IN *SACCHAROMYCES CEREVISIAE*

Mary Oyeleye* and Ross E Whitwam, Mississippi University for Women, Columbus, MS 39701

Prions are misfolded and infectious forms of cellular proteins. They are capable of propagating themselves by inducing properly-folded forms of the same protein to misfold. The [URE3] prion of baker's yeast, *Saccharomyces cerevisiae*, is the prion form of the Ure2 protein. At a very low rate, the properly-folded, functional form of the Ure2 protein can spontaneously misfold into the prion form. Very little is known about the mechanism of this spontaneous misfolding and about whether misfolded Ure2 protein alone is sufficient to establish the prion state or whether additional cellular factors are required. We have performed a variation of Luria and Delbruk's jackpot test on the rates of spontaneous [URE3] formation in prion-free yeast. When multiple samples from the same culture were plated on a medium that selects for [URE3]-containing cells, the mean number of [URE3] cells per sample was ten-folded lower than the variance, suggesting divergence from a Poisson distribution. However, when samples from multiple individual cultures were plated on the selective medium, the variance in the number of [URE3] cells per sample was an order-of-magnitude higher than the variance seen in the samples from the individual culture. We believe this supports the hypothesis that, while misfolding of the Ure2 protein is a random event, establishment of the self-propagating [URE3] state is dependent on other cellular factors which are not consistently present.

2:45 Break

3:00 ROLE OF *MSA* IN REGULATING BIOFILM FORMATION IN STAPHYLOCOCCUS AUREUS

Karthik Sambanthamoorthy* and Mohamed O. Elasri, University of Southern Mississippi, Hattiesburg, MS 39406

Staphylococcus aureus is a versatile pathogen causing a wide variety of infections ranging from superficial infections (skin abscess, wound infections), to toxemic syndromes (food poisoning) to life threatening conditions (osteomyelitis, endocarditis). The ability of this pathogen to form biofilms plays an important role in the establishment of infection. *S. aureus* expresses a wide variety of virulence factors that can be classified as either cell bound proteins (e.g., adhesins) or exoproteins (toxins). The coordination of the expression of virulence factors is under the control of two global regulatory systems, the accessory gene regulator (*agr*) and the staphylococcal accessory regulator (*sarA*). The *agr* system is a quorum sensing system that regulates expression of several virulence factors according to cell density. *sarA* is a second global regulator that controls the expression of virulence factors in two pathways, an *agr*-dependent pathway and an *agr* -independent pathway. We have identified and characterized a new gene, *msa*, that modulates the expression of SarA and several virulence factors. We have also discovered that *msa* plays a role in biofilm formation. Mutation of *msa* results in delayed biofilm formation *in vitro* and altered the expression of several biofilm forming genes.

3:15 SITE SPECIFICITIES OF HENNEGUYA EXILIS IN CHANNEL CATFISH (ICTALURUS PUNCTATUS)

Angela P. Brandon [1]*, Linda M. Pote [1], and Andrew Goodwin [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]University of Arkansas, Pine Bluff, AR 71601

Myxozoans are common metazoan parasites of marine and freshwater fish. Previous research identified myxozoans based on their morphological characteristics and site preference within the fish host. Recently with the advent of molecular techniques such as PCR and genomic sequencing, traditional identification based on morphology and location in the host has been shown to be inconsistent. Tumor-like growths containing Henneguya sp. myxospores were observed on the caudal fins and kidneys of naturally infected channel catfish (Ictalurus punctatus). Six samples of caudal fin lesions and two kidney lesions were isolated from fish collected in Mississippi and Arkansas. Each of these samples contained myxospores morphologically resembling Henneguya exilis. DNA was isolated from

these spores and the 18s rDNA was amplified with generic Henneguya spp. primers and sequenced. The results indicated that these spores were H. exilis. Currently, H. exilis has not been reported in tissues other than the interlamellar troughs of the gills of channel catfish, making the discovery of these spores in the caudal fin and kidney a new site preference for this organism in catfish. This confirms that H. exilis can infect organs other than the gills in channel catfish.

3:30 EXPRESSION ANALYSIS OF THE MOLD-SPECIFIC M46 GENE IN FIVE STRAINS OF THE PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*

Davida Crossley*, Hana Ali, and Glen Shearer, University of Southern Mississippi, Hattiesburg, MS 39406

Histoplasma capsulatum (Hc) is the etiologic agent for the respiratory disease histoplasmosis which afflicts an estimated 500,000 Americans each year. This dimorphic fungus grows in the soil as a multicellular mold. Once the soil is disturbed, spores or mold fragments are aerosolized and are inhaled into the lungs where the organism shifts to a unicellular yeast growth form. Without this mold-to-yeast conversion disease cannot occur. To understand the molecular basis of dimorphism, we have isolated several mold-specific and yeast-specific genes. The subject of this study is the mold-specific M46 gene. Northern blot analysis has shown that M46 is expressed in two strains of Hc (G186AS and Downs strains), but is transcriptionally silent in two other strains (G184AS and G217B strains). Recent analysis of WU24, which like the Downs strain is in the NAm1 class of *H. capsulatum*, has shown that M46 is expressed only in the mold morphotype. Sequence analysis has shown that the complete M46 gene is present in all of these strains. Therefore we have constructed M46 promoter-GFP fusions to determine if the promoters from the two non-expressing strains are nonfunctional or if these two strains are defective in some trans-regulating factor(s). Fluorescent microscopy data has shown that M46 promoters from all four strains were functional. This analysis allows us to hypothesize that M46 is not transcriptionally silent in strains G184AS and G217B due to a non-functional promoter but due to a missing trans regulating factor(s). Future work will focus on identifying any missing trans regulating factors that may be causing transcriptional silence in the latter strains.

3:45 THE CO-EXPRESSION OF AMPKA, AMPKB, AND AMPKΓ FROM *TRYPANOSOMA BRUCEI*

Jessica Lewis [1]*, James C. Morris [2], and Meredith T. Morris [2], [1]Mississippi University for Women and [2]Clemson University, Clemson, SC 29634

Trypansoma brucei is a protozoan parasite with a complex life cycle which involves the tsetse fly host and various mammalian hosts. In the mammalian blood stream, the parasites express variable surface glycoproteins. The coordinated expression of these surface molecules is essential to the survival of the parasite. In *T. brucei*, adenine monophosphate-activated protein kinase (AMPK) plays a role in the regulation of surface molecule expression. AMPK consists of three subunits: AMPKα, AMPKβ, and AMPKγ. We have identified candidate open reading frames (ORFs) that might encode the three AMPK subunits. However, we need to demonstrate that these open reading frames express gene products that function as the heterotrimeric AMPK complex. We have cloned the putative AMPKγ and AMPKβ ORFs into a pQE30 expression vector. When the expression construct was transformed into *E. coli*, both ORFs were expressed, but the protein products were insoluble. Work is continuing to clone the putative AMPKα ORF into the expression vector with the putative AMPKγ and AMPKβ ORFs and to express and purify the protein complex in *E. coli* in its functional heterotrimeric form.

FRIDAY MORNING

Bost Auditorium South

8:30 THE ROLE OF CSOS2 PROTEIN IN THE CARBOXYSOME OF HALOTHIOBACILLUS NEAPOLITANUS

Zhicheng Dou*, Jessup M. Shively, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi. Hattiesburg, MS, 39406

Carboxysomes are biological nanoreactors in some photo- and chemoautotrophic prokaryotes which can transform inorganic CO_2 into metabolizable sugars. CsoS2 protein is one of the carboxysome shell proteins and it exists in two physically distinct forms of approximately 85 and 130 kDa, respectively. It is our goal to understand what is the difference between these two protein products CsoS2A and CsoS2B and their roles in the self-assembly processes of carboxysomes *in vivo* to ultimately utilize that knowledge for the development of biopolymer based materials. To obtain the requisite large amounts of CsoS2, the *csoS2* gene was inserted into the pPROEX and IMPACT prokaryotic protein expression vectors and recombinant CsoS2 protein was produced. In both expression systems, CsoS2A and CsoS2B were expressed. However, only CsoS2B can be purified in the IMPACT system because of its C-terminal tag, while CsoS2A protein doesn¡¯t have the C-terminal tag by the immunoblotting analysis. The polyclonal antibody against CsoS2B protein can recognize these two polypeptides, which indicate these two variants have the similar epitopes. So, through these experimental results, we conclude that CsoS2B protein encodes the full length CsoS2 protein and CsoS2A may be a truncated form of CsoS2 protein. The mechanism of CsoS2 protein expression pattern is being investigated. Simultaneously, various strategies are being explored to increase solubility and concentration of purified recombinant CsoS2 protein in preparation for X-ray crystallography studies.

8:45 REGULATION OF ANTIBIOTIC RESISTANCE IN *STAPHYLOCOCCUS AUREUS*

Antony Schwartz* and Mohamed O. Elasri, University of Southern Mississippi, Hattiesburg, MS 39406

Infections caused by hospital and community-acquired Methicillin-Resistant *Staphylococcus aureus* (MRSA) have been on a steady rise. The *mec* operon encodes for Penicillin Binding Protein 2a (PBP2a) that has decreased binding affinity for β-lactam antibiotics. Results of a recent study from our group suggest that a novel regulatory protein Msa (Modulator of SarA) may be associated with methicillin resistance in *S. aureus*. In this study, we hypothesize that Msa regulates the expression of the *mec* operon. MIC of methicillin was reduced by several fold in the *msa* mutant compared to the wild type. Further analysis using quantitative real-time PCR (qRT-PCR) showed undetectable levels of *mecA* expression in the mutant. Protein levels in the wild type, mutant and complement strains were evaluated using custom-made anti-PBP2a polyclonal antibody. Results of this study suggest that Msa is involved in antibiotic resistance in *S. aureus*.

9:00 SITE DIRECTED MUTAGENSIS OF THE *csoS3* GENE OF *HALOTHIOBACILLUS NEAPOLITANUS*

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

Carboxysomes are proteinaceous microcompartments that play an integral part in the metabolism of cyanobacteria and many chemolithotrophic bacteria. These polyhedral inclusions are filled with the central CO_2 fixing enzyme, ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCO), and enhance the catalytic ability of RuBisCO by contributing to a CO_2 concentrating mechanism (CCM). The CCM acts to increase the concentration of CO_2 within the carboxysome, driving CO_2 fixation forward by mass action. A carbonic anhydrase (CA) believed to create CO_2, the substrate of RuBisCO, from abundant cytosolic HCO_3-, has been found within the shell of carboxysomes in the chemolithoautotrophic sulfur bacterium *Halothiobacillus neapolitanus*. Using x-ray crystallography, the carboxysomal CA (CsosCA) was determined to be a member of a new subclass of β-CA, containing one biologically relevant zinc-binding active site. A mechanism has been proposed involving three amino acid residues that serve as zinc ligands and are conserved in all β-CAs. To determine the importance of the conserved residues, site-directed mutagenesis of one of the zinc-binding residues (Cys 253) was attempted using PCR techniques. Stop-flow analysis of the recombinant protein will be used to determine the effect the mutation has on the enzymatic activity of the protein. The activity will then be compared to that of wild-type CsosCA to determine the importance of the mutated residue in the process of CO_2 hydration and HCO_3- dehydration.

9:15 FLUORESCENCE STUDY OF THE INTERACTION BETWEEN THE TAT-PTD PEPTIDE AND THE LIPID BILAYER

Venkataswarup Tiriveedhi* and Peter Butko, University of Southern Mississippi, Hattiesburg, MS 39406

The mechanism of internalization of cationic peptides into the cells is unknown. We used fluorescence spectroscopy to study the interaction between Protein Transduction Domain of the HIV-1 TAT protein (TAT-PTD; residues 47–60 of TAT, fluorescently labeled with tryptophan) and the lipid bilayer in the form of small unilamellar lipid vesicles [SUV]. The TAT-PTD tryptophan exhibited a decrease in fluorescence intensity and increase in anisotropy upon the interaction with SUV, which was proportional with the negative charge density in the membrane. Kinetic analysis of the interaction showed two apparent dissociation constants. Kd1 was independent of the negative charge density and accounted for 24% of the interaction, whereas Kd2, contributing 76% to the interaction, decreased linearly with the density of negative charge in the membrane, suggesting an electrostatic nature of the latter interaction. The former could not be inhibited by high salt, suggesting its van der Waals or hydrophobic nature. TAT-PTD did not dissipate membrane potential (165 mV, negative inside), nor did it affect fluorescence anisotropy of the membrane fluorescence probes TMA-DPH or DPH, indicating preserved membrane integrity upon TAT-PTD binding. When the pyrene-labeled phosphatidyl glycerol was included in the membrane, TAT-PTD induced pyrene excimer formation, but only at the temperature above the melting point of the lipid. Thus, the two prerequisites for a strong binding of TAT-PTD to the lipid membrane are the presence of the negative charge and the liquid crystalline phase of the lipid bilayer.

9:30 CONSTRUCTION AND MODIFICATION OF A SINGLE-CHAIN FV ANTIBODY BIOSENSOR FOR THE DETECTION OF SELECTED BACTERIA

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

The specificity of antibody molecules for their target antigens can be a utilized to generate a biosensor for the detection of ubiquitous pseudomonas species. Given the difficulties associated with expression of full-length IgG molecules in both bacterial and plant cultures, a single-chain antibody fragment (scFv) will be constructed and transformed into a bacterial culture to allow for high level expression and rapid assessment of gene mutagenesis. Once isolated, multiple scFv will be combined into a single gene construct to allow for either improved sensitivity of detection, or to add specificities for other antigens giving the biosensor multi-functionality of detection.

9:45 CHARACTERIZATION OF THE SHELL PROTEINS OF MICROCOMPARTMENTS INVOLVED IN ETHANOLAMINE CATABOLISM IN SALMONELLA ENTERICA

Balaraj B. Menon*, Andrea G. Marshall, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Bacterial microcompartments and related polyhedral organelles that are assembled in response to varying environmental cues have been observed and characterized in several

chemolithoautotrophic systems. Salmonella enterica serovar Typhimurium, the causative agent of a form of human gastroenteritis, synthesizes one such bacterial microcompartment that aids in the catabolism of ethanolamine, a substrate found in the human gut. The ethanolamine utilization (eut) operon, which is induced under aerobic growth conditions in the presence of ethanolamine and cyanocobalamin, is comprised of seventeen genes, five of which encode the shell proteins EutK, -L, -M, -N, and -S. All of these proteins bear significant homology to known carboxysomal shell proteins of autotrophic bacteria. Aside from limited genetic studies aimed at dissecting the biochemical role of these microcompartments in ethanolamine catabolism, very few studies pertaining to the structural understanding of microcompartment assembly have been attempted. The primary focus of this study is thus targeted at characterizing the architecture of microcompartments involved in ethanolamine catabolism. Crystallographic analyses, protein-protein interaction studies, and reconstitution experiments using recombinant shell proteins are underway. To this end, His6-tagged recombinant versions of all putative Eut shell proteins have been purified.

10:00 CLONING AND EXPRESSION OF THE EUTN GENE PRODUCT FROM SALMONELLA ENTERICA

Andrea G. Marshall*, Balaraj B. Menon, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Salmonella enterica serovar Typhimurium is a pathogen that resides in the gut of both wild and domestic animals. Ingestion of contaminated meats such as beef and poultry is the most common route for S. enterica infection in humans. Under aerobic conditions S. enterica can utilize ethanolamine, a chemical found in the human gut, as a sole source of carbon, nitrogen, and energy. When grown on ethanolamine, the bacterium forms polyhedral organelles that are similar in appearance to the carboxysomes found in certain photosynthetic and chemolithautotrophic bacteria. The 17 gene ethanolamine utilization (eut) operon of S. enterica contains five genes that are believed to code for the shell proteins of the polyhedral organelle, based upon homology of their primary sequences with those of known carboxysomal shell proteins. Although genetic studies have been performed to elucidate the role of these bacterial microcompartments in the catabolism of ethanolamine, few studies have addressed the structure of the proteins that compose the organelle. The gene of one of these proteins, eutN, was amplified by polymerase chain reaction (PCR) and purified using gel electrophoresis. The gene was then ligated into the pProEX HTb expression vector and the construct used to transform competent Escherichia coli cells. The insert was confirmed by DNA sequencing. Conditions for protein expression were optimized for high yield of recombinant EutN protein. Future studies will involve crystallographic analyses, protein interaction studies, and antibody development.

10:15 Divisional Business Meeting

FRIDAY AFTERNOON

Bost Auditorium North

3:00 Divisional Poster Session

FLUORESCENCE RESONANCE ENERGY TRANSFER STUDIES ON THE INTERACTION BETWEEN PAMAM DENDRIMER AND THE LIPID MEMBRANE

Venkataswarup Tiriveedhi [1], Shehzeen Shams [1]*, Kelly M Kitchens [2], Hamid Ghandehari [2], and Peter Butko [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]University of Maryland, Baltimore, MD 21201

Dendrimers, highly branched complex macromolecules, have been of particular interest in the biomedical field for their extensive use in the intracellular drug delivery. The exact mechanism of penetration of these highly positively charged macromolecules through the hydrophobic core of the lipid bilayer is not known. However, various yet to be proven theories have been put forward like inverted micelle formation or adsorptive endocytosis. We studied the interaction of the fluorescein-labeled PAMAM (polyamidoamine) dendrimers (G1, first generation, Mr = 1430 with eight positive charges on the surface) with negatively-charged small unilamellar lipid vesicles (SUV) composed of egg phosphatidylcholine/phosphatidylglycerol/lissamine-rhodamine-phosphatidylethanolamine (73:25:2). When the fluorescent dendrimer was mixed with the rhodamine labeled SUV, fluorescence resonance energy transfer was observed between the fluorescein donor and the rhodamin acceptor with efficiency of approximately 60%. These data were useed to calculate the average distance between the two fluorophores in our system, which was found to be 4.8 ± 0.3 nm. These results are consistent with the hypothesis that the dendrimer attaches to the surface of the lipid vesicle and does not significantly penetrate through the hydrophobic core of the lipid bilayer

EFFECTS OF VALPROATE AND ALCOHOL ON CADHERIN EXPRESSION

Brittney Tate*, and Ujjwal K. Rout, University of Mississippi Medical Center, Jackson, MS 39216

Exposure to valproate or alcohol during pregnancy results in neurobehavioral problems including autism in the offspring. Although it is apparent that these teratogens disturb the normal development of the brain, the mechanism of this phenomenon is not completely known. Adhesion molecules play critical role in the development of the brain. Therefore, it is possible that these teratogens may alter the expression and function of adhesion molecules in the neuronal cells causing their

abnormal proliferation, differentiation and migration in the developing brain. In the present investigation, neuron-like PC12 cells were used as an in vitro model to examine the effects of valproate and alcohol on the expression levels of adhesion molecule N-Cadherin that regulate cell-cell interactions. Both high and low concentrations of valproate and alcohol were used for the study. Concentrations of Nerve Growth Factor that cause differentiation of PC12 cells into neuronal phenotype were also varied. Cell lysate from untreated and treated cells were subjected to protein concentration determination and Western Blotting analysis to examine the expression levels of N-Cadherins using Alpha Imager software. Results show that both valproate and alcohol changes expression levels of N-Cadherin in PC12 cells. Presence of NGF also influenced valproate and alcohol induced changes in the N-Cadherin expression. Our data indicate that exposure to valproate and alcohol during pregnancy may alter brain development by changing cell-cell interactions mediated by N-cadherins. Supported by a grant from NIH (NIH/NCRR P20 RR017701).

THE CsoS1 PROTEINS AND OrfA/B: MAJOR AND MINOR COMPONENTS OF THE CARBOXYSOME SHELL.

Fei Cai [1]*, Sabine Heinhorst [1], Jessup M. Shively [2], and Gordon C. Cannon [1], [1]University of Southern Mississippi, MS 39406 and [2]Clemson University, Clemson, SC 29634

Carboxysomes belong to a family of microcompartments or biological nanoreactors that are found in many autotrophic bacteria and serve to facilitate bacterial CO_2 fixation. The polyhedral particles consist of a proteinaceous shell and are filled with the enzyme that catalyzes the CO_2 fixation reaction. To understand the molecular mechanism by which carboxysomes enhance RubisCO catalysis, efforts are underway to determine the three-dimensional structure of carboxysomes in the model bacterium *Halothiobacillus neapolitanus*. All eight polypeptide components of the carboxysome have been expressed successfully in *Escherichia coli* and were purified via affinity chromatography. Crystal structures have been obtained for the major shell components CsoS1A, CsoS1B and CsoS1C, which share over 90% amino acid sequence identity. Crystal packaging and biochemical characteristics suggest that these proteins form hexameric units that may well represent protomers in the carboxysome assembly pathway. Two-dimensional gel electrophoresis combined with immunoblotting indicated that the proteins OrfA and OrfB, although not abundant carboxysome components, are present in the shell. X-ray diffraction studies of OrfA and OrfB are currently underway to determine potential higher order (multimeric) structures formed by these polypeptides that might provide clues about their location and function in the carboxysome shell.

CHARACTERIZATION OF PHOSPHORYLATED PEPTIDES USING NANOSPRAY IONIZATION MASS SPECTROSCOPY

Jason Adams* and Bettye Sue Hennington, Tougaloo College, Jackson, MS 39174

Tandem Mass Spectroscopy (MS/MS) is used to obtain the amino acid sequence of proteins. â-casein was selected as a standard and was predicted to have several sites of phosphorylation.. It was expected that a minimum of two phosphorylated peptides would be identified along with the exact sites of phosphorylated amino acids. An in-solution trypsin protocol was used and the resulting â-casein peptides were loaded into an Fe++-activated Immobilized Metal Affinity Column (IMAC) that was used to capture the phosphorylated peptides. The peptides were eluted onto a C-18 column, analyzed with MS and MS/MS and analyzed Bioworks. One quadruply-phosphorylated peptide of â-casein was detected. The spectra also showed that the peptide lost up to four phosphates when it was exposed to Collision Induced Dissociation during MS/MS. Our â-casein findings matched the information that has been previously reported by other mass spectrometer labs. Once it was determined that we could capture and detect phosphorylated peptides and determine the phosphorylation sites, Rap 1, a yeast transcription factor, was isolated from Saccharomyces cereviseae using 1-D electrophoresis and Western blot techniques. After trypsinization, Rap 1 peptides were loaded onto the C-18 column and eluted. No phosphorylated peptides were detected. Bioworks confirmed the presence of a yeast transcription factor, but did not comfirm that it was Rap 1.

CONSTRUCTION OF A MINIMAL HETEROLOGOUS URA5-COMPLEMENTING SHUTTLE VECTOR FOR USE IN THE DIMORPHIC PATHOGENIC FUNGUS, *HISTOPLASMA CAPSULATUM*

Madhavi Patel* and Glen Shearer, University of Southern Mississippi, Hattiesburg, MS 39406

Approximately 40 million Americans have contracted the respiratory mycotic disease, histoplasmosis. This disease is caused by an infection with the fungus *Histoplasma capsulatum (Hc)*. This fungus is a dimorphic parasitic species that grows naturally in damp soil in a multicellular saprophytic mycelial (mold) form at 25ºC. The species is capable of undergoing a morphological shift from the environmental multicellular mold form to a unicellular pathogenic yeast in the infected host (or in the lab at 37C). Because the mold-to-yeast shift is an absolute requirement for disease, an understanding of the molecular genetics of this dimorphism is vital to control this important disease. A critical roadblock for current molecular biology research is the lack of a small, facile shuttle vector to study dimorphism associated genes. Therefore, we have constructed a vector with the smallest functional URA5 marker (AnURA5) from the fungus *Aspergillus nidulans*. The AnURA5 gene was first resected to identify the smallest promoter that maintained full expression in *Histoplasma capsulatum*. These experiments demonstrated that a 1.4 kb AnURA5 marker was the smallest fragment maintaining high transformation efficiency. This heterologous marker was cloned into a Hc telomere vector for future use in genetic knockout experiments. Interestingly, the resection experiments showed that removing approximately 200 bp of 5' promoter sequence abolished promoter function while

removal of 400 bp or more restored function. Work is ongoing to confirm this observation in other strains of *Histoplasma* and to determine the cause of this loss of function.

LIPID SPECIFICITY OF THE BT TOXIN/MEMBRANE INTERACTIONS

Kerrick Nevels [1]*, Marianne Pusztai-Carey [2], and Peter Butko [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]Case Western Reserve University, Cleveland, OH 44106

Cyt1A is a cytolytic toxin produced by the spore-forming bacterium *Bacillus thuringiensis* var. *israelensis* and is used in insecticide preparations. Understanding the molecular details of how the toxin changes conformation in the presence of lipid membrane is important for elucidating the toxin's mode of action. Previous binding studies were performed using membranes made of chemically undefined lipid egg PC. Here we studied lipid specificity of Cyt1A binding regarding saturation of fatty acyl chain and chemical nature of the lipid head-group. Fluorescence of tryptophan was used as a measure of binding. Results show that Cyt1A binds to the membranes made of the saturated lipid 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) to a similar extent as to those made of the egg PC lipid mixture. This suggests that Cyt1A has no preference for binding to vesicles composed of either saturated or unsaturated lipids. Results from the experiments designed to study effects of lipid fluidity on Cyt1A binding will also be presented.

EVALUTION OF ACTIVITY OF CRUDE EXTRACT OF *OCIMUM GRATISSIMUM* LEAVES ON HUMAN HEPATOCELLULAR CARCINOMA (HEPG2) CELLS, IN VITRO

Derrick White*, and Stephen Ekunwe, Jackson, MS 39206 Jackson State University, Jackson, MS 39217

Cancer is the second leading cause of death in humans. Statistics show that in 2006, of the estimated 1,399,790 new cases, 564,830 will die. Traditional treatments for cancer have shown some significant results. However, the incidence of cancers is still rising. In this study, the effects of crude extract from leaves of the edible plant *Ocimum gratissimum (Og)* on human hepatocellular carcinoma (HepG2) cells were investigated. It was hypothesized that crude extract of *Og* will inhibit growth of, be cytotoxicity to, and cause DNA fragmentation in HepG2 cells. To test this hypothesis, HepG2 cells were cultured at 37^{O}C in a humidified 5% CO_2 incubator in complete growth medium. The cells were allowed to grow until they became 60-65% confluent. They were serum starved for 24hrs, and then treated with *Og* extract at the following concentrations: 0.25, 0.50, 1.0, 2.0, 4.0, 8.0, 12.0, and 16.0mg/ml. Cell growth was assessed using thymidine incorporation assay. It was found that the *Og* extract inhibited the growth of HepG2 cells in a dose dependent manner. Trypan blue dye exclusion assay was used to test the cytotoxicity of the extract. Results of cytotoxicity evaluation show that HepG2 cells survive low concentrations of *Og* extract. DNA fragmentation test show that *Og* extract causes DNA fragmentation in HepG2 cells at all concentrations. These results show that crude extract of *Og* causes DNA fragmentation and inhibits the growth of HepG2 cells. These results warrant more detailed investigation of *Og* and its potential cancer fighting properties.

CYP2B1/2 MESSENGER RNA WITHIN THE LIVER

Mary Beth Dail*, Shane C. Burgess, E.Meek, J.Wagner, and J.E.Chambers, Mississippi State University, Mississippi State, MS 39762

Research suggests that CYP2B1/2 enzyme activity is differentially distributed within the liver and that this distribution is altered by various chemicals. This study examined CYP2B1/2 mRNA levels in different parts of the liver's functional unit. Rats were treated with either i.p. phenobarbital in saline at 80mg/kg/day for 5 days or dieldrin in corn oil p.o. at 2.5 or 5.0 mg/kg/day for 13 days. LCM and duplex QRT-PCR were used to measure the CYP2B1/2 mRNA produced in bands of liver cells isolated from 3 locations along the path of blood flow. CYP2B1/2 mRNA in whole liver was also determined. CYP2B1/2 enzyme activity was measured through 16βhydroxy-testosterone formation. General CYP activity was determined by desulfuration assays. Whole liver samples exhibited significant increases in CYP2B1/2 mRNA: 5.7-fold, phenobarbital; 29-fold, dieldrin at 5.0 mg/kg; and 38,166-fold, dieldrin at 2.5 mg/kg. A similar inverse dose response was seen for CYP2B1/2 enzyme activity, but not for general CYP enzyme activity. All LCM band samples showed significant increases in CYP2B1/2 mRNA. Dieldrin at 2.5 mg/kg caused increases as blood flowed through the acinus: periportal, 320-fold; midzonal, 538-fold; and centrilobular, 1,418-fold. A different pattern was observed in phenobarbital treated rats: periportal, 1,031-fold; midzonal, 4,973-fold; and centrilobular, 1,136-fold. The differences indicate the variable nature of CYP2B1/2 response following chemical exposure and add to the fund of knowledge required for a future model of liver function. Supported by NIH P20RR017661

CYTOTOXICITY STUDIES USING NITOGEN ONIUM SALTS

Emily Stewart*, Nancy Salloum, Wolfgang Kramer, Millsaps College, Jackson, MS 39210

The cytotoxicity of nitrogen onium salts was tested using Saccharomyces cerevisiae as a system. Drug uptake as well as retention studies were performed.

OPTIMIZATION OF ORGANIC WASTE BASED MEDIA SUSTAINABLE TO BIOHYDROGEN PRODUCTION

Hanqing Dong, Anberitha Matthews, Michael Cunningham*, Nara Gavini, and Lakshmi Pulakat, Mississippi State University, Mississippi State, MS 39762

Biohydrogen production is a promising novel energy

source whose developments remain hindered due to the physiological and biochemical restrictions from the hydrogen-yielding microorganism. Studies on the soil bacterium *Azotobacter vinelandii* indicate that it yields hydrogen as a by-product of nitrogen fixation; and its characteristics such as high respiratory rates, the ability of expressing anaerobic proteins, and lower growth requirements project the possibility of bridging the diazotroph and hydrogenase. We explored its capability of utilizing carbon compounds from various industrial wastes. The growth of the *Azotobacter* wild type strain was monitored in Burk's standard nitrogen media (BN^+), Burk's nitrogen-free media (BN^-) and modified BN^+/BN^- media in which sugar is substituted by different waste extracts respectively. When nitrogen was present, the strain grew best in the standard media; however, in absence of nitrogen source, the yam-peel based media appeared to provide the optimal environment for the growth. In addition we also expressed the Fe-nitrogenase alone by growing a mutated *Azotobacter* strain DJ54 in which Mo-dependant nitrogenase is not functional and in this strain the Fe-nitrogenase was induced by high iron concentration in the aforementioned biowaste-based media. *Azotobacter* DJ54 exhibited highest growth rate. These observations suggest that the industrial residual media are sufficient for *Azotobacter* nitrogenase activity and probably biohydrogen production.

SEQUENCE AND EXPRESSION ANALYSIS OF THE AAT1 AND SOX1 GENES FROM THE CYSTEINE PATHWAY OF THE DIMORPHIC PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*

Yuan-Chi Lin* and Glen Shearer, University of Southern Mississippi, Hattiesburg, MS 39406

Histoplasma capsulatum (Hc) is a dimorphic fungus which can be found in the soil in a multicellular mold form. When conidia or mold cells are inhaled, they will undergo a morphology shift and grow as unicellular yeast in the lungs of the infected individual. This mold-to-yeast shift is required for disease to occur. Sulfur metabolism, in particular cyst(e)ine, is known to play a critical role in this dimorphic process. The focus of this report involves two genes in the sulfur metabolic pathway: aspartate aminotransferase (AAT1) and sulfite oxidase (SOX1). We have isolated the Hc AAT1 and SOX1 genes and used northern blots and real-time PCR to measure the expression in the yeast and mold morphotypes of *Hc*. Transcripts from both genes are low abundance and the AAT1 transcript appears to be yeast specific. Currently work is underway to knockout both genes to examine their role in yeast-mold dimorphism in this important pathogen.

THE ROLE OF THE SIDE DOOR OF CARBOXYLESTERASES IN THE HYDROLYSIS OF ESTERS

Matt K. Ross*, Abdolsamad Borazjani, Tim M. Streit*, Mississippi State University, Mississippi State, 39762

Carboxylesterase (CE) enzymes catalyze the hydrolysis of esterified chemicals, including pesticides, drugs, and lipids. We have been investigating the substrate specificity of mammalian CEs toward pyrethroid insecticides. However, how CEs recognize pyrethroids and catalyze their hydrolysis is incompletely characterized. To fill this gap, we have commenced studies using a model CE derived from *Bacillus subtillis* (termed pnbCE), which is highly conserved both in sequence and structure with mammalian CEs. pnbCE variants were constructed with site-specific amino acid modifications at a location involved in substrate recognition and catalysis. Here, we show that amino acid substitutions in the 'side-door' domain of pnbCE are important for the hydrolysis of the pyrethroid *trans*-permethrin and some model ester compounds. Our results demonstrate that six site-specific mutants at position 362 (L362R, L362K, L362D, L362E, L362A, and L362V) exhibited markedly decreased V_{max} values (3-7-fold) compared to wild-type CE when rates of hydrolysis of *trans*-permethrin were examined. However, changes in K_m values were not markedly different for the mutant CEs. Viscosity variation studies using both wild type and L362R mutant enzyme demonstrated that rates of substrate association (k_1) and covalent acylation of pnbCE (k_2) by the ester substrate were significantly lower for the L362R enzyme. These data demonstrate the impact of a single amino acid substitution, in a domain adjacent to the active site, on enzyme function. [Supported by NIH P20RR017661]

CHRONIC DEVELOPMENTAL EXPOSURE TO ORGANOPHOSPHATES ELEVATES DOPAMINE LEVELS AND ALTERS NICOTINIC ACETYLCHOLINE SUBUNIT RNA EXPRESSION

Timothy W. Brown*, and Jeffrey B Eells, Mississippi State University, Mississippi State, MS 39762

Organophosphates (OP) inhibit acetylcholinesterase, the enzyme responsible for the inactivation of synaptic acetylcholine, which results in elevated acetylcholine neurotransmission. Acetylcholine neurotransmission is widespread throughout the brain and can affect multiple neurotransmitter systems including the mesencephalic dopamine system. The current experiment investigated how chronic, developmental exposure to the organophospates chlorpyrifos (CPS) or methyl parathion (MPT) affects dopamine levels and dopamine neuron gene expression. Newborn rats were treated with corn oil vehicle, CPS or MPT via gastric lavage daily from postnatal day (PND) 1-21. Rats were sacrificed at PND 21 and 50 and tissue collected and frozen. Dopamine levels were measured in the striatum using high performance liquid chromatography with electrochemical detection and gene expression in the substantia nigra was measured with quantitative real-time PCR. In the striatum, CPS and MPT treatment resulted in a trend toward elevated levels of dopamine, and DOPAC, with a statistically significant elevation in HVA levels. At PND 50, dopamine levels were reduced after CPS but not MPT. Additionally, dopamine turnover was significantly reduced after CPS due to reduced dopamine and a slight increase in DOPAC. Both CPS and MPT treatment caused a significant alteration in the ratio of αa7 to αa6 nicotinic acetylcholine receptor subunit expression in the substantia nigra at PND 21. At 50 days, the expression of αa7 to αa6 nicotinic

acetylcholine receptor subunit was altered only after MPS treatment. These data demonstrate that chronic, developmental inhibition of acetylcholinesterase can have a significant and persistent effect on dopamine neuron function.

EMBRYONIC GENOME ACTIVATION IN BOVINE

Muge Misirlioglu [1], Grier Page [2], Hakan Sagirkaya [1], Abdullah Kaya [3], John J. Parrish [3], Neal L. First [1] and Erdogan Memili [1]*, [1]Mississippi State University, Mississippi State, MS 39762, [2]University of Alabama, Birmingham, AL 35294 and [3]University of Wisconsin, Madison, WI 53706

Global activation of embryonic genome is one of the most critical events of early mammalian development. Maternal proteins and RNAs in oocyte support early embryonic development while a number of zygotic and embryonic genes are expressed at a stage specific manner leading to embryonic genome activation (EGA). However, the identities of embryonic genes expressed and the mechanism(s) of EGA are not well understood in the bovine. The aim of this study was to analyze gene expression at two key stages of bovine development, matured oocytes (MII) and 8-cell stage embryos that constitute rich maternal supply of materials for development and a stage during which EGA takes place respectively. Global transcriptome of MII oocytes, 8-cell embryos and 8-cell embryos treated with transcription inhibitor alpha-amanitin using bovine DNA microarrays (Affymetrix, Inc.) that contains probe sets representing over 23, 000 transcripts including assemblies from approximately 19, 000 UniGene Clusters. Total of 3, 972 genes showed significant expression (<2 fold, $P<0.01$). Key genes in regulation of transcription, chromatin structure cell adhesion and signal transduction were up-regulated at the 8-cell stage (as compared to alpha-amanitin and MII oocyte controls) while genes in DNA methylation and metabolism were up-regulated in the MII oocytes. These changes in gene expression related transcriptional machinery, chromatin structure and the other cellular functions occurring during several cleavage stages are expected result in a unique chromatin structure capable of maintaining totipotency during embryogenesis and leading to differentiation during the postimplantation development.

EFFECTS OF LEAF EXTRACT OF NIGERIAN BASIL, *OCIMUM GRATISSIMUM*, ON THE GROWTH OF HUMAN PROSTATE CANCER CELLS (PC-3) *IN VITRO*

Jelani Zarif* and Stephen Ekunwe, Jackson State University Jackson, MS 39217

Prostate Cancer is the third leading cause of cancer death of men in the U.S and it affects African-American men disproportionately. Various approaches have been taken to prevent this disease. One of the main approaches is chemotherapy which usually has harsh side effects. Therefore new approaches that have few adverse side effects are highly sought after. It is believed that edible herbs would provide such desirable treatment. A potential candidate is extracts from the leaves of Nigerian basil, *Ocimum gratissimum* (*Og*). These extracts, which are consumed as food in teas and soups, have been used in folk medicine to treat headaches, itching, hemorrhoids and pinkeye. Therefore, it is hypothesized that *Og* extract will inhibit growth of and will be cytotoxic to PC-3 cells, *in vitro*. To test this hypothesis, heated and unheated Og extracts were used to treat serum-starved sub-confluent PC-3 cells for 18 hours at the following concentrations: .25, .50, 1.0, 2.0, 4.0, 8.0, 12.0, and 16.0 mg/ml. The cells were then labeled with [^{3}H]-thymidine for 4-6 hours and counted in a Scintillation Analyzer. Trypan blue dye exclusion assay was used to measure cell viability after treatment with the *Og* extract. Results showed that *Og* extract is thermostable and it inhibited growth of PC-3 cells in a dose dependent manner. Trypan blue dye exclusion assay show that *Og* extract was cytotoxic to PC-3 cells especially at higher concentrations: 8.0, 12.0 and 16.0 mg/ml. These results suggest that *Og* extract may possess potential cancer-fighting agents.

PHOTOCHEMICAL & REDOX CONTROL OF HYDROGEN GAS PRODUCTION IN CYANOBACTERIA

Daya Cohly [1]*, Zandra Cole [1], Raphael Isokpehi [1], Rajendram V Rajnarayanan [2] Hari H P Cohly [1], [1]Jackson State University, Jackson, MS 39217, and [2]Tougaloo College, Jackson, MS 39174

Cyanobacteria exists in vegetative form during the daylight while it has heterocytsts during the night time. Under the influence of limiting conditions of nitrogen and/or blue light the equilibrium shifts towards the right while the equilibrium shifts towards the left in the presence of oxygen and/or red light. Water and carbon dioxide (CO_2) is transported in the interior of the cyanobacteria by aquaporins (AQP). In the daytime the transport of CO_2 via AQP is facilitated by AQP but is inhibitory for hydrogen gas production. This CO_2 is converted to HCO^{3-} in the interior which is eventually converted to carbohydrates. During the night these carbohydrates are converted enzymatically to H_2 gas. It could be hypothesized that there could be a direct relationship between the number of AQPs present and the amount of hydrogen gas produced. The mercury inhibition of AQPZ in the daylight is more pronounced where it affects the transport of water and CO2. This results in lesser concentration of carbohydrates available for enzymatic conversion in to H_2 gas during the night. Shifting of the photochemical redox equibrium reaction to the right hand side would lead to maximal production of H_2 gas. Further investigations on the combination of N_2, blue light and AQPZ modulators would provide more insights in to molecular and photochemical control of H_2 gas production in cyanobacteria. Acknowledgements: Mississippi NSF-EPSCoR “Innovations through Computational Sciences” Award (EPS-0556308) ; and the Research Centers in Minority Institutions (RCMI) – Center for Environmental Health (NIH-NCRR G12RR13459-09)

KAPPA-OPIOID RECEPTOR (KOR) INVOLVEMENT IN HYPOTHALAMIC ACTIVATION OF HYPOTHALAMO-PITUITARY-ADRENAL (HPA) AXIS: ROLE FOR BUTORPHANOL?

Deandria Magee [1]*, George Howell [2], Melissa Griggs [2], Rob Rockhold [2], [1]Tougaloo College, Tougaloo, MS 39174 and [2]University of Mississippi Medical Center, Jackson, MS 39216

Butorphanol is a narcotic analgesic with agonist efficacy at both KOR- and mu-opioid receptors. Acute administration of butorphanol stimulates the HPA axis, beginning with neuronal activation in the paraventricular nucleus of the hypothalamus (PVN), as indicated by an increase in c-Fos immunoreactivity. This neuronal activation is hypothesized to result from stimulation of the KOR by butorphanol. Male Sprague-Dawley rats received intracerebroventricular (i.c.v.) pretreatment with the selective KOR antagonist, nor-binaltorphimine (nor-BNI; 20 µg/5 µl), or saline 60 minutes prior to intravenous administration of butorphanol (10.0 mg/kg). Blood was withdrawn 30 minutes thereafter to assess plasma corticosterone concentrations as a marker of HPA axis activity. PVN neuronal activity was determined by c-Fos immunohistochemistry Pretreatment with nor-BNI, followed by saline treatment, slightly increased c-Fos immunoreactivity. Saline pretreatment, followed by butorphanol, increased both c-Fos immunoreactivity and plasma corticosterone levels. However, pretreatment with nor-BNI blocked neither butorphanol-induced PVN c-Fos activation nor increases in corticosterone. While these data do not support KOR actions of butorphanol, a companion report will document that higher (35 µg) doses of nor-BNI effectively reduce the stimulatory effect of butorphanol on neuronal activity. (DM was supported by a fellowship from the Mississippi Functional Genomics Network)

ENGINEERING OF A NOVEL INHBITOR OF BIOFILM-ENCAPSULATED PATHOGEN

Madhavi p, Gavini*, Mississippi School for Mathematics and Science, Columbus, MS 39701 and Mississippi State University, Mississippi State, MS 39762

Pseudomonas infection is a leading cause of death among patients with Ams, Cystic Fibrosis, cancer and burn victims. These opportunistic pathogens are multidrug resistant. They produce biofilms that protect bacteria from phagocytosis and antibiotics. Therefore, treating Pseudomonas infections requires biofilm inhibitors. The aim of this research is to engineer a method to inhibit growth ofbiofilm-forming pathogens. Since non-biofilm forming Pseudomonas is abundant in environment, the hypothesis is that herbal products would contain biofilm-inhibiting compounds. An abiotic technique was developed to isolate a biofilm-forming Pseudomonas from the non-biofilm forming lab-stock of Pseudomonas aeruginosa P AO I. The resulting clonal isolate designated Pseudomonas aeruginosa MGl could produce biofilm. Effects often herbal extracts/compounds on the growth ofPA01 and MGl were tested by spot testing and growth curve analysis. Terminalia chebula (Tc) extract was the most potent inhibitor of both Pseudomonas strains and was able to inhibit their growth even after over 100 fold dilution. Microarray analysis of gene expression and Real-time Polymerase Chain Reaction amplification showed that Tc can reduce or inhibit expression of genes needed for establishing biofilm and infection. The anti-microbial compound in Tc is water soluble, functional after autoclaving and at pH 7.0, and has a size <0.1 micron. It is ideal for developing anti-microbial sprays and inhalers to treat Pseudomonas infections. Author acknowledges LSBI at MSU for the generous gift of microarrays and facility.

RELATIONSHIP BETWEEN THE NUMBER OF AQUAPORINS AND HYDROGEN GAS PRODUCTION IN CYANOBACTERIA

Zandra Cole [1]*, Daya Cohly [1], Raphael Isokpehi [1], Rajendram V Rajnarayanan [2] Hari H P Cohly [1], [1]Jackson State University, Jackson, MS 39217 and [2]Tougaloo College, Jackson, MS 39174

Water and carbohydrate are the primary sources for hydrogen production in cyanobacteria. Water and carbon dioxide (CO_2) is transported in the interior of the cyanobacteria by aquaporins (AQP). In the daytime the transport of CO_2 via AQP is facilitated by AQP but is inhibitory for hydrogen gas production. This CO_2 is converted to HCO^{3-} in the interior which is eventually converted to carbohydrates. During the night these carbohydrates are converted enzymatically to H_2 gas. It could be hypothesized that there could be a direct relationship between the number of AQPs present and the amount of hydrogen gas produced. Hydrogen production occurs within at least 14 Cyanobacteria genera, under a vast range of culture conditions. One possibility is that there is efficient transport of CO_2 via a single AQP and the other is that the cumulative transport of CO_2 via multiple AQPs leading to increased H_2 production. To this end we explored 20 annotated genomes of cyanobacteria comprising of about 62,262 genes. Gleobacter PCC 7421 with 3 known AQPs shows increased H_2 gas production in comparison to Synechocystis sp. PCC 6803 which has only one AQP. There is a clear correlation of the number of AQPs and H_2 gas production in the AQPs examined in the study. We are currently examining the number of AQPs present in the unannotated bacteria *Anabaena variabilis* which produces 10-fold more hydrogen than *Gleobacter*. Acknowledgement: Mississippi NSF-EPSCoR "Innovations through Computational Sciences" Award (EPS-0556308); and the Research Centers in Minority Institutions (RCMI) – Center for Environmental Health (NIH-NCRR G12RR13459-09)

DEVELOPMENT OF PRIMARY CULTURE OF ENTEROCYTES TO STUDY ADAPTIVE REGULATION OF INTESTINAL NUTRIENT ABSORPTION

Yasuhiro Kimura*, Dwaine A. Braasch, and Randal K. Buddington, Mississippi State University, Mississippi State, MS 39762

Small intestine tissues exposed to adenosine or AMP rapidly (<10 min) and reversibly increase (~2-fold) glucose uptake. Since signaling networks, and mechanisms of adaptation are difficult to define using intact tissues, we sought a cultured

cell model. Although the colon adenocarcinoma cell line, Caco-2, is commonly used as a model for enterocytes, glucose accumulation decreases by 70% and 15% after exposure to adenosine and AMP, respectively. Although IEC-6 cells, a spontaneously immortalized cell line (derived from crypt cells of rat ileum) respond to adenosine and AMP through increases in glucose uptake of 307% and 322% respectively, the response requires plating on Matrigel (a cell binding enhancer) and exposure to 100 nM dexamethasone for 72 h to induce differentiation. Cells of a different tissue origin and degree of differentiation require long-term sterile culture. The use of undifferentiated cells further requires the induction of differentiation. We evaluated mix population primary cultures of enterocytes liberated from BALB/c mouse intestine. Isolated enterocytes were cultured on membrane inserts (PET; 0.4 μm pore size) for 8 h. Subsequent exposure to adenosine and AMP increased glucose uptake by 6- and 9-fold. Therefore, primary cultures of enterocytes can be used to identify molecules that regulate transport functions, and define the associated signaling networks and mechanisms, without depending on long-term, rigorous culture conditions. Moreover, the use of freshly harvested enterocytes provides opportunities to obtain data that are physiologically relevant.

EFFECT OF HETEROTROPHY ON OXIDATIVE STRESS IN THE HERMATYPIC CORAL *CAULASTREA ECHINULATA*

Bridget Napier*, Patricia M. Biesiot, and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

Coral nutrition involves host heterotrophy and symbiont autotrophy. Previous studies in other labs have found that: 1. heterotrophy by corals lead to increased productivity by zooxanthellae; 2. both photosynthetic and respiring cells produce reactive oxygen species (ROS) that, if left unquenched, damage cell components and can cause cell death; 3. antioxidant enzymes (AE) function to quench ROS; and 4. AE capacity increases in response to damage by ROS. Our study examined the putative relationship between heterotrophy and subsequent oxidative stress that may arise during periods of increased photosynthesis. *Caulastrea echinulata* colonies were fragmented and individual polyps were assigned to one of two groups (fed and unfed). Fed polyps were given grass shrimp the morning of the test whereas unfed polyps were fasted. Both groups were exposed to sunlight for 8 h. Activities of two AE [superoxide dismutase (SOD) and catalase (CAT)] were measured at 0, 4, 6, and 8 h. Activities of both SOD and CAT were higher in fed than unfed polyps; however, only SOD activity of fed polyps was statistically significant. Highest SOD activity occurred at 4 h and declined thereafter. Highest CAT activity occurred at 6 h but it was not significant. The lag in peak CAT activity may be due to coupled activity of the enzymes; CAT is known to remove toxic hydrogen peroxide produced by SOD.

ALTERED DOPAMINE LEVELS IN THE NUCLEUS ACCUMBENS OF ISOLATED AND GROUP REARED NURR1-NULL HETEROZYGOUS MICE FOLLOWING ADMINISTRATION OF AMPHETAMINE BY MICRODIALYSIS

Talisha M Moore*, Timothy W Brown, and Jeffrey B Eells, Mississippi State University, Mississippi State, MS 39762

One hypothesis of schizophrenia is that altered dopaminergic transmission attributes to the etiology. Transgenic technology disturbing the Nurr1 gene demonstrated that it is essential for dopamine (DA) neuron development. Nurr1- null heterozygous mice (+/-) possess decreased tissue dopamine levels in the nucleus accumbens (NuAcc) and, when raised in isolation, have disrupted sensorimotor gating, a behavior typical of schizophrenia. To determine the effect of isolation on DA release, male Nurr1 (+/-) and (+/+) mice were randomly reared in groups or isolation at 18-21 days. At 4-6 months microdialysis was conducted within the shell of the NuAcc using amphetamine and CNS. All samples were measured for stimulated DA, DOPAC, and HVA using HPLC with electrochemical detection. At basal levels, the +/- genotype significantly affected DA release in group raised mice. At the 10&muM level, there were no significant differences observed across groups. At the 100&muM level, (+/-) genotype did not affect DA release, however when combined with isolation, +/- IS mice possessed the greatest level of amphetamine stimulated DA release. In terms of DOPAC, (+/-) mice possessed no significant differences under basal conditions, displayed inconsistent trends at the 10&muM level, and when combined with isolation, displayed elevated DOPAC levels at the 100&muM level. No differences in HVA were observed across groups. These data suggest that isolation differentially affected DA release in the shell of the NuAcc of +/- mice which may underlie the disruptions in sensorimotor gating in these mice and may be relevant to disruptions in sensorimotor gating observed in schizophrenia.

HEPATIC CYTOCHROME P450 ACTIVITY IN A ZEBRAFISH ALCOHOLIC LIVER DISEASE MODEL

Keila Brown*, Stanley Smith, Veronica Levison, Christine A. Purser, Tina G. Smith, and Rodney C. Baker, Tougaloo College, Tougaloo, MS 39174

Alcoholic liver disease results in high morbidity and mortality rates in affected individuals. It is a complex disease resulting in a number of cellular consequences that can lead to tissue damage and liver dysfunction. The hepatic cytochrome P450s have been implicated in the progression of alcoholic liver disease via the generation of reactive oxygen species and other reactive intermediates. Using a zebrafish (Danio rerio) experimental model for alcoholic liver disease, we investigated the role of hepatic cytochrome P450s. Zebrafish were treated for 5-7 days with 50 mM ethanol in the habitat water and compared to zebrafish not exposed to ethanol. The microsomal fractions of the zebrafish livers were isolated after cellular disruption and

differential centrifugation. The microsomes were then assayed for cytochrome P450 activity. We chose testosterone as the test substrate. The site of testosterone hydroxylation suggests which cytochrome P450 isoform is responsible. We assayed product formation using HPLC and gas chromatography/mass spectrometry (GC/MS). Surprisingly, HPLC analysis indicated no apparent hydroxylation of testosterone. However, we observed a consistent decrease in the parent testosterone peak that was dependent on the presence of zebrafish microsomes. This occurred in both the control and ethanol-treated samples. We analyzed the reaction products in more detail via GC/MS. From the GC/MS results, the disappearance of testosterone correlated with the appearance of products that were identified in the mass spectral reference library as stanolone and dihydroandrosterone. Further experiments are underway to characterize this activity and identify the cytochrome P450 isoform involved.

OPTIMIZATION OF GENE EXPRESS PROFILING (GEXP) MULTIPLEX QUANTITATIVE PCR TO MEASURE GENE EXPRESSION IN MESENCEPHALIC DOPAMINE NEURONS

Jeffrey B. Eells*, Timothy W. Brown, and Banu Elibol-Flemming, Mississippi State University, Mississippi State, MS 39762

Mesencephalic dopamine neurons are involved in neurological processes such as motivation, cognition and control of movement. As such, alterations in dopamine neuron function have been implicated several diseases and disorders including schizophrenia, Parkinson's disease, attention deficit hyperactivity disorder and drug addiction. Gene eXpress Profiling (GeXP) Multiplex RT-PCR is a recently introduced technology that has the capability to quantitatively measure the expression of up to 30 genes in one PCR reaction. This assay produces multiple fluorescently labeled PCR products of the genes of interest that differ in length by 5-6 base pairs which can be analyzed by the Beckman CEQ 8000 capillary electrophoresis. The goal of the current project was to develop a multiplex PCR reaction to measure dopamine neuron gene expression in order to ultimately assess how dopamine neuron gene expression is affected by pathological conditions. The multiplex reaction consists of primers for 1) extracellular receptors expressed on dopamine neurons, 2) dopamine neuron transcription factors, 3) dopamine neurotransmission genes and 4) internal control genes (β-actin and GAPDH). Singlet reactions produced fragments of the appropriate size in 26 of the 28 primer pairs tested with no undersigned fragments. In the multiplex of mouse whole brain, 18 fragments were identified. These preliminary results demonstrate that multiplex PCR reactions can be developed as a high through-put method to quantify gene expression of a focused subset of genes. Future studies will continue to optimize the multiplex reaction as well as further test the quantitative properties using known concentrations of gene targets.

MOLECUALR ANALYSIS OF INTERACTION OF INSULIN RECEPTOR BETA-SUBUNIT WITH ANGIOTENSIN II RECEPTOR AT2

Maya Ramdas*, Ravindra Kolhe, Nara Gavini, and Lakshmi Pulakat, Mississippi State University, Mississippi State, MS 39762

Angiotensin II (Ang II) is a multifunctional hormone implicated in the regulation of blood pressure and in the pathogenesis of hypertension, insulin resistance and metabolic syndrome. We have shown previously that the Ang II receptor AT2 can function in a ligand-independent manner and that the AT2 can interact with the cytoplasmic ATP-binding region of receptor tyrosine kinase (RTK) ErbB3. Such interaction could be significant in the regulation of growth promoting signaling by RTKs. To further investigate regulation of receptor tyrosine kinase signaling by the AT2, we analyzed whether the AT2 interacts with the Insulin receptor IR. Here we show that a truncated AT2 receptor (amino acids 226-363) interacts strongly with the IR β subunit in yeast two-hybrid (Y2H) assay. We also show that a chimeric AT2-AT1 receptor (third intracellular loop of the AT2 is replaced with that of the AT1) could also interact strongly with the IR β subunit in Y2H assay. The Ang II receptor AT1 also showed week interaction with the IR-beta. However, a truncated AT2 in which the C-terminal cytoplasmic region was deleted did not interact. These results suggested that the C-terminal cytoplasmic domain of AT2 is essential for this interaction. In addition, our studies using Chinese Hamster Ovary (CHO) cells showed that transient expression of the AT2 could result in AT2-IR-beta complex formation and lack of phosphorylation of IR-beta. Based on these data, we propose a model that involves receptor level interaction between the AT2 and IR in response to transient expression of AT2.

INTERACTIONS OF PAMAM DENDRIMERS WITH MODEL LIPID MEMBRANES

Venkataswarup Tiriveedhi [1]*, Kelly M Kitchens [2], Hamid Ghandehari [2], and Peter Butko [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]University of Maryland, Baltimore, MD 21201

Dendrimers and other cationic macromolecules in general are considered potential vehicles for intracellular drug delivery. We used fluorescence spectroscopy to study the interaction of cationic PAMAM (polyamidoamine) dendrimers with model lipid bilayers. When the dendrimers interacted with small unilamellar vesicles (SUV) loaded with the self-quenching fluorophore calcein they did not induce release of calcein neither with neutral SUV (made of egg phosphatidylcholine) nor negatively charged SUV (with 25% egg phosphatidylglycerol). The G1 (generation 1, Mr = 1430) dendrimer was labeled with fluorescein and the G4 dendrimer (Mr = 14215) with a similar fluorophore Oregon green, and their membrane interactions were followed by changes in fluorescence anisotropy during titrations with lipid. The saturating value of anisotropy changed linearly with the density of negative charge in the membrane. The addition of high salt caused redissociation of the dendrimers from SUV. These two observations prove the electrostatic nature of the interaction. Analysis of the binding data yielded values of the dissociation constants Kd. For G1 dendrimer, Kd = 30 ± 16

mM with neutral SUV and Kd = 11 ± 3 mM with negatively charged SUV. For G4, which carries much higher charge on its surface, exhibited lower dissociation constants, Kd = 16 ± 7 mM with neutral SUV and 5 ± 1 mM with negatively charged SUV. We conclude that the interaction of PAMAM dendrimers with lipid membrane is electrostatic and the dendrimer binding does not significantly disrupt the bilayer integrity.

IMMOBILIZATION OF ANTIBODY ON A QUARTZ CRYSTAL FOR DETECTION OF PSEUDOMONAS

Amy Denson*, Scott Walper, Sabine Heinhorst, Gordon C. Cannon, and Jeffrey A. Evans, University of Southern Mississippi, Hattiesburg, MS 39406

Quartz crystal microbalance (QCM) biosensors have been developed for the detection of various bacteria and viruses. The QCM system measures resonant frequency decreases proportional to the mass addition deposited on the crystal surface. Current techniques employed in the development of biosensors include attachment of antibodies via covalent coupling to an amine-functionalized polymer. To couple antibodies specific for *Pseudomonas* species to the crystal surface, polyethyleneimine (PEI) was used followed by glutaraldehyde treatment. After verifying immobilization of the antibody to the crystal surface, experiments were conducted to determine the optimal concentration of antibody needed to coat the crystal surface for detection of bacteria.

CHARACTERIZATION OF OVEREXPRESSION OF *KIN3* IN *S. CEREVISIAE*

Andrew Gilder*, Yulon Stewart, and Sarah Lea McGuire, Millsaps College, Jackson, MS 39210

The *KIN3* gene of *Saccharomyces cerevisiae* encodes a poorly understood protein kinase, the deletion and overexpression of which have been previously reported to have no effects on cells. Because we have recently found that deletion of *KIN3* leads to a number of previously uncharacterized subtle cellular effects, we have undertaken a study of the effects of overexpression of *KIN3* on cells. To do this, we amplified the *KIN3* gene from strain Y2454, cloned the amplification product into a Topo-TA vector, and then directionally cloned into the pYES vector, putting *KIN3* under control of the *GAL1* promoter. This vector was then transformed into Y2454 cells and growth tested under inducing and repressing conditions. No differences in plate growth rates were observed under any conditions, compared to the control strain. We are currently performing FACS analysis and microscopy to determine if more subtle effects on the cells occur due to overexpression. We also plan to transform our *KIN3* deletion strain with the overexpression vector to determine if overexpression leads to reversion of the deletion phenotype.

CULTURE MAKES A DIFFERENCE IN DEVELOPMENT AND MOLECULAR BIOLOGY OF PORCINE PREIMPLANTATION EMBRYOS IN VITRO

Song-yi Jung *, Hongfeng Wang, Nelida Rodriguez-Osorio, Kriston Faith Garrison, Kristi Wolgemuth, Laura Samantha Greer, Jean Magloire Nguekam Feugang, and Erdogan Memili, Mississippi State University, Mississippi State, MS 39762

In vitro production of pig embryos is important both for basic biomedical research and for animal biotechnology. However, their efficiency and quality are sub par. To determine developmental biology of porcine embryos cultured in two semi-defined media, presumptive zygotes were produced in vitro. Using a 2 x 2 factorial treatment arrangement the effect of the modified culture medium (NCSU-23 + 0.4% BSA or PZM-3 + 0.3% BSA) and additives (10ng/mL Leptin, 10ng/mL EGF, 10-9M Melatonin, or the combination of all three additives) was analyzed. The rates of cleavage and blastocyst development were evaluated at 48 hours post insemination (hpi) and 144 hpi, respectively. The PZM-3 provided better development at all stages as compared to the NCSU-23 medium (cleavage rates: 41% vs. 38%; blastocyst rates: 16% vs. 10% respectively; $P<0.05$). In the PZM-3 medium, the cleavage rates seem to increase in the EGF and combination groups compared to the control group (49% and 48% vs. 41%; $p=0.07$). At the blastocyst stage however, the EGF showed the lowest result (9%), while there were no statistical differences between the other groups ($p>0.05$). In the NCSU-23 medium, only the leptin and melatonin provided a higher number of cleaved embryos as compared to the control (42% for leptin and melatonin vs. 38% for the control). Blastocyst development was similar for the all the groups. We concluded that PZM-3 medium provided better development rates to blastocysts than NCSU-23.

IDENTIFICATION AND INITIAL CHARACTERLZATION OF SINGLE NUCLEOTIDE POLYMORPHISMS OF MAIZE GLOSSY15

Biing-Ru Wu [1]*, Thomas D. Brooks [2], Dawn S. Luthe [3], Jeff R. Wilkinson [1], and W. Paul Williams [2], Mississippi State University, Mississippi State, MS 39762, [2]USDA-ARS Corn Host Plant Resistance Research Unit, Mississippi State, MS, 39762, and [3]Pennsylvania State University, PA, 16802

Persistence of juvenile leaves in maize increase predation by fall army worm. Transition of maize shoots from the juvenile to the adult stage is affected by a variety of leaf epidermal cell traits, including: leaf hairs, cell wall characteristics, and presence of epicuticular waxes such as those regulated by the maize putative transcription factor of Glossy 15 (gl15). In maize the first two juvenile leaves are maintained by the kernel, whereas juvenile leaf status in the subsequent leaves is maintained by the expression of Glossy 15 (gl15). Thus, different rates of glossy15 gene expression results in varying transitional periods. Glossy15 has significant sequence similarity to the Arabidopsis regulatory gene APETALA2. This factor regulates floral organ identity and ovule development in Arabidopsis. Studies of APETAL2 have shown that single nucleotide polymorphism (SNP) of microRNA (miR172) target site controls the

expression rate in Arabidopsis. However, sequence comparisons of four maize inbred lines (MP313E, MP608, TX601, B73) revealed no nucleotide differences in the microRNA target site. However, from comparisons of gl15 and apetala2 promoters, AP1, and AP2 domains two SNPs were identified in the AP2 domain-2. These SNPs may indicate regulation occurs within the coding region instead of the microRNA site for maize. To ascertain the relationship AP2 may have to gl15 regulation site directed mutagenesis will be performed and the resulting changes in expression rates will be measured.

GENERATION OF GENE SPECIFIC MARKERS ASSOCIATED WITH RESISTANCE TO ASPERGILLUS FLAVUS AND ALFATOXIN FOR USE IN MARKER ASSISTED SELECTION OF HYBRID ZEA MAYS LINES

Erik Mylroie [1]*, Rowena Y. Kelley [1], W. Paul Williams [2], Thomas D. Brooks [2], Jeff R. Wilkinson [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]USDA-ARS Corn Host Plant Resistance Research Unit, Mississippi State, MS 397562

Apergillus flavus is a fungal pathogen that infects tree nuts, maize, cotton, and peanuts. After infection, A. flavus often produces aflatoxins, which are mutagenic, teratogenic, and immunosuppressive compounds known to cause hepatocellular carcinoma. To limit exposure to this naturally occurring carcinogen, the FDA has placed action levels of 20 ppb for human consumption. Maize losses due to aflatoxin contaminated products is estimated to be half a billion dollars annually. Since an economically feasible method does not exist to eliminate or remove aflatoxin from contaminated corn, breeding programs aimed at increasing cornâ€™s resistance to A. flavus are a key component in efforts to reduce aflatoxin contamination. The USDA has released maize lines that show resistance; however, introgression of resistance into production lines has been limited due to a lack of resistance specific markers. Microarray analysis of one â€œresistantâ€• line (Mp313E) identified 234 genes that are differentially expressed when compared to the susceptible line (Va35) during A. flavus infection. Of these 234 genes, we have mapped 64 to the 10 maize chromosomes. Out of the 64 genes, 25 map directly to the Quantitative Trait Loci (QTL) on chromosomes 2, 3, and 4, which account for approximately 48% of resistance in Mp313E. Using loci specific primers, these 25 genes have been PCR amplified and are being sequenced to identify single nucleotide polymorphisms (SNP). Gene specific primers associated with resistance will be designed using SNPâ€™s for subsequent use in marker assisted selection (MAS) of hybrid maize lines.

EXPRESSION, PURIFICATION, AND CHARACTERIZATION OF A PREDICTED DROSOPHILA GLUTAMINYL CYCLASE

Amanda Parker* and Robert C. Bateman, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

Glutaminyl cyclase (QC) is responsible for the N-terminal conversion of glutamate to pyroglutamate. Though the N-terminal pyroglutamate is found in many different peptides in virtually all species, including *Drosophila*, QC activity has not been observed in *Drosophila*. Sequence homology analyses revealed protein sequences in *Drosophila* with high sequence homology to human QC. To evaluate the enzymatic activity of the predicted *Drosophila* QC sequence a bacterial fusion protein was designed which contained the predicted amino acid sequence for *Drosophila* QC along with a purification tag. Expression of the fusion protein and subsequent purification revealed a protein of approximately 44kD. The 44kD protein was evaluated using two previously published QC activity assays. Both assays revealed QC activity in the fusion protein, suggesting the *Drosophila* protein is a QC. The *Drosophila* QC revealed similar activity as the human QC and was also inhibited with published QC inhibitors. Further analyses will be completed to compare the structural properties of the *Drosophila* QC to the human QC.

EFFECT OF MELATONIN ON DEVELOPMENT OF PORCINE PREIMPLANTATION EMBRYOS IN VITRO

Nelida Rodriguez-Osorio [1]*, In Ju Kim [1], Song-yi Jung [1], Abdullah Kaya [2], and Erdogan Memili [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]University of Wisconsin, Madison, WI 53706

Melatonin, a reactive oxygen species scavenger, prevents apoptosis and has been used for improving embryo in vitro development. This study aimed at determining the effects of melatonin on porcine embryo cleavage, blastocyst rates, and blastocyst cell number. Porcine abattoir-derived oocytes were subjected to standard *in vitro* maturation and fertilization procedures. Fertilized oocytes cultured in PZM-3 medium supplemented with Melatonin at concentrations of 10^{-3}, 10^{-6}, 10^{-9} and 10^{-12} M, 5 hours after insemination (hpi), and cultured in a humidified incubator with 5% CO_2 at 39°C. Cleavage rates were assessed 48 hpi, and blastocyst rates determined at day 6 post fertilization. The number of cells per embryo was assessed after DAPI epifluorescent staining. Experiments were repeated 8 times and the results were analyzed using t-test. At 10^{-9} M concentration, Melatonin had a positive effect on cleavage rates with 45%±1.94 (mean±SEM) against 39%±2.01 in the control group ($p<0.05$). Conversely, at 10^{-3} M, melatonin had a negative effect on cleavage rate with 32±5.59%. Blastocyst rates were also higher for the Melatonin 10^{-9} M group with 43%±0.79 and lower, in the group supplemented with 10^{-3} M melatonin 19%±0.71 ($p<0.05$). There were no differences in embryo development from the groups with Melatonin at concentrations 10^{-12} M and 10^{-6} M. Blastocyst cell numbers were significantly higher in the Melatonin 10^{-9} M group, with 65±3.22 (cell number±SEM), compared to 50±2.07 for the control group ($p<0.01$). Our data indicate that melatonin (10^{-9} M) supports development of porcine preimplantation embryos and increases total number of cells in the blastocysts.

DEVELOPMENT OF A ZEOCIN RESISTANCE CASSETTE FOR MOLECULAR GENETIC RESEARCH IN THE PATHOGENIC FUNGUS HISTOPLASMA CAPSULATUM

Brooke Wheeler* and Glen Shearer, University of Southern Mississippi, Hattiesburg, MS 39406

Histoplasma capsulatum is a dimorphic fungus which can exist in mold form at 25°C and morph into a yeast form at 37°C. The conversion to the yeast form is required for pathogenesis. *Histoplasma capsulatum* is the causative agent for the disease histoplasmosis. This disease causes an estimated 500,000 infections each year in the United States alone. The fungus is endemic to the Mississippi and Ohio River valleys; however, it can be found throughout the world. An impediment for understanding the molecular genetics of the mold-to-yeast dimorphism is the lack of dominant selectable genetic markers. Therefore, we undertake this study to develop an efficient Zeocin-resistance cassette. A heterologous promoter from *Aspergillus nidulans* transcription elongation factor I gene, a Zeocin resistance gene isolated from *Stretoalloteichus hindustanus*, and a TrpC terminator from *Aspergillus nidulans* were fused via PCR. The resulting fragment was then placed in a telomeric vector. In one construct a second selectable marker, AnURA5 was included. The vector was then electroporated into *H. capsulatum* to determine the effectiveness. If this construct is effective, a new dominant selectable marker will be available for molecular genetic research. The heterologous promoter will be resected to determine the minimal functional sequence.

ELUCIDATION OF THE SULFUR METABOLIC PATHWAY IN THE DIMORPHIC PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*: ISOLATION AND CHARACTERIZATION OF THE CDO1, GSH1 AND GSH2 GENES

Melissa Adams* and Glen Shearer, University of Southern Mississippi, Hattiesburg, MS 39406

The dimorphic fungus, *Histoplasma capsulatum* is the causative agent of histoplasmosis, the most common systemic fungal disease of man. *Histoplasma* grows in certain soils as a multicellular saprophytic mold. In the lungs of an infected host, a shift to the unicellular parasitic yeast occurs. The de-differentiation from the multicellular mold to the unicellular yeast morphotype is required for the progression of the disease. Sulfhydryl groups (particularly cysteine) are necessary for the mold to yeast transition. Several pathways are involved in cysteine metabolism in *Histoplasma*. In order to better understand the molecular basis of the dimorphism, the different pathways are being elucidated. The cysteine dioxygenase (CDO1) gene from *Histoplasma capsulatum* has been isolated in our lab. Reports in the literature indicate that CDO1 enzyme activity is only found in the yeast morphotype. Our data however show that the CDO1 transcript is abundant in both the mold and yeast morphotypes. Either the reports in the literature that CDO1 enzyme activity is yeast specific are incorrect or some level of post-transcriptional control is involved. To study this question, we are conducting enzyme assays and correlating this data to transcript levels measured by northern blotting and real time PCR. In addition, we are beginning studies to examine two enzymes involved in glutathione synthesis (gamma-glutamyl cysteine synthetase, GSH1 and glutathione synthetase, GSH2).

CHARACTERIZATION OF LATE EMBRYONIC B-CELL STAGES IN CHICKEN

Balazs Felfoldi*, Amanda M. Cooksey, and G. Todd Pharr, Mississippi State University, Mississippi State, MS 39762

The bursa of Fabricius serves as a primary lymphoid organ for the development of a diverse repertoire of B-cells. B-cell development is initiated between embryonic days (ED) 8-14 when the bursa anlage is populated by a single wave of committed stem cells expressing the sialyl Lewis X carbohydrate (SLEX). Between ED15-17, there is a phenotypic transition in cell surface glycosylation from SLEX to high levels of a related carbohydrate structure termed Lewis X (LEX). The switch in surface glycosylation correlates with the onset of repertoire development by immunoglobulin-gene conversion. A thorough proteomic analysis of the two B-cell stages is needed to understand their perspective physiology and to identify the genes controlling the progression from one developmental stage to the next. The objective was to identify proteins expressed by developing B-cells before and after the SLEX to LEX transition. Using mass spectrometry, we identified 612 proteins in ED15 B-cells and 823 in ED18 B-cells. The differentially expressed proteins were cell-adhesion apoptosis-associated and signal transduction molecules. The ED15 B-cells express proteins that show a stem cell-like phenotype with anti-apoptotic and cell-adhesion molecules associated with homing to the bursa. The ED18 B-cells express pro-apoptotic proteins, cell adhesion molecules with both homo- and heterophilic binding activity and various immune response receptors. Future studies will evaluate mRNA levels and will visualize the expression patterns of genes on a histological level.

IDENTIFICATION OF DOCKING SITE MUTATIONS ON THE AMINO TERMINUS OF NIFM, WHICH ACTS AS A REGULATORY REGION FOR THE PEPTIDYL PROLYL CIS/ TRANS ISOMERASES ACTIVITY OF NIFM

Vandana Chaturvedi*, Lakshmi Pulakat, Nara Gavini, Mississippi State University, Mississsippi State, MS 39762

The Parvulins are ubiquitous and a highly conserved family of Peptidyl prolyl cis/ trans isomerases (PPIases). The ESS1 in *Saccharomyces cerevisiae* was the first parvulin to be found in eukaryotes. Mutations in the ESS1 protein rendered the yeast strains temperature sensitive. The ESS1 temperature sensitive strains ($ESS1^{TS}$) grew like the wild type at lower temperature but were unable to grow at restrictive temperatures. A homology search showed that the carboxy terminus of NifM from *Azotobacter vinelandii* protein, which is 292 amino acid long, shows a high structural homology with the PPIase domain

from the eukaryotes. The common motifs and putative catalytic residues were also conserved. The 876-basepair-nif *m* when cloned into pYES2.1 TOPO vector downstream of galactose promoter and then transformed into ESS1^{TS}strain H164R. was unable to rescue the ESS1^{TS} mutants, the truncated NifM containing only the C terminal PPIase domain could do so. However when *nifH,* the substrate for *nifm*, is present along with entire *nifm*, the ESS1^{TS} mutants could grow at restrictive temperature. This elucidates that the substrate *nifH* is binding at amino terminus of the NifM and thereby opening and exposing the carboxy terminus catalytic domain for the isomerisation activity. The above results shows that the amino terminus of NifM is conformationally blocking the catalytic activity of its carboxy terminus. A mutant of amino terminus of NifM, with mutations located at position 33, 146 and 155 amino acids showed loss of activity with the PPIase domain. This was defined as docking site mutant.

EVALUATION OF FACTORS AFFECTING FUNCTIONAL ANNOTATION QUALITY IN EUKARYOTIC GENOMES

Teresia Buza*, Nan Wang, Susan M. Bridges, Shane C. Burgess, and Fiona McCarthy, Mississippi State University, Mississippi State, MS 39762

High-throughput technologies, such as DNA microarray-based gene expression profiling and proteomics provide valuable information on the genes and gene products. The functional interpretation of microarray and proteomics data is a time-consuming and poses major challenge to many researchers. The Gene Ontology (GO), a controlled vocabulary for describing the biological function of a gene product, is the de facto standard for functional annotation in any organism. A major problem with GO is that researchers do not know the quality of GO entries that they are using to link genes with functions. Additionally, investigators may not be aware of any changes in GO usage. We developed a stable method that take into consideration the GO breadth, depth and quality and we combine these aspects to determine the overall GO annotation quality (GAQ) for a species. We used three different gene datasets to determine the GAQ scores in each organism. The results revealed that GAQ is species-specific and is positively correlated to the quality and depth of GO terms. GAQ represent a powerful stable new approach for showing how good GO is at the time of functional modeling of genes and gene products. Improved GAQ will lead to improved modeling of microarray and proteomics data. Unlike other GO tools, GAQ can be applied in any species.

FOLDING PATHWAY OF THE FE-PROTEIN: EFFECT OF AMINO ACID REPLACEMENTS ON NIFM INDEPENDENT FE-PROTEIN CONFORMATION

Girish V Jamnekar*, Lakshmi Pulakat and Nara Gavini, Mississippi State University, Mississippi State, MS 39762

Nitrogenase is composed of two distinct components, the Fe-protein and the MoFe-protein. The Fe protein is an electron donor for the reduction of Nitrogen in MoFe-protein. The Fe-protein requires several accessory genes of the *nif*-gene cluster to form sn functional unit of Nitrogenase. The *NifM* is an accessory gene, which is a PPIase, is required for the folding of the Fe-protein. The PPIase alter the protein conformation through isomerization of peptidyl-prolyl bonds of N-terminal of the proline residue. The NifM protein is inactive in *Azotobacter vinelandii* strain (AV98) due to insertion of *kan^r* cassette in the *nifM* and exhibits a Nif$^-$ phenotype. Therefore, the NifH is unable to undergo cis/trans isomerization leading to improper folding. Using chemical mutagenesis, the *nifH* mutants were generated and. In the present study, the *nifH* mutant, pBG1161 having mutations leading to change in amino acids in the region 210-230aa. It was studied in *Azotobacter vinelandii* strain (AV98). Growth curve analysis showed that the pBG1161 with mutant *nifH* was able to change phenotype of *A. vinelandii* (Av98) to Nif$^+$. To understand NifM independence of the mutant Fe-protein, we studied the interactions between small regions NifH regions using Bacteriomatch Two Hybrid System. The Fe-protein was dissected into three distinct smaller regions, 30-73aa (F1), 205-240aa (F2) and 240-289aa (F3). These analyses, combined with molecular modeling analysis showed that the region spanning amino acids 210 to 230 may be involved in the active conformation of the Fe-protein of nitrogenase in the absence of NifM.

ASSEMBLY OF THE LANTIBIOTIC MUTACIN 1140 IN MEMBRANES

James L. Smith [1]*, Shawanda Wilson-Stanford [1*], Eefjan Breukink [2], Hester E. Hasper [2], and Jan Novák [3], [1]Mississippi State University, Mississippi State, MS 39762, [2]Utrecht University, The Netherlands, and [3]University of Alabama, Birmingham, AL 35294

Multi-drug resistance has lead to a great demand for new antibiotic development. Mutacin 1140 and nisin A, are posttranslationally modified peptide antibiotics belonging to a family of antibiotics called type A lantibiotics (lanthionine-containing antibiotics). There is a high degree of structural and sequence similarities in the N-terminal rings A and B of both nisin and mutacin 1140, which is known to be a lipid II binding domain. Nisin function by binding to lipid II and forming transmembrane pores causing the efflux of ions, ATP, and other essential cellular components. More recently, another antimicrobial mechanism of activity has been reported, where mutacin 1140 and nisin abduct lipid II from the site of new cell wall synthesis. Further experimentation using fluorescence techniques reveals that mutacin 1140 has a higher affinity for lipid II than nisin and that the lipid II-mutacin 1140 assembly differs from the assembly of lipid II-nisin complexes. These differences may be attributed to the fact that nisin is a pore former and mutacin does not form pores in membrane system used in our experimental systems or in vivo against Streptococcus rattus, a bacterium known to be sensitive to mutacin 1140. Furthermore, we show that mutacin 1140 has a strong propensity for complex formation by electron microscopy.

AN ADDITIONAL BIOCHEMICAL MECHANISM FOR PERTUSSIS TOXIN-MEDIATED NEURONAL DAMAGE

Mary Hetrick [1]*, Dieter Knowle [2], Nitin Warier [2], Nara Gavini [1], and Lakshmi Pulakat [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Bowling Green State University, Bowling Green, OH 43403

Infants are vulnerable victims of whooping cough and neurological damage is often an after-effect among infected infants. The known biochemical mechanism for S1-mediated pathogenesis is ADP-ribosylation of Gi protein and disruption to the signaling of cognate receptor. Signaling by the Angiotensin II receptor AT2 is inhibited by Ptx, although whether the AT2 receptor activates Gi&alpha is unclear. High-level expression of AT2 is exhibited in infant brain implicating a role for this molecule in neuronal development. We have shown through yeast two-hybrid analysis that the S1 subunit can directly interact with the 3rd ICL and cytoplasmic tail of AT2. To determine whether S1 interacted with AT2 in mammalian cells, we partially purified a His-tagged S1 subunit and tested whether it could interact with AT2 expressed in Chinese Hamster Ovary (CHO) cells. Our studies showed that AT2 could co-immunoprecipitate with S1, however mutations in the 3rd ICL or C-terminus of AT2 inhibited this interaction in mammalian cells. Based on these studies, we contend that S1 inhibits AT2-mediated signaling via sterical inhibition. The significance of this observation is that S1 uses sterical hindrance of AT2 via direct interaction to cause pathological effects. This raises the question of whether the current acellular vaccines, which involve mutations in the catalytic region of the S1 subunit, are safe or possess the capability to interfere with AT2-mediated signaling.

QUANTITATIVE SERUM PROTEOMICS OF A TRYPTOPHAN DEPLETED DIET USING ^{18}O LABELING AND A RUBISCO INTERNAL STANDARD

Amanda M. Cooksey [1]*, Marek D. Koter [2], Alejandro Corzo [1], Timothy S. Cummings [1], Michael T. Kidd [1], and Shane C. Burgess [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]University of California, Irvine, CA 92697

Tryptophan plays an important role in vertebrate metabolism as not only a building block of proteins, but also as a precursor of serotonin, melatonin, niacin and kynurenines, which influence immune tolerance. Here we use a quantitative proteomic analysis of serum to model tryptophan deficiency. We applied bidirectional $^{16}/^{18}O$ labeling to serum proteins from chickens fed on tryptophan depleted and adequate diets, using the plant protein Rubisco as an internal standard. The proteins were trypsin digested and processed by 2-dimensional liquid chromatography electrospray ionization tandem mass spectrometry (2D-LC ESI MS^2). The resulting mass spectra were analyzed using the SEQUEST algorithm and the ProteinMapper program to identify up- and down-regulated proteins. We identified 4161 proteins labeled bidirectionally, of which 46 were up- and 90 were down-regulated. Using Ingenuity Pathways Analysis (IPA) software, we found tryptophan deficiency influences not only protein synthesis, energy production and immune response, but also cell/tissue morphology, cell cycle progression and cancer. From these results, we are able to conclude that tryptophan plays a role in a number of important physiological processes, further elucidating the role of tryptophan and emphasizing the importance of this essential amino acid.

SITE DIRECTED MUTAGENESIS OF THE CARBOXYSOME CARBONIC ANHYDRASE OF *HALOTHIOBACILLUS NEAPOLITANUS*

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

Carboxysomes are proteinaceous organelles that sequester ribulose 1,5-bisphosphate carboxylase/oxygenase (RubisCO), the primary carbon fixing enzyme of autotrophic bacteria. These microcompartments are thought to participate in a carbon concentrating mechanism (CCM) through the action of a carbonic anhydrase (CA), which is associated with the carboxysome protein shell. The CA catalyzes the reversible dehydration of HCO3- and is believed to enhance the catalytic efficiency of RubisCO within the carboxysome by converting bicarbonate to CO_2 for fixation. Insertion mutagenesis of the CA gene (csoSCA) of *H. neapolitanus* with a kanamycin resistance cassette and subsequent complementation with a wild type allele has revealed that the carboxysomal CA is vital for growth of the bacteria at ambient CO2 levels. The structure of the carboxysomal CA (CsoSCA) was elucidated by x-ray crystallography and revealed an active site with a zinc ion that is coordinated by Cys173, His242, and Cys253 residues. In addition, Asp406 and Arg457 are believed to be crucial residues of the active site. Site-directed replacement of Asp406 with Glu was performed and the resultant mutant CA was expressed as recombinant protein in *Escherichia coli* to assess the role of Asp406 in enzymatic catalysis of CA by a stopped-flow spectrophotometric assay. Combined with results from the analysis of other mutant versions of the carboxysomal CA, these results will be used to elucidate the enzyme's catalytic mechanism.

IDENTIFICATION OF WOOD DECAY FUNGI BY FUNGAL AND BASIDIOMYCETE INTERNAL TRANSCRIBED SPACER PRIMERS

M.L. Prewitt [1]*, S. V. Diehl [1], T.C. McElroy [2], and W.J. Diehl [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Kennesaw State University, Kennesaw, GA 30144

Wood decay is desirable when it occurs in carbon recycling and a nuisance when it occurs in our homes causing major repair expenses. Traditional methods to protect wood from decay have focused on the use of chemical preservatives as broad spectrum pesticides without knowing the identity of the specific organism or organisms responsible for the decay. Basidiomycete fungi are the principle decomposers of wood and in order to better control and understand wood decomposition, a method to

rapidly identify decay fungi is needed. The objective of this study was to compare Restriction Length Polymorphism Length Polymorphisms (RFLP) and sequence data from the internal transcribed spacer regions amplified with general fungal and basidiomycete fungal primers in identifying isolates of selected wood decay fungi. DNA was extracted from pure fungal cultures, amplified with either general fungal or basidiomycete primers, sequenced or digested separately by four enzymes: Hinf1, HaeIII, Alu and Taq. Results from this study indicated that isolates of Phanerochaete clustered separately from isolates of Trametes in both RFLP data and sequence data. Isolates of T. hirsuta and T. versicolor showed separate clustering patterns. However isolates within Gloephyllum did not show a distinct clustering pattern. RFLP produces similar clustering patterns as sequence data in distinguishing isolates of Phanerochate chyrsosporium, Trametes versicolor and Trametes hirstua.

BOVINE GERMINAL VESICLE OOCYTE : A SYSTEMS APPROACH

Divyaswetha Peddinti*, Bindu Nanduri, Erdogan Memili, and Shane C. Burgess, Institute for Digital Biology, Mississippi State University, Mississippi State, MS 39762

The bovine oocyte is a model for studying reproduction, fertility and reproductive diseases in humans. Oocyte undergoes many transitions in its life span that must evoke a dynamic network of gene expressions. The recent completion of the bovine genome sequence provides the opportunity to study oocyte development at systems level by applying functional genomics techniques. Describing the proteome of the oocyte will allow us to model protein interaction networks and pathways involved in its maturation. The objective of this study is to define the proteome of GV stage oocyte using high-resolution differential detergent fractionation (DDF) proteomics and apply systems approaches to model its function. Follicles of 2-8 mm, containing oocytes were collected and proteins extracted using differential detergent fractionation (DDF). Proteomic analysis was done using duplicate samples and 1950 proteins were identified using SEQUEST. Pathways involved in oocyte maturation and development and its phenotype were identified using Ingenuity pathway analysis (IPA). Since bovine proteins are not accepted by IPA, by BLAST searches we identified human orthologs of our bovine proteins for IPA analysis. Of the 48 networks found, majority of oocyte proteins were identified in a network involved in cellular growth and proliferation. To bring about this proliferative function in oocyte, signaling pathways are necessary. We analyzed the various signaling pathways that the identified oocyte proteins represent. We identified 18 signaling pathways at IPA significance threshold. EGF signaling, PPAR signaling, IGF-1 signaling, VEGF signaling, and PDGF signaling is necessary for oocyte maturation and we identified all these signaling pathways in our DDF oocyte proteome. However, the most significant signaling pathway identified was cell cycle: G2/M DNA damage checkpoint regulation. This pathway could help maintain the integrity of oocyte genome during different stages of development. Our oocyte proteome systems analysis confirmed the expression of a number of proteins that can describe both oocyte phenotype and maturation and development. The better we understand the interaction networks involved in oogenesis, the more rational our approach will be to modulate bovine fertility.

REGULATION OF DBF4-DEPENDENT KINASE IN SACCHAROMYCES CEREVISIAE

Asela Roberts, Marilyn Burke, and Bernadette Connors*, Millsaps College, Jackson, MS 39210

In *Saccharomyces cerevisiae*, dbf4p initiates DNA synthesis by activating and escorting cdc7p to origins of replication, after which the protein is proteolyzed. Dbf4p levels peak at the onset of S phase and are maintained until late mitosis, whereas cdc7p levels are maintained at a constant level through the cell cycle. It is hypothesized that regulation of DDK is accomplished in part through the proteolysis of dbf4p, as well as by changes in its association with cdc7p. My research aims to investigate the regulated proteolysis of dbf4p, and examine the genetic interactions between DDK and spindle checkpoint genes that control exit from mitosis. In order to elucidate dynamic biochemical interactions, an HA-tagged version of dbf4p was used in coimmunoprecipitation experiments with cells blocked in early S phase as well as late mitosis. Furthermore, both deletion and mutational analysis will be used to identify sites of direct interaction between dbf4p and its interacting partner(s). With the goal of revealing genetic interactions between *dbf4* or *cdc7* and genes known to regulate the metaphase to anaphase transition, crosses between either *dbf4-1* or *cdc7-7* and selected strains deleted for nonessential spindle checkpoint genes were performed. Tetrad analysis has shown novel interactions between both *dbf4* or *cdc7* and many of these genes. Since disruption of the orderly progression of cell cycle events often leads to unrestrained cell growth and predisposition to cancer, research into the molecular mechanisms that regulate these processes is consequently of great medical and scientific interest. Characterization of DDK regulation will help to elucidate the controls involved in this orderly progression of the cell cycle among eukaryotic organisms.

ERYTHROMYCIN BLOCKS NON-SELECTIVE CATION CHANNELS IN THE AIRWAY MUCUS GLAND CELLS

Huiling Liu, Bela Kanyicska, and Jerry Farley*, University of Mississippi Medical Center, Jackson, Mississippi 39216

Erythromycin (EM), a macrolide antibiotic, has been known to directly inhibit airway mucus secretion that is independent of its anti-bacterial and anti-inflammatory effects. In this study, we examined the mechanisms of erythromycin actions. In Ussing chamber studies, EM, applied serosally but not apically, blocked ACh or thapsigargin-induced short-circuit current in the plateau phase, and non-selective cation channel blockers such as 2-APB and SKF96365, had similar effects to EM. Under whole-cell patch clamp, ACh or thapsigargin induced non-selective cation current that was blocked by EM, 2-APB, SKF96365, and Gd^{3+}. Real-time RT-PCR detected mRNA expressions for TRPC-

1, 3, 4 and 6 in the freshly isolated mucus gland cells. Taken together, these data demonstrate that EM inhibits ACh- or thapsigargin-induced capacitive Ca^{2+} entry by blocking Ca^{2+} influx via non-selective cation channels. These data suggest that EM inhibits mucus secretion by blocking Ca^{2+} entry required for mucus release. This study was supported by a grant from American Heart Association to J.M.F.

COMPARATIVE STUDIES OF VERNONIA AMYGDALINA AND TAMOXIFEN IN MCF- 7 TUMORAL CELLS

Jetaime C. Ross*, Michael Opata, and Ernest. B. Izevbigie, Jackson State University, Jackson, MS 39217

Breast cancer claims the lives of approximately 40,000 women annually in the U.S. One in every eight women will be diagnosed with the disease in her life time. Botanicals may be combined with conventional cancer drugs to optimize treatment outcome. Evidence suggests that a Nigerian edible leaf extracts [*V. amygdalina* (VA)] may be anti-tumorigenic. The effects of co-treatment of cells with VA and conventional breast cancer drug(s) are unknown. The objective of the study was to assess the effects of Tamoxifen (TAM), VA, and the combination of TAM and VA on cell number and DNA synthesis in MCF-7 cells. Cell number was determined using a hemacytometer and DNA synthesis was determined by [^{3}H]thymidine incorporation assays. TAM treatment inhibited cell growth in a concentration-dependent fashion (0 TAM, 0 %; 1 µM TAM, 25 ± 10%; 10 µM, 51.3 ± 0%; and 100 µM, 98 ±0.4% ($P < 0.05$) cell growth inhibition). Likewise, VA inhibitory action was also concentration-dependent [0 VA, 0%; 50 µg/ml, 25.8 ±9% ($P < 0.05$); 150 µg/ml, 42.0 ± 24.7%; and 450 µg/m/, 51.7± 14.9% ($P < 0.01$] cell growth inhibition). CONCLUSION: TAM IC_{50} was reduced by approximately ten-fold in the presence of VA (1µg/ml ± 0.08 with VA vs. 10 µg/ml ± 1.2 without VA). These data suggest that VA, upon further assessment through clinical studies, may reduce the therapeutic dosage of TAM and its unwanted side effects, and improve the quality of life for cancer patients.

ROLE OF NIFH GLU112 IN BINDING TO NIFK OF NITROGENASE COMPLEX

Hanqing Dong, Anberitha Matthews*, Lakshmi Pulakat, and Nara Gavini, Mississippi State University, Mississippi State, MS 39762

In *Azotobacter vinelandii*, biological nitrogen fixation is catalyzed by nitrogenase complex, which is composed of the nitrogenase dehydrogenase (NifH, 289aa) and nitrogenase (NifDK, 492aa and 523aa respectively). The proper interaction between NifH and NifK is essential for the enzyme conformation as well as the orientation of electron flow. It has been reported that one of the important factors facilitating the interprotein communication is the carbodiimide crosslink formed by Glu112 of NifH and Lys400 of NifK. To determine how the interaction is influenced by the characteristics of the amino acids available at position 112 of NifH, we introduced site mutations by site-directed mutagenesis to the codon encoding for Glu112 thus generating proteins carrying various residues instead of glutamic acid. The resulting mutants include Glu112Asn and Glu112Lys, both of which are differently charged compared to the residue found in the wild type strain. Growth analyses indicated that both mutant strains are capable of propagation under nitrogen-deficit conditions although the growth rate is approximately 15% lower than that of wild type strain. Superimposed crystal structures of the mutant proteins also highlight the possibility that both mutated residues can be appropriately accommodated. Therefore the charge carried by the amino acid at position 112 of NifH plays a minor role in the interaction whereas; a more important factor is the length of the side chains.

CONSTRUING THE ROLES OF ETHYLENE AND JASMONIC ACID IN THE EXPRESSION OF THE MAIZE HERBIVORE DEFENSE PROTEIN ¨C MIR1

Arunkanth Ankala [1]*, Dawn S. Luthe [2], Paul Williams [3], and Jeff R. Wilkinson [1], [1]Mississippi State University, Mississippi State, MS 39762, [2]Pennsylvania State University, University Park, PA, 16802, and [3]USDA-ARS Corn Host Plant Resistance Research Unit, Mississippi State, MS 39762

Maize genotypes like MP708 that are resistant to insect feeding employ a novel herbivore defense cysteine proteinase (Mir1), which efficiently retards the growth of Spodoptera frugiperda (fall army worm). The regulatory signals in maize responsible for inducing defense mechanism against insect feeding are orchestrated by two major plant hormones, Ethelyne and Jasmonic acid. To investigate the roles of Ethelyne and Jasmonic acid in the signal transduction pathway of Mir1 expression, the resistant genotype (MP708) was treated with exogenous ethylene and total protein was isolated. Western blot analysis of the treated samples showed increases in the Mir1 protein levels when compared to untreated samples. This increase in Mir1 indicates that ethylene alone is sufficient to induce expression. Subsequent western blots of Ibuprofen and Antipyrine, two Jasmonic acid inhibitors, treated plants revealed a decrease in Mir1 when compared to control plants. However, treatments with exogenous Jasmonic acid alone result in no increase in mir1 expression. It is clear that Jasmonic acid is involved in regulation of Mir1 expression, though the exact mechanisms are not understood. To investigate the role of Jasmonic acid and how interactions with Ethelyne effect Mir1 expression, MP708 lines will be treated with exogenous ethylene, ethylene inhibitors, exogenous Jasmonic acid and Jasmonate inhibitors alone and in combination. Expression of Mir1 will be evaluated and a model of hormonal regulation of the insect resistant protein will be constructed.

THE ROLE OF DETOXICATION ENZYMES IN THE AGE-RELATED TOXICITY DIFFERENCES OF ORGANOPHOSPHATE INSECTICIDES

Valerie C. Beasley, Edward Meek, Howard W. Chambers, Janice E. Chambers, Russell L. Carr, Mississippi State University, Mississippi State, MS 39759

Organophosphate (OP) insecticides are more toxic to juvenile animals than they are to adults. It is thought that the reduced vulnerability of adults is mediated primarily by the higher levels of detoxication enzymes such as the carboxylesterases and non-target cholinesterases. It is thought that if these enzymes were not present in the adult, the toxicity level of an OP would be similar in adults and juveniles. To test this, adult rats and juvenile rats at postnatal day 1 (PND1) and PND12 were treated with a similar dosage of paraoxon (P=O) and brain cholinesterase (ChE) inhibition was determined. Additional adult animals were then pre-treated with specific inhibitors of the carboxylesterases and non-target cholinesterases prior to exposure to P=O and brain ChE inhibition was compared to the inhibition obtained without the pre-treatment. A dosage of,0.25 mg/kg resulted in 18%, 90%, and 96% inhibition in adults, PND12, and PND1 animals, respectively. However, when detoxication enzyme activity was eliminated in adults prior to P=O treatment, the level of ChE inhibition increased to 86% which is comparable to that observed in the juvenile animals. These data suggest that the greater vulnerability of juvenile animals to OP insecticides is due to, for the most part, the lack of protective esterases which are present in the adult. (Supported by NIH R01 ES011287).

THE MOLECULAR MECHANISMS FOR THE EXPRESSION, SECRETION, AND UNIPOLAR LOCALIZATION OF ICSA IN SHIGELLA FLEXNERI

Brandy N. Roberts, Catrina Prather, Amanda Williams, Jessica R. Walker, Ashley Garriga, and Lauren Brandon*, Mississippi University for Women, Columbus, MS 39701

The Gram negative bacterium Shigella flexneri causes shigellosis, a form of dysentery, leading to 1.1 million deaths world wide per annum. It expresses a virulence protein, IcsA that is responsible for the motility of the bacterium from one infected cell to another. An understanding of the molecular mechanisms for the expression and surface localization of IcsA will help us to further understand the mechanism of Shigella mediated pathogenesis. A number of complete knockout mutations have been generated by transposon mutagenesis in Shigella flexneri strain JS11.0 which is isogenic to wild type Shigella only the icsA::phoA fusion gene has replaced wild type icsA. The phoA component of this fusion construct shows whether IcsA has been secreted across the cytoplasmic membrane to the periplasm of Shigella since the PhoA is only active in the periplasm. Transposition events that disrupt genes that are responsible for either the targeting of the IcsA::PhoA fusion protein at the inner face of the cytoplasmic membrane, the secretion of this protein across the cytoplasmic membrane or the expression of this protein are the focus of our research. We have currently identified 52 mutations and have mapped 19 of these mutations by complementation analysis. We will continue to use complementation or recombination to map the remainder of these mutations.

FUNCTIONAL ANALYSIS OF A *ModC* HOMOLOG IN THE *Azotobacter vinelandii nif*-GENE CLUSTER

Sangeetha Shivaji*, K. Raja, Lakshmi Pulakat, and Nara Gavini, Mississippi State University, Mississippi State, MS 39762

The *nif* genes of the *nif* regulon are required for production of MoFe-protein in *Azotobactor vinelandii*. This regulon also contains several other potential genes (ORFs). Amongst these, ORF10 is of particular importance because its gene product is similar to the molybdate transporter protein ModC. ModE is a molybdate-dependent regulator of several operons including the molybdate transport system of *modABC*. Analysis of the ORF10 promoter revealed potential binding sites for RpoN, NifA, and ModE, indicating regulation based on nitrogen availability and intracellular molybdate concentrations, respectively. To further investigate ORF10, we constructed the mutant-ORF10 *A. vinelandii* strain *MH5200*. This was accomplished by cloning the 1.66kb sequence of ORF10 and flanking regions into a plasmid and subsequently interrupting ORF10 with Kan^R gene via *Pst*1-digestion. The resultant plasmid was introduced into wild-type *A. vinelandii*. Transformants exhibiting kanamycin-resistance, which indicated genomic incorporation of Kan^R-interrupted ORF10 since plasmid replication cannot occur in *A. vinelandii*, were selected. Comparisons of mutant growth with wild-type, in molybdate-limited conditions, showed that the ORF10 mutation can be detrimental to diazotrophic growth and implied that ORF10 plays a role in the maturation and assembly of FeMo-cofactor.

THE ROLE OF *NIF*-SPECIFIC CLPX IN *AZOTOBACTER VINELANDII*

Hanqing Dong*, Preeti Patil, Lakshmi Pulakat, and Nara Gavini, Mississippi State University, Mississippi State, MS 39762

Nitrogenase, which catalyzes the biological reduction of atmospheric nitrogen, consists of the Fe and the MoFe protein encoded by *nifH* and *nifDK* genes respectively. The Orf9 of *Azotobacter vinelandii* exhibits about 53% identity and 75% similarity with ClpX. ClpX is an ATPase involved in substrate recognition. It interacts with ClpP to form ClpXP, which is an ATP dependent protease complex found in many prokaryotes and eukaryotes. In order to decipher the functional role of Orf9 in the biogenesis of nitrogenase, we have investigated its interaction with proteins encoded by *nif*-structural genes, the *nifHDK*, by utilizing BacterioMatch™ Two Hybrid system. The DNA corresponding to *orf9* was PCR amplified and cloned in pBT and *nifH*, *nifD*, and *nifK* were cloned in pTRG. The interactions of Orf9 with Nif proteins were detected by analyzing the expression of the reporter genes, the *lacZ* and *bla*. The Orf9 showed positive interaction with NifK, whereas no detectable interaction was observed between NifD and NifH. Amino acid sequence comparisons revealed that carboxyl terminus domain of NifK shares about 36% homology with the SsrA tag, the ClpX recognition sequence. A deletion in carboxyl terminus domain of NifK abolished its interaction with Orf9. Furthermore, based on an analysis of interactions of ClpX with the three Nif proteins, we proposed that the Orf9 is a *nif* specific ClpX and its putative

functions include a role in MoFe-protein assembly. The growth analysis also indicated that Orf9 plays an important role in nitrogenase activity during pH stress conditions.

CHEMISTRY AND CHEMICAL ENGINEERING
Chair: Mudlagiri Goli, MS Valley State University
Vice-chair: Douglas Masterson, University of Southern Mississippi

THURSDAY MORNING

Hunter Henry Ballroom A

8:00 Divisional Business Meeting

8:30 THE SITE-DIRECTED MUTAGENESIS OF NEURAL CADHERIN BETWEEN DOMAIN 1 AND DOMAIN 2

Chinela Udemgba*, Nagamani Vunnam, Susan D. Pedigo, University of Mississippi, University, MS 38677

Neural cadherins are members of the cadherin family known for its calcium ion dependent cell adhesion. Classical cadherins contain 5 ectodomains, which are sevenstranded, beta-sheet gobular domains. Domain 1 and 2 were altered by mutating 6 different amino acids (D1C, W2A, R25C, E89A, D134A and D136N). The goal of this work is to discover the role of Ca3 and the linkages between the two domains through the mutations D134A and D136N. The mutant proteins were then over-expressed and purified for later testing. To confirm the mutation, the DNA will be sequenced and the molecular weight of the mutant proteins determined.

8:45 PREPERATION OF HOMOCHIRALLY SIMILAR TYROSINE AND SERINE ANALOGS FROM A COMMON INTERMEDIATE

Dale Rosado* and Douglas S. Masterson, University of Southern Mississippi, Hattiesburg, MS 39406

Recently, there has been much research in the area of unnatural (α,β,γ, and δ) amino acids. It has been shown that incorporation of such unnatural amino acids into protease specific sites in small peptides (such as peptide hormones) increases the in vivo half-life of the peptide. This behavior could make such peptides powerful site specific drug delivery systems to cells, such as cancerous cells (i.e. pancreatic cancer cell lines), which produce and use relatively large quantities of peptide hormones composed of natural (αa) amino acids. Currently, synthetic routes to synthesize the unnatural analogs of the &aplha;-methyl amino acids easily, inexpensively, and with sufficient enantiomeric yields does not exist. The goal of this project is to develop a method to synthesize all homologues of the unnatural tyrosine and serine analogs via common synthetic intermediates. Furthermore, the synthetic path chosen allows for synthesis of both enantiomers of each in sufficient chemical and enantiomeric yields. This synthetic path uses derivitized prochiral malonate diesters on which a desymmetrization enzyme (i.e. Esterases) can be used to hydrolyze one of the ester substituents to a carboxylic acid. This produces a chiral propanoic acid derivative with an enantiomeric excess of either the (R) or (S) enantiomer. The acid substituent can then be derivatized via a combination of several well-known synthetic paths (Curtius, Wolff, Witting), to give one series of homochirally similar unnatural serine or tyrosine analogs. The current progress into the synthesis of both enantiomers of the &aplha;, $\beta^{2,2}$, and $\beta^{3,3}$ homochirally similar tyrosine and serine analogs will be presented.

9:00 A NOVEL METHOD TO SYNTHESIZE UNNATURAL CYSTEIN ANALOGS

Kinkini Roy and Douglas S. Masterson*, University of Southern Mississippi, Hattiesburg, MS 39406

The aim of this project is to synthesize a wide variety of unnatural cystein analogs (alpha, beta, gamma and carbon analogues of cysteine) from a common synthetic intermediate. This should allow for the construction of amino acids in optically pure form and for the parallel preparation of both enantiomers. The general approach will be as follows: 1) preparation of the prochiral intermediates of malonic acid by using tert-Butylchloromethylsulfide 2) Using esterase to perform a desymmetrization of the prochiral intermediates 3) Analysis of the resulting chiral half ester intermediates 4)Formation of different amino acids from that half ester by using different common organic synthetic pathway. We already prepared both enantiomers of alpha-Methyl Cysteine , both enantiomers of beta-2,2- Methyl Cysteine, both enantiomers of beta-3,3- Methyl Cysteine. Once the synthesis has been achieved in a large scale we shall use them to prepare unnatural Somatostatin analogs with potential biological or enhanced biological activity.

9:15 GRUBBS-TYPE METATHESIS CATALYSTS WITH FUNCTIONALIZED CARBENES FOR APPLICATIONS IN AQUEOUS MEDIA

Adam Roberts* and Hans Schanz, University of Southern Mississippi, Hattiesburg, MS 39406

Over the past four decades, metathesis has evolved to become a highly valuable and versatile tool in organic and polymer synthesis. Since the early 1990s ruthenium-based Grubbs-type metathesis catalysts, such as first generation Grubbs' Catalyst 1 have immensely broadened the application spectrum of this reaction due to their high tolerance towards functional groups as well as moisture and molecular oxygen

compared to homogeneous molybdenum-based systems.
The true potential of aqueous metathesis, i.e. its scope and limitations, has yet to be explored. The concept, while proven to be feasible for certain ruthenium (Ru)-based Grubbs-type catalysts, we find that water-soluble examples of such catalysts with an excellent performance profile remain elusive. Our research targets the synthesis of novel Ru-based metathesis catalysts which bear functionalized carbene moieties 2-5 which should enhance catalyst solubility in aqueous solvents for application in Ring Opening Metathesis Polymerization (ROMP) of water-soluble norbornene derivatives (Figure 1). Therefore, we will exchange the initial carbene of highly active metathesis catalysts using functional olefins. ROMP will retain the function carbene as a tethered group, thus the catalyst will not change its solubility profile. Due to the favorable ratio of the rate of initiation vs. propagation, first generation catalysts are favored to provide materials with narrow molecular weight distributions under "living" conditions. We will present recent results on the catalyst syntheses and initial polymerization experiments.

9:30 REVERSIBILE INHIBITION/ACTIVATION OF GRUBBS' CATALYST

Steven J. P'Pool*, Nancy J. Berger, and Hans Schanz, University of Southern Mississippi, Hattiesburg, MS 39406

Over the last four decades olefin metathesis has increasingly become an important synthetic tool in organic and polymer chemistry. Grubbs' first and second-generation catalysts are the most common catalysts used for these transformations.1 Various ligand modifications have been designed to accommodate special applications, such as temporary catalyst inhibition for ROMP of DCPD2. Little research has been invested in catalyst systems, which can reversibly be activated and inhibited. Our project investigates the influence of electron-rich N-donor ligands on the catalytic activity of Grubbs' catalyst. We have found that addition donor ligands such as 1-methylimidazole or 4-dimethylaminopyridine (DMAP) are capable of completely inhibiting the metathesis reaction, such as RCM and ROMP, when at least two equivalents are used to completely produce a six-coordinate species of low activity. Upon acid addition, the initial Grubbs' Catalyst is restored and the metathesis reaction proceeds according to the additive-free catalyst. We will present new synthetic and kinetic data on reversible catalyst inhibition/activation of Grubbs' catalyst.

9:45 SYNTHESIS OF UNNATURAL ISOLEUCINE ANALOGS FROM A COMMON INTERMEDIATES

Sandipan Dawn* and Douglas S. Masterson, University of Southern Mississippi, Hattiesburg, MS 39046

he aim of this project is to synthesize a wide variety of unnatural isoleucine analogs (α, β and γ) from a common synthetic intermediate. This should allow for the construction of amino acids in optically pure form. The general approach will be as follows: 1) preparation of the diastereotopic intermediates of malonic acid 2) Using esterase to perform a desymmetrization of the intermediates 3) Analysis of the resulting half ester intermediates 4)Formation of different amino acids :α (Curtius),β(Wolff,Curtius),γ(Wittig, Curtius) from that half ester. Once the synthesis has been achieved we can use that to prepare unnatural peptides with potential biological or enhanced biological activity. These unnatural amino acids can be used to replace their natural counterparts in some hormones (eg Neurotensin) to increase their half-life inside a biological system.
New Synthetic Approaches to Water-Soluble Ruthenium-Based Second Generation Olefin Metathesis Catalysts

10:00 Break

10:15 NEW SYNTHETIC APPROACHES TO WATER-SOLUBLE RUTHENIUM-BASED SECOND GENERATION OLEFIN METATHESIS CATALYSTS

Hans Schanz [1]*, Nancy J. Berger [2], and Steven J. P'Pool [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]Lycoming College, Williamsport, PA 17701

Despite environmental and commercial benefits, metathesis in aqueous media has not been vigorously pursued over the last decade apart from conceptual studies. Various factors have contributed to the slow development in this area: 1) Dissatisfactory Cost/Benefit Ratio: Water-soluble phosphines are expensive and cumbersome to synthesize. Commercially available phosphine ligand Cy2P(CH2)2NMe3+Cl- is near ten times the cost of PCy3. Thus, competitive water-soluble olefin metathesis catalysts need to be: A) Highly active designs based on less expensive water-soluble NHC-ligands, B) Recyclable to improve the cost/benefit ratio. 2) Hydrolysis of Catalysts Bearing Water-Soluble NHC-ligands: Protic solvents often cause slow hydrolysis of the metal-NHC bond. This observation was made for various catalysts. Steric protection of this bond is needed. 3) Problematic Catalyst Synthesis: The NHC ligand/phosphine exchange reaction at first generation catalysts, to date the method of choice for the synthesis of second generation catalysts, requires solvents of low polarity. This renders almost all ionic NHC-ligand designs unfeasible as they display low solubility and thus very slow conversion rates. We have recently synthesized a ruthenium carbene complex which is a reversibly water-soluble, pH-responsive catalyst which has potential for improved catalyst separation and recycling. Only a handful of water-soluble designs have been reported thus far, none of which is pH-responsive. the neutrally charged catalyst is soluble in organic media, highly active and bears an NHC ligand with two dimethylamino groups. Upon acid addition, the catalyst should be suitable for reactions in aqueous media. We will present results on the synthesis, thermal stability and catalytic activity of both, neutral and double-protonated catalysts. We propose, such catalysts can be effective in aqueous and organic media, can perform co-polymerizations of largely different monomers, and can be recycled upon pH change.

10:30 SPECIFIC DELIVERY OF ANTI-SURVIVIN SIRNA TO KB CELLS BASED ON FOLATE RECEPTOR

Jun He*, University of Southern Mississippi, Hattiesburg, MS 39406

The recent discovery of RNAi has provided a powerful means of regulating gene expression. RNAi is not only revolutionizing the ways bioscientists perform basic science research such as studying gene function and mechanism, but also presents immense potentials for developing the next generation biomedicine with unmatched high potency and low side toxicity. The advancement of understanding of cellular functions at molecular levels has revealed differences in gene expression profiles between normal cells and cancerous cells. Such differences may become the basis for biomedical intervention of cancer genesis and progression. For example, folate receptor (FR) is not expressed in normal cells but high levels of FR expression are associated with certain cancers, which require a steady supply of folic acid for the biosynthesis of nucleic acids. Based on expertise in chemistry, RNA, and enzomolgy, we are exploiting FR as a cancer-specific delivery vehicle of anti-survivin siRNA. Survivin belongs to the family of inhibitors of apoptosis protein (IAP). Expression of survivin is essential for cancer proliferation. Down regulation of survivin can induce apoptosis of cancerous cells. Therefore, our experiments may lead to new cancer therapy based on RNAi.

10:45 DOWN REGULATION OF VEGF AND VEGFR BY RNAI THROUGH CANCER-SPECIFIC DELIVERY

Yilin Zhang*, Yanlin Guo, and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

Angiogenesis is a process of initiation, growth, and development of new blood vessels from pre-existing ones. Angiogenesis is critical for cancer genesis and tumor growth. Numerous studies have established vascular endothelial growth factor (VEGF) as an essential factor for angiogenesis. Cells can obtain VEGF by either self VEGF expression or from extracellular environment. With the powerful RNAi technology, we are investigating siRNA¡¯s effect against both VEGF and VEGFR. Using the transfection agent Lipofectamine and quantitative real time PCR, we have demonstrated that our self-designed and prepared siRNAs are efficient inhibitors of VEGF and VEGFR expression. However, Lipofectamine-based siRNA is not cell specific and displays a certain degree of toxicity. Taking the advantage of high level folate receptor (FR) expression by certain cancer cells, we are developing cancer-specific delivery tools for siRNA application. By binding and stabilizing siRNA and using cancer-specific receptors, the new siRNA delivery agents will lead to significant improvement on siRNA delivery, paving the way for applications of RNAi in biomedicine.

11:00 THE EFFECT OF ROTATIONAL ACCELERATION ON DIFFUSION BETWEEN MISCIBLE FLUIDS

John A. Pojman [1]*, Gloria Viner [1], and Renato Lombardo [2], [1]University of Southern Mississippi, MS, 39406 and [2]Universita di Palermo, Italy

We studied three types of miscible systems in a spinning drop tensiometer. The first system, isobutyric acid and water, exhibits an Upper Critical Solution Temperature at 26.5° C above which it is miscible in all proportions. The second, butanol and water, has a solubility limit. The third system, dodecyl acrylate and poly(dodecyl acrylate), is miscible in all proportions. We analyzed the effect of the rotational acceleration and show why the isobutyric acid system is more affected by writing the equation for the flux and including a term for the buoyancy. Finally, we explain why the first two systems retain very sharp concentration gradients even as one fluid dissolves into the other but the monomer-polymer system does not.

11:15 THE USE OF SQUARAINE DYES AS MOLECULAR SENSORS

Karl Wallace*, University of Southern Mississippi, Hattiesburg, MS 39406

Squaraine molecules are an unusual class of molecules that have some unique physical properties. Squaraine dyes are interesting materials to work with and have been used for many applications in materials science. For example, electrophotography, optical data storage, and non-linear optics, have all incorporated squaraine dyes. An interesting property of squaraine dyes is the sharp intense Q-band seen at wavelengths between 600-670 nm, with extinction coefficients (ϵ) $\geq 10^5$ cm^{-1} M^{-1}. This intense absorption band is a very attractive property for sensor design, as it is close to the near infrared (NIR) region of the spectrum, which is desirable for integration with optical instrumentation. However, squaraine dyes have only recently been utilized as molecular sensors in the field host-guest recognition (an area of supramolecular chemistry). For example, in their use for the detection of trace elements, such as, iron and zinc. Iron and zinc are important in biological systems and in the environment. Many of us are aware that our cells contain metal ions that are “tied” up in proteins. However, chelatable or “free” trace elements can also be found in small quantities, and they can have a negative impact on our bodies. These can be the source for metabolic reactions to occur within the cell and are often a site for the generation of radicals. The use of squaraine dyes as molecular scaffolds for the detection of trace elements either by colorimetric means (i.e., can we see a visual color change? - “naked eye” detection) or using fluorescence spectroscopy, which enables us to detect trace elements at lower concentrations, will be discussed.

11:30 INVESTIGATION OF CLAY INTERCALATION/EXFOLIATION MECHANISMS IN EPOXY RESINS

Yongcheng Zhang* and Charles U. Pittman, Jr., Mississippi State University, Mississippi State, MS 39762

Montmorillonite clay is an important nano-layered material. Intercalation and exfoliation are common methods to make the best use of the clay layers. Many factors affect the intercalation/exfoliation process. The effect of intragallery epoxy polymerization rate, extragallery epoxy polymerization rate and diffusion rate was investigated. The effect of overall epoxy polymerization rate was investigated by adding very small amounts of catalyst to the clay/epoxy system so that the polymerization rate would vary without much change in the initial viscosity. The anhydride curing agent (HY 918) was used because it cures epoxy resins with very low curing speed even at fairly high temperatures. The use of high temperature will greatly increase the diffusion rate into the galleries. The composites cured with lower catalyst concentrations had better clay dispersions and larger d-spacings. High temperature pre-treatment of clays with epoxy resin was also conducted to investigate the effect of diffusion. This pre-treatment of pillared organo-clays improved the d-spacing greatly, but little change was observed for clay without any pillaring agents. The effect of intragallery polymerization rate was also investigated by using clays with different pillaring agents. In summary, higher diffusion rates and lower overall polymerization rates favor the intercalation/exfoliation of Montmorillonite clay in epoxy resin systems.

THURSDAY AFTERNOON

Hunter Henry Ballroom A

1:30 ACYLATION OF 2-PROPENYL-2-OXAZOLINE AND SUBSEQUENT DIELS-ALDER REACTIONS

Yingquan Song [1]*, Hua Guo [1], Guozhong Ye [1], Aihua Zhou [2], and Charles U. Pittman, Jr. [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]University of Kansas, Lawrence, KS 66045

2-Propenyl-4,4-dimethyl-2-oxazoline, 1, was synthesized by acylation of 2-amino-2-methyl propanol with crotonyl chloride and subsequent ring closure upon treatment with mesyl chloride. 1 reacts with benzoyl chloride to give a cyclic ketene acetal 2, where both the nitrogen and the |Â carbon have been acylated. This compound is an electron rich diene. Therefore, we attempted using the Diels-Alder reaction with maleic anhydride to generate the adduct 3 which has a dense and rich functionality. This reaction proceeded readily. Compound 3 is of interest because the exocyclic double bond is part enamine, part vinyl ether, part diene and part |Á, |Â-unsaturated ketone simultaneously.

1:45 DETERMINATION OF ANTIOXIDANT CAPACITY OF HYDROXYFLAVONES AND HYDROXYCHROMONES TO FURTHER UNDERSTAND THE MECHANISM FOR PROTECTION OF WOOD AGAINST FUNGAL DECAY

Christopher V. Ruhs*, Nursen Binbuga, Tor P. Schultz, and William P. Henry, Mississippi State University, Mississippi State, MS 39762

Decomposition by decay fungi renders wood and wooden structures unusable resulting in huge negative economic consequences. Wood products are currently treated with metallic biocides to prevent biodeterioration, but these preservatives are coming under increasing scrutiny. Thus, a need exists to develop environmentally-benign, totally organic wood preservatives. It is proposed that decay fungi initially attack the cell wall of wood using radicals generated via Fenton chemistry. Hydroxychromones and hydroxyflavones inhibit fungal wood decay. It is of interest to determine the mechanism by which these compounds function to protect wood in order to develop alternative non-metallic wood preservatives. As part of this effort, a number of hydroxychromone and hydroxyflavone compounds' capacities for scavenging free radicals were evaluated. Compounds studied were morin, kaempferol, 3-hydroxyflavone, 5-hydroxyflavone, 3-hydroxychromone and 5-hydroxychromone. Interestingly, both 5-hydroxyflavone and 5-hydroxychromone protect wood from decay fungi but do not show significant ability to neutralize the radical cation of 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) [ABTS●?+] in ethanol. This suggests that these two compounds are able to protect wood by mechanisms other than radical-scavenging and may be evidence that complexation with metal ions is the predominant mechanism by which hydroxyflavones protect wood from decay fungi.

2:00 DIELECTROPHORETIC FIELD AND FREQUENCY DEPENDENCE ON RED BLOOD ABO CELL TYPES

Prashant Reuben Daggolu* and Adrienne R. Minerick, Mississippi State University, Mississippi State, MS 39762

Dielectrophoresis is a phenomenon of the movement of particles in a non-uniform electric field [1] with the advantage that it can be used for polarizable particle separations and characterizations. This nonlinear electrokinetic tool is a field strength and frequency dependant phenomenon [2]. Dielectrophoresis has already found a variety of application in biological research such as separation of malarial cells and cancer cells from healthy cells. The response of red blood cells to a dielectrophoretic field has been of a particular interest in this work due to its easy accessibility and prominent role in medical diagnostics. Dielectrophoresis of red blood cells is being studied to assess its usefulness as a tool in portable, point-of-care, medical diagnostic microdevices. Previous works established that red blood cells translate across electric field lines to form chains in two dimensional dielectrophoretic fields[2]. Our research has discovered that the overall movement of the cells in the dielectrophoretic field is characteristic of their ABO blood type. In the present work, we investigate the dependency of dielectrophoretic field strength and frequency on the movement of positive ABO red blood cell types. Experiments were performed at five different field strengths and six different frequencies to assess and quantify their movements and behaviors in the dielectrophoretic field. Results will be reported for each blood

type; comparisons and conclusions will be drawn from the behaviors observed. The study will potentially elucidate any blood type dependencies and determine optimal field strength and frequency for each blood system. These results will be important in the future development of dielectrophoretic medical diagnostic kits.

2:15 SNELL'S LAW OF REFRACTION OBSERVED IN THERMAL FRONTAL POLYMERIZATION

Veronika Viner*, John A. Pojman, Shanna Lavergne, Melanie Winsper, and Burcu Binici, University of Southern Mississippi, Hattiesburg, MS 39406

We demonstrated that Snell's Law of refraction can be applied to thermal fronts propagating in a domain with two different inherent velocities. We used the frontal polymerization of a triacrylate with clay filler that allowed different domains containing different concentrations of a peroxide initiator to be molded and placed in contact. Because the front velocity is a function of the initiator concentration, it was possible to create a bifurcated domain in which the front velocity differed in each half of the domain. By measuring the normal front velocity and the angle of refraction, we were able to verify that Snell's Law can be applied to thermal frontal polymerization.

2:30 POLYAMMONIUM CRYPTANDS FOR ANION BINDING

Md. Alamgir Hossain*, Jackson State University, Jackson, MS 39217

Anion binding is achieved by week bond interactions of the ligands with anions. The main forces responsible for the binding are hydrogen bonding or electrostatic interactions between the ligands and substrates, which mimic many natural processes in biology. Polyammonium cryptands are bicyclic compounds, which are suitable for encapsulating anion in the cavity center. NMR binding of the ligands with inorganic anions, and crystallographic structures of the encapsulated anions will be presented.

2:45 PROS AND CONS OF MICROWAVE OVEN USE IN ORGANIC SYNTHESIS

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

Microwave synthesis is in use for last couple of decades. I had the opportunity to test drive it. The drive began here in Mississippi Valley State University and then in Dr. Pittman's laboratory in Mississippi State University. The compounds of interest were Oxazoline and Thiazoline derivatives. They were subjected to acylation reactions using microwave oven. The focus was to check the effectiveness of doing known synthesis, using a microwave and to see if we can speed up the reaction. Second wish was to see if we can get the product that is not possible in normal thermal reflux reactions. Sure enough Microwave worked better, it was fast, but has limitation. It did not give any new desired products that were not forming in regular thermal reactions. The bad part is the cost of the machine. The presentation will dwell more in details on a new toy every Organic Chemist would love to have!

3:00 Break

3:15 SMALL-ANGLE NEUTRON SCATTERING STUDY ON A STRUCTURAL CHANGE IN THE POLYMERIZATION OF THE DODECYL ACRYLATE MICROEMULSION

Jolanta Marszalek [1]*, Kirt Page [2], and John A. Pojman [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]National Institute of Standards and Technology, Gaithersburg, MD 20899

Hydrophobic polymer films having an aqueous phase distributed throughout the matrix are formed by polymerizing a solution of dodecyl acrylate and 1,6 hexanediol diacrylate containing nanometer-sized drops of water stabilized by chemical name (AOT). Photopolymerization-induced aggregation of the water drops and phase separation occurs, as the initially clear solutions become opaque films. The polymerized films become clear, as the relative humidity is reduced. The transition from opaque to clear films is reversible provided that the film did not become completely dry and form cracks.In this study, SANS is used to determine not only size distribution of the micelles in dodecyl acrylate-based microemulsion, but also change in the structure of the microemulsion upon polymerization. For microemulsions prepared with the same D_2O-to-AOT ratio, but increasing D_2O content the organization of the micelles is constant. As predicted, a change is observed in the micelles' organization with an increasing D_2O-to-AOT ratio. Upon polymerization, the organization of the surfactant changes. The spherical structures assume lamellar shape. In addition, increasing water content has definite influence on the distance between surfactants' layers.

3:30 ELECTROCHEMICAL FORC: A NEW CYCLIC VOLTAMMETRY METHOD FOR EXAMINING PHASE TRANSITIONS

Ibrahim Abou Hamad [1]*, Daniel Robb [2],and Per Arne Rikvold [3], [1]Mississippi State University, Mississippi State, MS 39762, [2]Clarkson University, Potsdam, NY 13699, and [3]Florida State University, Tallahassee, FL 32306

We present a new experimental technique for cyclic voltammetry, based on the first-order reversal curve (FORC) method for analysis of systems undergoing hysteresis. The advantages of this technique are demonstrated by applying it to dynamical models of electrochemical adsorption. The method can not only differentiate between discontinuous and continuous phase transitions, but can also quite accurately recover equilibrium behavior from dynamic analysis of systems with a continuous phase transition. Experimental data for the Electrochemical

FORC (ECFORC) analysis could easily be obtained by simple reprogramming of a potentiostat designed for conventional cyclic-voltammetry experiments.

3:45 THE USE OF LASER LINE DEFLECTION TO DETERMINE THE DIFFUSIVE BEHAVIOR OF METHYL METHACRYLATE AND POLY(METHYL METHACRYLATE) FOR ISOTHERMAL FRONTAL POLYMERIZATION MODELS

John Russell McPherson*, Joshua S. Hanna, and Lydia Lee Lewis, Millsaps College, Jackson, MS 39210

Isothermal Frontal Polymerization (IFP) is a self-sustaining, directional polymerization that occurs when a solution of monomer and thermal initiator come in contact with a polymer seed and create a viscous region where a higher polymerization rate, the gel effect, occurs. IFP can be used to produce gradient refractive index materials (GRINs), which are materials that contain a spatial change in their refractive index. These materials are used industrially in laser and lens applications, and mathematical models of IFP have been constructed in hopes of producing improved GRINs. One drawback to these models is the lack of information in the literature on the two diffusion processes that occur in IFP: liquid monomer diffusing into the solid polymer seed and the solid polymer seed diffusing into the liquid monomer. We used laser line deflection (or Weiner's method) to monitor these two diffusion processes for the methyl methacrylate/poly(methyl methacrylate) system and determined for all tested temperatures and for three different polymer molecular weights that the high molecular-weight (or glassy) polymers used in IFP exhibit Case II diffusion. In addition, we determined that laser line deflection can simultaneously illuminate three of four possible regions within Case II diffusion (pure liquid, swollen glassy polymer, and pure glassy polymer) and can monitor their movement over time.

4:00 EVALUATION OF PYRENE-BASED STATIONARY PHASES FOR METALLIC NITRIDE FULLERENE HPLC SEPARATIONS

Katie Carpenter [1]*, Mary Mackey [2], Paige Phillips [2], and Steven Stevenson [2], [1]Mississippi University for Women, Columbus, MS 39701 and [2]University of Southern Mississippi, Hattiesburg, MS 39406

The separation and purification of metallic nitride fullerenes (MNFs) can be performed by HPLC. However the cost for these specialty HPLC columns is exorbitant. Motivations for this work include the following: (1) investigating the feasibility of a more economical stationary phase and (2) synthesizing and evaluating new stationary phases prepared in our labs. We have prepared an array of functionalized silicas and subsequently packed our own HPLC columns using a slurry method at high pressure (9000 psi). The columns were evaluated by calculating the capacity factors for C60, C70, and Sc3N@C80 MNFs. Results indicate a successful separation of MNFs from contaminant empty-cage fullerenes.

4:15 THE CONTROLLED POLYMERIZATION OF NEW CATIONIC EXO-7-OXA-NORBORNENE DERIVATIVES USING COMMERCIALLY AVAILABLE GRUBB'S CATALYSTS

David Rankin* and Andrew Lowe, University of Southern Mississippi, Hattiesburg, MS 39406

Ring opening metathesis polymerization (ROMP) is a transition metal catalyzed polymerization technique belonging to a family of metathesis reactions that allow for carbon-carbon bond formation by double bond scrambling. ROMP is applicable to strained cyclic alkenes such as norbornene derivatives allowing for the synthesis of polymers with unsaturation along the polymer backbone. This polymeric unsaturation can allow for further chemistries, thus producing polymers with new and interesting properties. The advent of well-defined ruthenium metal catalysts, e.g. Grubb's catalyst, allows for the synthesis of highly functionalized polymers in a controlled/"living" fashion. To date, we have synthesized a series of new cationic exo-7-oxanorbornene derivatives by reacting exo-tertiary amine-functionalized 7-oxanorbornene with benzyl, butyl, ethyl, propyl, pentyl, and octyl bromide/chloride. Conditions were optimized for their subsequent polymerization under homogeneous conditions in organic media. Such conditions facilitate the use of the commercially available first generation Grubb's catalyst, therefore negating the need for complex, multi-step initiator synthesis or protecting group chemistries in the preparation of cationic norbornene¨Cbased materials. These polymerizations proceed rapidly in a controlled fashion resulting in low polydispersity indices, the ability to prepare (co)polymers with pre-determined molecular weights and the ability to prepare materials with more advanced architectures including statistical and block copolymers. Additionally, other halogenated alcohols, such as 2,2,2-trichloroethanol and 1,1,1,3,3,3-hexafluoroisopropanol, were found to be effective cosolvents that allow for controlled/"living" polymerizations.

6:00 Divisional Poster Session
Location: Bost Auditorium North
Posters may be set up between 4:00p and 4:30p

SOLUBILITY OF OLEIC ACID OXIDATION PRODUCTS IN SUPERCRITICAL CARBON DIOXIDE

Darrell L. Sparks [1]*, L. Antonio Estévez [2], Rafael Hernandez [1],W. Todd French [1], Rebecca K. Toghiani [1], Hossein Toghiani [1], Earl Alley [1], and Mark Zappi [3], [1]Mississippi State University, Mississippi State, MS, 39762, [2]University of Puerto Rico, Mayaguez, PR 00681 and [3]University of Louisiana, Lafayette, LA 70504

Renewable feedstocks for producing chemicals, intermediates, and fuels are necessary to reduce dependence on petroleum. Many chemicals used for manufacturing consumer products could be made using lipids derived from vegetable oil, animal fat, and microorganisms. For example, oleic acid is a common unsaturated fatty acid that can be oxidized with ozone to produce azelaic acid and pelargonic acid. These products are

used in the production of plastics, pharmaceuticals, herbicides, and other products. The conventional method for performing the oxidation reaction involves passing ozone through oleic acid. Since ozone is a gas and oleic acid is a liquid under reaction conditions, mass-transfer limitations exist. The main objective of the project is to eliminate the mass-transfer limitations using supercritical carbon dioxide (SC-CO_2) as a reaction medium. By allowing the two reactants to coexist in the same phase, the reaction may proceed at a faster rate. Additionally, if a significant difference exists between the solubility of azelaic acid and pelargonic acid in SC-CO_2, a supercritical fluid separation can be used to fractionate the products minimizing downstream unit operations. In order to determine operating conditions, a secondary objective is to determine and model the solubility of oleic, pelargonic, and azelaic acid in SC-CO_2. The solubilities of azelaic acid and pelargonic acid were determined at pressures of 100, 133, 167, 200, 233, 267, and 300 bar at 40˚C and 60˚C. The data were modeled using the Peng-Robinson equation of state, the Chrastil equation, and the Méndez-Teja equation.

SYNTHESIS AND CHARACTERIZATION OF SOME SCHIFF BASE COMPLEXES OF VANADIUM(V)–SIGNS OF SOME EXCITING EFFECTIVE INSULIN-LIKE PROPERTIES.

Alvin A. Holder [1]*, Gabriel R. Harewood [2], Kerry-Ann Green [2], Paul T. Maragh [2], and Tara P. Dasgupta [2], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]University of the West Indies, Mona, Jamaica

Several new vanadium(V) complexes with Schiff bases as ligands were synthesized. The vanadium(V) complexes were characterized by UV-visible, IR, NMR, and X-ray diffraction. Electrochemical studies were carried out on the complexes in DMSO solution so as to determine the redox potentials of the vanadium center and the effect of ligand environment on the redox potential of vanadium(V). Effectiveness of these compounds in lowering blood glucose in STZ-induced diabetic rats is being investigated.

OXIDATIVE STABILITY OF CATFISH AND SOYBEAN BIODIESEL

Supanee Danviriyakul [1]*, Saowalee Jongrattananon [2], and Juan Silva [2], [1]Chandrakasem Rajabhat University, Thailand and [2]Mississippi State University, Mississippi State, MS 39762

The stability of biodiesel depends on the quality of the feedstock, transesterification process, environmental conditions, and other factors. There are many methods to measure oxidative stability including peroxide value, anisidine value, free fatty acids, induction period and others. The induction period is being tested as a standard measure of oxidation of oils and biodiesel. The induction period refers to the time it takes a sample to volatilize into acids at a rapid rate, when heated under an air flow. The European Union sets biodiesel at an induction period of 6 or more hours. To achieve this, antioxidants will have to be added to the product. Pure biodiesel from soybean was more stable than that of catfish, 4.91 and 0.54 h, respectively. However, their stability was enhanced by the addition of antioxidants. This was in the order of TBHQ > PrG > BHA > αa-Tocopherol. An induction time of up to almost 60 h was obtained from soybean biodiesel with 3200 ppm of TBHQ. Longer induction time was expected if additional TBHQ would have been used in catfish biodiesel at higher concentration than 800 ppm used in this study. Among the four antioxidants tested, αa-tocopherol was the least effective, especially with soybean biodiesel.

MULTILAYER KERATIN FILMS VIA LAYER-BY-LAYER ASSEMBLY TECHNIQUE

Brittany Jones [1]*, Jun Li [1], Robert A. Smith [2], and Sarah E. Morgan [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]Keraplast Technologies Ltd

Keratins are the major fibrous proteins found in the outer coverings of animals, including human hair, wool, nails and horns. Keratins have been demonstrated to provide wound healing capability and biocompatibility, and thus keratin based coatings are of interest for a wide range of biomedical and personal care applications. In this work, the layer-by-layer polyelectrolyte assembly technique was explored to produce useful keratin coatings. Keratin produced via the oxidative sulfitolysis of wool was employed as the polyanion and ammonium functionalized cellulose (polyquarternium) was employed as the polycation. The multilayer films were analyzed via ellipsometry and atomic force microscopy. The factors which might influence the layer-by-layer assembly process, including changes in pH, salt concentration and molecular weight, were investigated. It was found that stable multilayer keratin films were obtained via the LBL process, and salt concentration and pH of the solution were critical factors in determining film properties. Acknowledgment is made to the donors of the American Chemical Society Petroleum Research Fund for support of this research.

THE REACTIONS OF 2-METHYL-4,5-DIHYDROIMIDAZOLES AND 2-METHYL-1,4,5,6-TETRAHYDROPYRIMIDINES WITH ACID CHLORIDES

Guozhong Ye [1]*, Yingquan Song [1], Aihua Zhou [2], Charles U. Pittman, Jr. [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]University of Kansas, Lawrence, KS 66045

2-Methyl-4,5-dihydro-1*H*-imidazole(1), 1,2-dimethyl-4,5-dihydro-1*H*-imidazole(2), 2-methyl-1,4,5,6-tetrahydropyrimidine(3), and 1,2-dimethyl-1,4,5,6-tetrahydropyrimidine(4) react with acid chlorides under mild conditions to give *N*,*N*\'-diacyl-&*beta*-keto-cyclic-ketene-*N*,*N*-acetals (5) (eq.1), (Z)-3-((2-amidoethyl)(methyl)amino)-3-oxo-1-prop-1-enyl benzoate (6) (eq.2), N,N\'-diacyl-cyclic-ketene-*N*,*N*-acetals (7) (eq.3), N-acyl-&*beta*,&*beta*\'-diketo-cyclic-ketene-*N*,*N*-acetals (8) (eq.4), respectively. The extent of acylation and sites acylated are dependent on the size of *N*,*N*-ring system (5 or

6-membered ring) and the substitutions on the nitrogen atom (H, Me, acyl).

THE ROLE OF SUPERACIDS IN CATALYTIC CRACKING OF OLEIC ACID

Tracy J Benson*, Rafael Hernandez, W Todd French, Mark G White, Earl G Alley, and William E Holmes, Mississippi State University, Mississippi State, MS 39762

Although the growing demand for renewable fuels has led to an increase in annual production of biodiesel from 0.5 to 75 million gallons, biodiesel production is mainly limited to plant oils such as soybean and canola and gives off glycerol as an unwanted byproduct. Therefore, a new biofuel is needed that can utilize a wider variety of lipids without producing unwanted byproducts. Municipal sewage sludge and cultivated algae are just two lipid sources that could be used to produce green diesel. These lipids (i.e., glycolipids, phospholipids, sphingolipids, etc.) could be cracked with superacids to produce diesel range organics that can be burned in compression ignition engines. In this study, oleic acid, a major fatty acid component of many potential lipid feedstocks, was reacted at 0˚C using triflic acid as the protonating catalyst. Oleic acid was found to crack into liquid and gaseous products. Liquid products were analyzed by NMR, FTIR, and GC/MS. The liquid fraction is composed of a mixture of C9 – C14, C16 and C18 free fatty acids. This is indicative of alpha and gamma cracking analogous to that found in heterogeneous catalysis of petroleum fuels. Both, straight and branch chain isomers are formed for many of the carbon-lengths. Furthermore, decarboxylation to form diesel range organics can be achieved using high-temperature, transition metal catalytic reactions.

SYNTHESIS OF NATURALLY OCCURING POLYPHENOLS WITH ANTITUMOR POTENTIAL

Sidika Polat Cakir, Matthew S. O'Brien*, and Keith T. Mead, Mississippi State University, Mississippi State, MS 39762

Epicalyxin J is one of many diarylheptanoids found in the Chinese plant Alpinia blepharocalyx that are known to possess antiproliferative activity towards certain types of cancer cells. Because the absolute stereochemistry of epicalyxin J is not known, our work is directed towards the synthesis of this diarylheptanoid for structure confirmation and further cancer screening. Owing to the complexity of epicalyxin J, a simpler model structure will be synthesized to help determine the stereochemical influences of an intramolecular cyclization approach to the core, fused, tricylic ring system. Molecular orbital calculations for the model structure predict that the desired isomer will be favored due to pi-pi stacking of aromatic rings.

INSPIRATION THROUGH CHEMISTRY EDUCATION

Michelle Windham [1], Marcus Steele [1]*, and Mark Stovall [2], [1]Delta State University, Cleveland MS 38733 and [2]Sunflower Landing Adolescent Treatment Facility , Clarksdale, MS 38614

Rural schools in the Mississippi Delta lack the funding to provide adequate resources for offering strong courses in the physical sciences. The underserved youths are at a higher risk to become involved in illegal activities such as drugs and other forms of criminal activity. This premise of this project is to develop a set of focused activities in the physical sciences that can used to empower trouble youths as a means of diverting them from future criminal activity. The study, conducted over a six month time period, develops teaching styles and materials appropriate to achieve the desired goal. The instruction is based on a guided inquiry technique in which lectures are designed around each laboratory activity. Due to the limited laboratory facilities, the chosen activities will utilize reagents commonly found in homes and do not involve the use of open flames, corrosives or otherwise dangerous materials. Eighteen students were involved in the project ranging in age from 13 to 18 with varied science backgrounds. The lessons were conducted once a week for one and a half hours in an “open setting” in which they could discuss the concepts freely. The facility staff were closely involved in the activities and assisted by encouraging the slower students. Students were asked to complete assignments in the interim periods and record any questions about the previous week’s activity. These questions were submitted and answered anonymously to provide an environment free of ridicule from peers. Each lesson was composed of approximately 30 minutes of lecture centered on the topics examined in the activities. The remainder of the class time involving in performing the activities. All activities were taken from the website, www.about.com.

ELECTRIC-ARC PLASMA SYNTHESIS OF METALLIC NITRIDE FULLERENES

Howard Louie Coumbe*, Corey Thompson, Curtis Coumbe, Paige Phillips, Mary Mackey, and Steven Stevenson, University of Southern Mississippi, Hattiesburg, MS 39406

The electric-arc synthesis of metallic nitride fullerenes consists of the vaporization of metal-packed graphite rods in a helium atmosphere. Nitrogen is introduced into the reactor via a gas inlet or as a dopant in the packed graphite rod. Results suggest that key parameters to optimize include gap voltage, current, and pressure within the reaction chamber. Our discussion will also include the effect of plasma additives on MNF production. Results indicate the relative amounts of C60, C70 and MNF fullerenes are sensitive to variables in the plasma environment.

COLLOIDAL DISPERSIONS OF POLY-(METHYL METHACRYLATE/n-BUTYL ACRYLATE)

Amy Rutland*, Shelley Huskey*, Laura G. Kolibal, Anuradha Singh, and Marek W. Urban, University of Southern Mississippi, Hattiesburg, MS 39406

These studies focus on synthesis and film formation of colloidal dispersions containing stimuli-responsive components. In order to gain a fundamental understanding of these processes the influence of bio-active dispersing agents on colloidal film formation is examined. In this study, a copolymer of poly-(methyl methacrylate/n-butyl acrylate) was synthesized using an

emulsion polymerization process. Utilizing sodium dioctyl sulfosuccinate (SDOSS) as surfactant, the effect of particle size and surfactant concentration was examined. These studies indicate that larger colloidal particles enhance the mobility of surfactant migration within the film matrix, which is attributed to decreased surfactant coverage around the larger colloidal particles and freer surfactant within the film matrix. The influence of bio-active phospholipids was also examined. These studies show that the presence of mixed micellar structures under various stimuli such as pH, ionic strength, and temperature lead to the controlled migration of individual dispersing agents to the film-air or film-substrate interfaces. This work was supported primarily by the RET program of the National Science Foundation under Award Number EEC-0602032.

ANION BINDING BY TREN-BASED AMINE LIGAND

Katrina Battle*, Md. Alamgir Hossain, and Ashton T. Hamme, Jackson State University, Jackson, MS 39217

Design and synthesis of anion receptors are of current focus of research because of the important role played by anions in both environment and life. Among the various anion ligands, polyamines are widely used for anion binding. The polyamines, after protonation, are capable of interacting with anions through hydrogen bonding. Tren-based amines are converted into the protonated amines in the form of p-toluene sulfonate salts, which are then used for binding of inorganic anions in solution by NMR titration methods. Anion complexes are obtained by the reaction of the ligands and the mineral acid. The details of the synthesis, NMR binding and crystal structures will be will be presented in this poster.

SYNTHESIS AND CHARACTERIZATION OF FUNCTIONAL IRON OXIDE FERROFLUIDS

David Heaps*, Erin Fortenberry, Curtis Coumbe, Steven Stevenson, and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

This project addresses the need to develop functional agents, which can provide an immediate, local action (e.g. catalytic) when applied to the target system and allow for subsequent easy and complete removal of the agent on command. By using a core-shell ferrofluid – comprised of a superparamagnetic magnetite particle core and a functionalized active agent shell – agent removal can be facilitated via a simple bar magnet extraction procedure. Magnetite is a preferred magnetic core material due to its low toxicity and well-characterized magnetic behavior. Initial work in the synthesis and characterization of magnetite core-shell structures is described. In these systems, magnetite base ferrofluid physical properties (e.g. particle size) – characterized by optical, TEM and light-scattering techniques – are found to be strongly dependent on the method of ferrofluid preparation. Recent shell-forming techniques include coating the magnetite cores with a thin, silica layer, which can be readily derivatized with application-specific functional groups.

ABSENCE OF AUTOACCELERATION IN AROMATIC SULFONYL AZIDES AS FREE-RADICAL INITIATORS FOR PHOTOPOLYMERIZATION

Bridget Confait*, Nicole Mackey, Emery Shier, Charles Hoyle, and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

The decomposition reaction of aromatic sulfonyl azides when irradiated with UV light produces nitrogen gas and the nitrene diradical. The nitrene diradical produced is shown to initiate the free-radical photopolymerization of acrylates, such as hexanediol diacrylate (HDDA). Typically, the rates of photopolymerization in acrylate systems are characterized by an autoacceleration period where there is an increase in photopolymerization rate as the movement of the growing radical chains becomes restricted. The rates of photopolymerization of HDDA using sulfonyl azide initiators – as determined by photo-dsc analysis – do not exhibit the characteristic autoacceleration period typical of these systems.

VOMM SYNTHESIS AND WATERBORNE INDUSTRIAL COATINGS

Glenn Dale*, Jamie Morrison*, David E. Delatte, Lori Howell, and James W. Rawlins, University of Southern Mississippi, Hattiesburg, MS 39406

Vegetable oils are triglyceride esters of fatty acids extracted as a raw material precursors from plants. Newly developed vegetable oil derivatives, termed vegetable oil macromonomers (VOMMs), have been designed and synthesized for use as comonomers in emulsion polymerization. VOMMs are being incorporated and developed for environmentally responsible, decorative, and protective coatings that do not require the use of cosolvents for efficient film formation. However, these VOMMs possess limited hydrolytic resistance as they contain labile ester groups, inherently susceptible to hydrolysis. Ester-free VOMMs were designed to achieve improved hydrolytic resistance. Several new reaction methodologies were conducted at various temperatures and the progress was monitored continuously via infrared spectroscopy. Meanwhile, industrial coatings were formulated using commercial latexes to serve as controls for evaluating VOMM-based emulsions in industrial coating applications. Three styrene-acrylic latexes and two alkyd dispersions were formulated into industrial coatings in combination with hexamethoxymethylmelamine crosslinker and evaluated via ASTM test methods. This work was supported primarily by the RET program of the National Science Foundation under Award Number EEC-0602032.

PERSISTENCE: COMPLETION OF STEM DEGREES AT AN HBCU

Jeffrey Zubkowski*, Shonda Allen, Loria Brown, Linda Channell, and Donna Lander , Jackson State University, Jackson, MS

39217

Persistence: To go on resolutely or stubbornly in xpite of opposition, importunity or warning. The NSF has reported an increase in degrees earned by underrepresented groups in the STEM disciplines. The relationship between student success and support programs was examined. Specifically, the relationship between program interaction, stipend, research opportunities, development activities and student persistance in obtaining a baccalaureate degree are discussed.

STUDY OF CHEMICAL COMPOSITIONS OF A NIGERIAN EDIBLE PLANT *VENONIA AMYGDALINA (VA)*

Xuan Luo, Daniel Oyugi, Ernest B. Izevbigie, and Ken S. Lee, Jackson State University, Jackson, MS 39217

Breast cancer is the most commonly diagnosed cancer in women. One out of every eight women will be diagnosed with cancer in her lifetime. Numerous drugs have helped prolong the expansion of cancer but an effective drug has significantly yielded the progress in the fight against cancer. Among these drugs are plant-derived products which are considered potentially effective for their use as chemotherapeutic and chemopreventive agents. One such plant, *Vernonia amygdalina* (VA) leaf extract, has been reported to be potentially potent to human breast tumor cell line MCF-7. We have used two organic solvents, 100% EtOAc and 85% EtOH to extract active organic components from VA leaf. The experiment data reveals that the condensate of 85% EtOH shows higher potent activity than that of EtOAc. At the same time, using 85% EtOH to extract just requires shorter period to extract than EtOAc. Silicon gel will be used to absorb the condensate in the gradient elution (the solvent system is 100% hexane, 3 : 1=hexane : EtOAc, 1 :1=hexane : EtOAc)=, and 100% EtOAc) to separate the condensate into four fractions. From previous experiment of ethyl acetate extract with gradient elution and column chromatograph gave four fractions and fourth one shows best activity toward MCF-7 cell. Using TLC for analyzing fourth fraction further, mixture of CH_2Cl_2 : MeOH (8:2), can be separated into two parts. The result of analysis and separation will be discussed in detail.

SYNTHESIS AND CHARACTERIZATION OF PHENOLIC RESIN/OCTA(AMINOPHENYL-T_8-POLYHEDRAL OLIGOMERIC SILSEQUIOXANE (POSS) HYBRID NANOCOMPOSITES

Sang Ho Lee [1]*, Yudong Zhang [1], Mitra Yoonessi [2], Hossein Toghiani [1], and Charles U. Pittman, Jr. [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Air Force Research Laboratory, Wright-Patterson AFB, OH 45433

Nanocomposites composed of nano-sized dispersed phases blended into organic polymeric resins have been developed extensively in the past decade. Polyhedral oligomeric silsesquioxanes (POSS) have been employed as a curing hardener for resins in nanomaterial science. Octa(aminophenyl)-T_8-polyhedral silsesquioxane, $(NH_2)_8(C_6H_4)_8O_{12}Si_8$, 1, is an octafunctional-T_8-POSS containing eight aniline-like amino groups, one on each corner silicon atom. 1 was synthesized by an improved two-step reaction sequence; nitration (HNO_3) and reduction ($HCOOH/Et_3N$). The amino functional groups of 1 can form chemical bonds or hydrogen-bonds to appropriate matrix polymers or resins. Various resole phenolic resin/1 nanocomposites (0, 1, 3, 6, and 12 wt% 1) were prepared. The intermolecular interactions in these nanocomposites were probed by FT-IR. The micro-morphology and aggregation state of 1 were investigated using SEM, TEM, and WAXD studies. Thermal and mechanical properties and thermal stabilities of these composites were examined by DMTA and TGA, respectively. Moreover, surface extractions by THF removed only a portion of the 1 in the surface regions based on X-EDS analyses for Si, suggesting that a portion of 1 might chemically bond into the phenolic resin matrix during the cure. As the loading of 1 increased, the content of 1 at specific surface locations gradually tends to increase and confirmed excellent dispersion of 1 in the micron size-scale at all locations.

COMPARISON OF C^{13}–NMR CHEMICAL SHIFTS WITH QUANTUM CALCULATIONS

Cardell Givens*, Joseph A. Bentley, and Alline P. Somlai, Delta State University, Cleveland, MS 38733

The Carbon-13 Nuclear Magnetic Resonance (C^{13}–NMR) spectra were collected on a 300 MHz ECX-JEOL spectrometer for four constitutional isomers: *n*-butyl bromide, isobutyl bromide, *t*-butyl bromide and 2-butyl bromide. The C^{13}-NMR chemical shifts were calculated by both ChemDraw and the computational chemistry program SPARTAN using the STO-3G, 3-21G(*), 6-31G(D) and 6-31G** basis sets. Although neither calculation gives extremely good agreement with the experiment, the methods are comparable and give fairly good estimations of the experimental chemical shifts. The energies calculated using SPARTAN are also presented.

SOLUBILITY INVESTIGATIONS OF (K+, Na+, Cs+)-NO3--OH-H2O SYSTEMS

Caleb Tash*, Laura T. Smith, Rebecca K. Toghiani, and Jeff S. Lindner, Mississippi State University, Mississippi State 39762

The thermodynamic behavior of Cs+ and K+ ions in solution is of interest when modeling high-level waste separation processes and in the establishment of operational envelopes for waste processing. For thermodynamic modeling of Department of Energy legacy nuclear wastes, the Environmental Simulation Program (ESP, OLI Systems, Inc.) is used. The aqueous electrolyte model allows estimation of the solid-liquid equilibria of waste constituents and evaluation of physical properties including densities, aqueous phase viscosity, pH, and phase volume fractions. Work in this laboratory has been on-going since 1997 and has focused on experimental measurement of the solubility for major sodium salts present in the waste. These include NaNO3, NaNO2, Na2SO4, and Na2CO3.1H2O, and more complex double salts including Na7F(PO4)2.19H2O, Na6(SO4)2CO3, and Na3FSO4. The results of this effort have been compiled into a double salt database (V7DBLSLT) which

is in use throughout the DOE complex. Current available databases contain limited information, however, on the solubility of potassium nitrate and cesium nitrate in caustic solutions under high ionic strength conditions. An initial comparison of available literature data for these systems with ESP predictions revealed disagreement. Thus, solubility measurements for two systems were undertaken: KNO3/ NaNO3 and CsNO3/NaNO3. Experiments were conducted at two temperatures (25 and 50 „aC) in water, 1m and 3m NaOH. Each sample was monitored weekly to establish attainment of equilibrium. A comparison of preliminary experimental data with ESP predictions indicates that the ESP model overestimates the potassium and cesium ion concentrations. Model predictions, experimental results, and comparisons will be discussed.

MECHANISTIC STUDIES OF FREE RADICAL AZIDATION

Douglas S. Masterson and Jessica Shackleford*, University of Southern Mississippi, Hattiesburg, MS 39406

Carbon-Nitrogen bonds can be formed through free radical azidation using Sulfonyl Azides, however the mechanism is still questionable as to which Nitrogen acts as the free radical trap. Through our research, we have been able to label the γ? Nitrogen of the Sulfonyl Azide by treating Sulfonyl Hydrazide with Nitrogen-15 labeled Sodium Nitrite in HCl to produce an average 93% yield of N15 labeled Sulfonyl Azide. Our first primary reaction treated Ethyl Iodoacetate and Octene with Sulfonyl Azide to produce the product Ethyl 4-Azidodecanoate, while our second primary reaction treated Ethyl Iodoacetate and Methylene Cyclohexane with Sulfonyl Azide to produce Ethyl 3-(1-Azidocyclohexyl)propanoate. Both products were hydrogenated at a later time so that only the free radical trap Nitrogen remained. Each reaction was repeated multiple times, and in all reactions the labeled γ? Nitrogen always served as the free radical trap. The data gained from this study could be applied to making Nitrogen-15 labeled Amino Acids from simple materials.

PHOTOCHEMICAL CLEAVAGE OF DNA WITH NITROGEN ONIUM SALTS

Amanda Mayo*, Andrew S. Olinger, and Wolfgang Kramer, Millsaps College, Jackson, MS 39210

Quantitative photochemical DNA cleaving studies with nitrogen onium salts were performed using potential DNA intercalators based on the quinoline, isoquinoline and phenanthridine skeletons. The efficiency was analyzed by gel electrophoresis.

INVESTIGATION OF THE PERFORMANCE OF COATINGS FORMULATED WITH THE REACTIVE DILUENT TETRA(2,7-OCTADIENYL) TITANATE

Rhonda Robertson [1]*, Crystal Smith [2]*, Alp Alidedeoglu [2], Kevin Davis [2], James W. Rawlins [2], and Sarah E. Morgan [2], [1]Jones County Junior College, Ellisville, MS 39437 and [2]University of Southern Mississippi, Hattiesburg, MS 39406

Volatile organic compounds (VOCs), traditionally used in the formulation of paints and coatings, are the subject of environmental concern and legislation mandating reduction of their use. There is currently intense research interest in developing coatings with no or low solvent emissions. One method of reducing VOCs is through incorporation of reactive diluents, which replace solvents in the formulation but do not evaporate upon application, but rather undergo crosslinking reactions in the resin on exposure to oxygen. A new reactive diluent, tetra(2,7-octadienyl) titanate, was synthesized through ether exchange reaction between 2,7-octadienol and tetra(ethyl) titanate, evidenced by 1H-NMR, 13C-NMR, HPLC and FTIR. The resulting reactive diluent was formulated with soy-based and linseed-based alkyd resins, both with and without added metal dryers, at weight percentages ranging from 10 to 30%. Films were prepared from the formulations and their properties evaluated in comparison to controls, including hardness, adhesion, impact strength, cure, viscosity, optical properties and chemical resistance. Fast drying, low VOC, low viscosity formulations were obtained utilizing the reactive diluent. Films prepared from reactive diluent formulations exhibited exceptionally fast dry times and superior hardness in comparison to controls. Adhesion properties and impact properties were somewhat reduced, while other tested properties were equivalent to controls.

DEVELOPMENT OF INHIBITORS OF AGMATINASE: SYNTHESIS OF AGMATINE ANALOGUES, PIPERAZINECARBOXAMIDINE

Eva A. Clark *, Vyvyca Jones, and Ken S. Lee, Jackson State University, Jackson, MS 39217

Agmatine is an endogenous amine with four carbon chain to a guanidine group that is synthesized in the brain following decarboxylation of L-arginine by arginine decarboxylase. Recent studies indicate that agmatine can have several important biochemical effects in humans, ranging from effects on the central nervous system to cell proliferation in cancer and viral replication. In a series of experiments with rat pups, agmatine showed the effect reducing the brain damage in hypoxia-ischemia and the production of nitric oxide when it was added. Agmatinase catalyses the hydrolysis of agmatine to putrescine and urea and is a major target for drug action and development. Therefore we are looking for the way to regulate the level of agmatine in the brain. One of methods we are interested in is to modify the structure of agmatine, which can inhibit degradation of agamatine by blocking the agmatinase. From the previous study including QSAR, one of agmatine analogues, 3-aminopropylguanidine showed the promise. And the study suggests the piperazine analogues of agmatine would have the properties we are looking for. As a second phase of study we attempted to synthesize piperazine-carboxamidine and 2-methylpiperazinecarboxamidine. They were prepared by the reactions between cyanamide and corresponding diamines

including piperazine derivatives like piperazine and 2-methylpiperazine. Piperazinecarboxamidine were synthesized as described and its spectroscopic data including ^{1}H, ^{13}C NMR and IR were taken.

TREATMENT OF SAWDUST WITH IONIC LIQUID: SEPARATION OF CELLULOSIC MATERIAL FROM LIGNIN

Teresa Demeritte*, Jeffrey Thorn, and Ken S. Lee, Jackson State University, Jackson, Mississippi 39217

Green chemistry has received great attention from chemists and environmentalists since it reduces the usage of hazardous materials in the chemical process. One of developments in green chemistry is to substitute the volatile organic solvents with ionic liquids to reduce the VOC. It is known that some ionic liquids can dissolve cellulose in higher temperature and the phase of cellulose can be changed easily. Therefore we have attempted to separate the cellulosic material from lignin in sawdust of soft pine wood. Ionic liquid, 1-n-butyl-3-methylimidazolium chloride ($[C_4mim]^+Cl^-$), was prepared from n-butyl chloride and 1-methylimidazole and purified. Its preparation was confirmed by ^{1}H and ^{13}C NMR and it was mixed with sawdust with various ratios for finding better condition. Sawdust was separated based on the mesh number and they were mixed with ionic liquid separately. Mixture was stirred at elevated temperature for overnight and it filtered under the pressure. Addition of water into the filtrate gave brown colloidal solution. The brown powder was separated and its chemical analysis was attempted for identifying cellulose.

SYNTHESIS AND CHARACTERIZATION OF PH-RESPONSIVE POLYMER BRUSHES

Shijie Ding* and Keisha B. Walters, Mississippi State University, Mississippi State, MS 39762

A well-defined series of polyamine brushes have been synthesized via surface-confined atom transfer radical polymerization (ATRP) on silicon (Si) wafers. These polymer brushes were polymerized from initiator reacted onto the terminal groups of self-assembled monolayers (SAMs). The effect of solvent, monomer concentration, ligand and initiator on the polymerization success was examined. The chemical composition of the samples at each reaction step was characterized using FTIR and x-ray photoelectron (XPS) spectroscopies and the thickness of the polymer layers was measured with ellipsometry. By changing the monomer, our goal is to synthesis a series of polyamines with varying tertiary amine functionalities. The tertiary amine pendant groups on these polymer brushes are bases and will therefore show changes in chain extension and contraction with changes in pH. The pH-responsive behavior of polymer brush thickness will be measured using *in-situ* ellipsometry.

INTERCALATIONS OF ORGANIC MOLECULES INTO CLAY MIMICS

Alicia M. Beatty* and Austin Pickett, Mississippi State University, Mississippi State, MS 39762

Several organic molecules will be intercalated into the interlayer of a clay mimic constructed of 3,5-Pyridinedicarboxylic acid and a diamine. The two diamines used are 1,10 Diaminodecane and 1,12 Diaminododecane. The clay mimic crystals were sonicated in a solution of the individual organic molecules, most of which contain polar groups, and tests were taken of the sonicates to determine if intercalation occurred. The three tests used were Differential Scanning Calorimeter (DSC), Thermogravimetric Analysis (TGA), and NMR. Results for several guest molecules will be discussed, including results for different polar organic molecules. Synthesis of an amine-containing ether to replace the diamines used will also be discussed. The presence of oxygen atoms in the carbon chain will hopefully provide more possible hydrogen bonding sites to secure the intercalated guests.

IDENTIFICATION OF PEPTIDES THAT BIND TO ESTROGEN RESPONSE ELEMENTS: USING PEPTIDE PHAGE DISPLAY LIBRARY

Matthewos Eshete*, Zakary Ndegwa, and Matthewos Eshete*, Mississippi Valley State University, Itta Bena, MS 38941

Short peptides can mimic estrogen receptor proteins and bind to the same site on the DNA as the proteins do. In this research peptide phage display library has been utilized to select peptides which bind to estrogen response elements. The phage display library used to select peptides against the target Estrogen response elements were random 15-mer phage display library and f88-4/Cys6 phage display library. Human pS2 ERE and Xenopus Vitelloginin A2 ERE were used as target DNA molecules. The first round of selection has been performed using 15-mer phage display library and f88-4/Cys6 phage display library against Xenopus Vitelloginin A2 ERE and Human pS2 ERE. From 15-mer phage display library 25 phage clone were selected using Xenopus vitelloginin A2 ERE as a target molecule and 19 phage clones were selected using Human pS2 ERE. On the other hand 15 phage clones were selected from the f88-4/Cys6 phage display library against Xenopus vitelloginin A2 ERE as a target molecule and 30 phage clones were selected using Human pS2 ERE as a target molecule. Each of the phage clones selected from both phage display library corresponds to the binder peptide sequences. However only the peptides selected at the last or 4th round would be sequenced to get the corresponding binder peptides. The progressive selection at the different round would tell us the selectivity and specificity of binding to the target molecule.

PRODUCTION OF RARE-EARTH METALLIC NITRIDE FULLERENES

Corey Thompson*, Curtis Coumbe, Mary Mackey, Paige Phillips, Howard Louie Coumbe, and Steven Stevenson, University of Southern Mississippi, Hattiesburg, MS 39406

Metallic Nitride Fullerenes (MNFs) containing rare-earth metal atoms are being developed as new pharmaceuticals. MNFs and application areas include Gd3N@C80 (MRI contrast agents), Lu3N@C80 (X-Ray contrast agents), and Ho3N@C80 (radiopharmaceuticals). Hence, the synthesis of these rare-earth

MNFs is of great importance. Results indicate that rare-earth MNFs have lower yields than Sc3N@C80. The relative yields for the rare-earth series are Lu3N@C80 > Ho3N@C80 > Gd3N@C80.

MISCIBILITY STUDIES OF SOLUTION BLENDED POLYPHENYLSULFONE AND POLYPHENYLENE

Camille Short*, Paul J. Jones, and Sarah E. Morgan, University of Southern Mississippi, Hattiesburg, MS 39406

The goal of this research was to determine optimum film formation conditions for blends of polyphenylsulfone and polyphenylene and to evaluate their miscibility via optical microscopy and differential scanning calorimetry (DSC) techniques. Film formation factors evaluated include temperature of solvation and polymer concentration. Polymer powders were dissolved in 1-methyl-2-pyrrolidinone (NMP) at elevated temperatures. Solution temperature was optimized to avoid polymer degradation. Solutions were cast on glass plates and placed in a vacuum oven for overnight drying, and then placed in a convection oven to remove any remaining solvent. The cast films and unmodified polymer powders were analyzed by DSC. DSC results indicate that the blends are miscible over the concentration and temperature range evaluated.

INTERCALATION OF THE SNI_2 LAYERED PEROVSKITE INORGANIC-ORGANIC HYBRIDS

Nilantha Bandara and Alicia M. Beatty*, Mississippi State University, Mississippi State, MS 39762

Inorganic-organic hybrid perovskites have gained much attention over the past years due to their unique electronic and optical properties. Currently we are interested in making layered perovskites using SnI_2 with primary and diammine organic components, in order to test their ability to intercalate guest molecules. In the past, small molecules have been incorporated into the lattice by crystallization, and we are investigating the ability to *remove* and *reincorporate* these guests into the solid framework by both sonication and re-dissolving methods. The products will be characterized by single crystal X-ray diffraction, powder X-ray (PXRD), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), IR and melting point analysis.

PREPARATION AND TREATMENT OF HANFORD TANK WASTE SLUDGE

Timothy Ruff*, L. T. Smith, Rebecca K. Toghiani, Dave C. Swalm, and Jeff S. Lindner, Mississippi State University, Mississippi State, MS 39762

The 53 million gallons (240,000 tons) of nuclear waste stored at the Hanford site comprises approximately 60% of the nation's legacy nuclear waste. Previously, processing of the saltcake phases of tank wastes dominated disposal efforts at Hanford. Interest is now being directed at the processing and pretreatment of the sludge phases of the waste. These sludges consisting of complex combinations of insoluble metal compounds present many challenges. This presentation deals with experimentation around possible pretreatment strategies for the complex sludge phases of the Hanford tank waste. First, an "average" sludge composition was established from statistical analysis of tank inventories. Previous work has involved preparation of simulant sludge from the Savannah River Site (SRS). The recipe for SRS waste sludge will be modified for use in preparation of the Hanford simulant sludges. Proposed pretreatment strategies involving caustic leaching and washing of sludges are also discussed as well as the performance of washing and leaching. Certain aspects of aluminum chemistry have also been investigated as a part of this work and are discussed, including solubilities of common aluminum species found in Hanford tank sludge as well as transition between those species.

3D-QSAR ANALYSIS OF FARNESYLTRANSFERASE INHIBITION FOR ANTIMALARIAL DIAMINOBENZOPHENONES

Shawna Clark [1]*, Aihua Xie [2], and Robert J. Doerksen [2], Tougaloo College, Tougaloo, MS 39174 and University of Mississippi, Oxford, MS 38677

This project focuses on a quantitative structure-activity relationship (QSAR) investigation of a series of 2,5-diaminobenzophenone farnesyltransferase inhibitors developed by Schlitzer et al. as a new class of antimalarial compounds, in order to gain understanding and as a step toward developing a rational strategy for further lead optimization. 3D-QSAR methods (CoMFA and CoMSIA) were used to study a series of compounds, including 37 N-(4-tolyacetylamino-3-benzoylphenyl)-3-arylfurylacrylic acid amides, 24 N-(4-acylamino-3-benzoylphenyl)-3-[5-(4-nitropheyl)-2-furyl]acrylic acid amides, 14 N-(4-acylamino-3-benzoylphenyl)-4--nitrocinnamic acid amides, 8 N-(4-aminoacylamino-benzoylphenyl)-3-[5-(4-nitrophenyl)-2-furyl] acrylic acid amides, and 8 5-arylacryloylaminobenzophenones. Four 3D-QSAR models were built: three CoMFA models composed of steric and electrostatic fields, and one CoMSIA model containing only a hydrophobic field. The models prepared were not of high statistical quality but the resulting field contours combined with other drug design technology still can provide insights for lead optimization.

PRODUCTION OF GREEN DIESEL THROUGH CATALYTIC CRACKING OF PHOSPHOLIPIDS

Stephen Dufreche [1]*, Rafael Hernandez [1], Todd French [1], Mark G White [1], Mark E. Zappi [2], Earl Alley [1], and Bill Holmes [1], [1]Mississippi State University, MS 39762 and [2]University of Louisiana, Lafayette, LA 70504

The paper will describe results of cracking phospholipids with triflic acid (super acid) to determine reaction mechanisms and product composition of Green Diesel. This fuel would

be chemically identical to conventional diesel fuel, but derived from a clean renewable feedstock. The results will be used to assist in the synthesis of heterogeneous catalysts better suited for large-scale production. The paper also will cover the basic theory behind cracking of phospholipids through acid catalysis as well as a description and economics of potential feedstock sources capable of supplying the U.S. with large amounts of green diesel.

SYNTHESIS OF A SELF-ASSEMBLED, NANOSTRUCTURED POLYMER FOR ORGANIC PHOTOVOLTAIC (OPV) CELLS

LaTisha Wilson [1]*, Dolly Batra [2], and Millicent Firestone [2], [1]Tougaloo College, Tougaloo, MS 39174 and [2]Argonne National Laboratory; Argonne, Illinois 60439

Organic photovoltaic cells (OPVs) differ from conventional silicon-based photovoltaics (PVs) because they offer increased flexibility and cheaper costs; however, the efficiency of OPVs (3-5%) is considerably lower than that of traditional, inorganic PVs. The development of nanostructured, organic polymers where electron transport can be easily controlled offers an approach for fabricating a more efficient OPV framework. With this project the synthesis of a photopolymerizable ionic liquid monomer was targeted and it was hypothesized that polymerization would lead to a nanostructured poly(ionic liquid) incorporating both an electron accepting imidazolium group and an electron donating thiophene group. Further studies will involve studying the change in self-assembly caused by thiophene, and how transport properties of the resulting polymer affect the efficiency in an OPV material. This work was performed under the auspices of the Office of Basic Energy Sciences, Division of Materials Sciences, United States Department of Energy, under contract No. DE-AC02-06CH11357.

INVESTIGATING THE EFFECT OF SODIUM CHLORIDE CONCENTRATION ON COMPLEX COACERVATE FORMATION WITHIN A CONCENTRATED REGIME

Lisa Fike*, Nicole McWright*, and Robert Lochhead, University of Southern Mississippi, Hattiesburg, MS 39406

Shampoos comprise amphipathic molecules called surfactants that self assemble into nano-scale micelles. The micelles are responsible for the cleaning action of shampoos. In conditioning shampoos, polymers interact with the surfactants. The dilution of shampoo, while washing hair, causes the cationic polymer and the anionic surfactant to form complex coacervates that can phase separate from the solution and, during rinsing, this polymer-surfactant complex is deposited on the hair as a conditioner. There are many possible self-assembled structures that can form from the surfactants and the polymers, and the shampoo formulator has to find the best formula. High-throughput screening allows the examination of hund reds of compositions each day. Thus, our high-throughput method using a liquid handler allows approximately 200 different concentrations to be performed in about 45 minutes. In our research, Polyquatemium-l0 (JR 30M) was used as the cationic polymer and sodium lauryl ether sulfate(SLES) as the anionic surfactant. Sodium chloride (NaCl) is added to shampoos to increase the viscosity, but salts can also influence the micelle structure, the poly ion conformation and the nature of the coacervate. Our motivation in doing this experiment was to investigate how sodium chloride affects this interactive system. Our results show that as the concentration of NaCl increased, the amount of coacervate formed decreased in the 'ion-exchange' region but increased in the large micelle region.

FRIDAY MORNING

Hunter Henry Ballroom A

8:00 NANO-ENCAPSULATION OF TRACE METAL IMPURITIES IN BIODIESEL

Shampa Aich,* Keisha B. Walters, and Adrienne Minerick, Mississippi State University, Mississippi State, MS 39762

Biodiesel, an alternative diesel fuel, has environmental benefits and can be synthesized from renewable biological sources such as vegetable and seed oils, animal fats, and sewage sludge. Depending on the raw materials, trace metal contaminants are present in the processing streams including Cu, Mn, Pb, Zn, Co, Fe, and B. These metal impurities can have significant adverse effects, such as biofuel fouling or degradation during long-term storage. Therefore, our research objective is to determine the feasibility of growing inert silica shells around the trace metal particulates via core-shell nanotechnology. The resulting inert nanoparticles may be removed by gravitational settling, filtration, or magnetic / electrophoretic separations. Silica, the coating material, is chemically inert, optically transparent, and produces concentrated dispersions by preventing coagulation. In the literature, nanoencapsulation of colloidal nanoparticles has included metals (Au, Ag, Fe/Fe2O3), semiconductors (CdS, ZnS, CdSe/ZnSe), polymers (polystyrene, polydimethylsiloxane), and inorganic oxides (boehmite rods, gibbsite platelets). However, encapsulation of the two most important metal impurities in sewage sludge derived biodiesel, Cu and Pb, has not occurred. Nanoencapsulation of colloidal Cu nanoparticles with silica shells is investigated. The reaction sequence will be perfected using clean stock solutions of copper nanoparticles (15-20 nm) functionalized with polyvinylpyrrolidone (PVP) and sodium dodecylbenzene sulphonate (SDBS). PVP and SDBS function as linkers and stabilizers prior to encapsulation with the shell-building material, tetraethoxysilane (TEOS). Aqueous ammonia and ethanol are used as the catalyst and solvent respectively. The resulting nanoparticle metal core–silica shell samples are then characterized with TEM, SEM, FTIR, and UV-vis spectroscopy to assess average particle diameter, silica shell thickness, and optical properties. As this work progresses, the reaction sequences will be adapted to biodiesel samples.

8:15 A MICROFLUIDIC STUDY OF TRANSIENT INTERFACIAL PHENOMENA IN MISCIBLE AND PARTIALLY MISCIBLE SYSTEMS

Gloria Viner* and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

This study focused on the unusual interfacial phenomena of different miscible and partially miscible systems such as isobutyric acid and water. Previously, we had studied systems such as isobutyric acid and water with a spinning drop tensiometer; we wanted to see how different miscible systems that we could not previously studied, such as ethanol/water, and some systems that we have studied would behave in a system that allows the components to interact without any rotating forces. The microfluidic approach allowed us to observe the Rayleigh-Plateau instability without mixing of the fluids.

8:30 INTERCALATIONS OF LEWIS BASES INTO INORGANIC/ORGANIC HYBRID CLAY MIMICS

Greg Hogan* and Alicia M. Beatty, Mississippi State University, Mississippi State, MS 39759

Clays intercalate small molecules or ions between metal oxide layers. Our group makes hydrogen-bonded layered material using coordination complexes and organic amines. The coordination complexes contain axial water ligands, and we wish to determine if these ligands can be replaced by Lewis bases while retaining the hydrogen-bonded layer structure. A series of reactions were set up in which the layered solid is exposed to an excess of a variety of Lewis bases through sonication in hexanes. Characterization of these products was done by IR, DSC, powder XRD, and TGA. Using the latter technique we observed significant differences in weight loss in starting material versus products. These weight losses corresponded to replacement of water with the Lewis bases. These and other results will be discussed.

8:45 POST TRANSLATIONAL REGULATION OF PROLYLCARBOXYPEPTIDASE (PRCP) IN CHINESE HAMSTER OVARY (CHO) CELLS

Mubina Isani* and Shariat Madar, University of Mississippi, University, MS 38677

PRCP involves in the conversion of angiotensin II (Ang II, a potent vasoconstrictor) to angiotensin 1-7 and conversion of bradykinin (BK, a vasodilator) to form des Arg9 bradykinin. PRCP converts PK to plasma kallikrein when the high molecular weight kininogen (HK) combines with PK, forming the HK-PK complex that binds to human umbilical vein endothelial cells (HUVEC) membranes. Formed kallikrein then liberates BK from HK, which leads to vasodilation. This physiological function is mediated by the BK type 2 receptor in the G protein-coupled receptor family. The balance between BK production and Ang II inactivation is important for wound healing, angiogenesis and high blood pressure regulation. Our goal was to determine the post translational regulation of PRCP in CHO cells. CHO cells were transfected with full-length PRCP under the control of a CMV promoter and rPRCP was expressed as a fusion protein with C-terminal enhanced green fluorescent protein (EGFP). The binding of biotinylated HK to wild type CHO cells was time dependent, dose dependent, saturable and reversible. The PRCP-induced PK activation was similar on wild type and PRCP-transfected CHO cells. PRCP inhibitor, Z-Pro-Prolinal did not block PK activation on wild type cells. In the future, we wish to further characterize the molecular trafficking of PRCP in PRCP-transfected CHO cells. In sum, these findings will be an important advance in our knowledge of PRCP function.

9:00 AN ELECTROCHEMICAL STUDY OF A SCHIFF BASE COMPLEX OF VANADIUM(V) AND ITS INTERACTIONS WITH CALF THYMUS DNA IN DMSO- A SEARCH FOR NEW ANTI-CANCER AGENT

Suman Parajuli [1], Gabriel R. Harewood [2], Kerry-Ann Green [2], Paul T. Maragh [2], Tara P. Dasgupta [2], Wujian Maio [1]*, and Alvin A. Holder [1]*, [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]University of the West Indies, Mona, Jamaica

A new vanadium(V) complex with an azo Schiff base as ligand was synthesized and characterized. Cyclic voltammetric studies were carried out on the complex in de-aerated DMSO solution containing 0.10 M TBAP at a glassy carbon electrode. Preliminary data showed that, two reduction waves, located at -0.35 V and -0.51 V vs. Ag/AgCl, were observed at a scan rate of 50 mV/s, which are probably associated with of reductions of V(V) to V(IV), and V(IV) to V(III), respectively. No re-oxidation corresponding to the above two reduction waves was observed, suggesting that the reduction of the metal center is irreversible. An irreversible oxidation wave, located at 0.76 V vs. Ag/AgCl, was observed, which could be attributed to the ligand oxidation. The effectiveness of this complex in binding to calf thymus DNA has also been carried out through cyclic voltammetry with "DNA-complex titration method". The results of the findings will be presented.

9:15 SEPARATION AND ISOLATION OF NEW METALLIC NITRIDE FULLERENES

Mary Mackey*, Curtis Coumbe, and Steven Stevenson, University of Southern Mississippi, Hattiesburg, MS 39406

Recent work in our lab has led to the isolation of Sc3N@C68, Sc3N@78, and Sc3N@C80 Metallic Nitride Fullerenes (MNFs). However, there is a paucity of information on the existence of other MNFs (i.e. other carbon cages). Soot has been obtained from our electric-arc plasma nanomaterial generator. These soot extracts were then characterized by HPLC. The chromatograms for these samples indicate the presence of new peaks. We have identified and collected HPLC fractions and characterized them by MALDI-TOF mass spectrometry. Results also indicate candidate molecular formulas for these new species.

9:30 STUDIES OF ELECTROCHEMICALLY PREPARED ION-SELECTIVE MEMBRANES WITH SECM

Shijun Wang [1], Milka T. Neshkova [2], Wujian Miao [1]*, [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]Bulgarian Academy of Sciences, Sofia, Bulgaria

A semi-conductive Cu(II) ion-selective membrane of $Cu_{2-x}Se$ (x = 0.67) was electrochemically synthesized and deposited on the surface of a Pt-disk electrode. The potentiometric response of the membrane in the presence of diluted Cu(II) solutions was found to follow Nernstian behavior (29 mV dec^{-1}) at room temperature. In order to investigate the mechanism of the ion-selective membrane, aqueous solutions of mM levels of $CuSO_4$, 1.0 M CH_3CN, and 0.10 M $LiClO_4$ were prepared and their electrochemical behavior was studied with cyclic voltammetry using macro- and micro- Pt electrodes. One electron-transfer reversible process between Cu(II) and Cu(I) was observed and the diffusion coefficient of Cu(II) under the present experiment conditions was determined. Scanning electrochemical microscopic (SECM) experiments were conducted with a Pt microelectrode as the tip and the membrane deposited on Pt as the substrate using above Cu(II)-CH_3CN-$LiClO_4$ solution as the electrolyte mediate. The open circuit potential changes of the membrane with the approaching of the tip held at the reduction potential of Cu(II) was monitored. Finally, a mechanism of the ion-selective membrane was proposed. Financial support through NSF-OISE-0535467 grant is gratefully acknowledged.

9:45 SCALABILITY ASSESSMENT OF THE SAFA TECHNIQUE FOR ISOLATING METALLIC NITRIDE FULLERENES

Curtis Coumbe [1]*, Mary Mackey [1], Katie Carpenter [2], Paige Phillips [1], David Heaps [1], and Steven Stevenson [1], [1]University of Southern Mississippi, Hattiesburg, MS 39406 and [2]Mississippi University for Women, Columbus, MS 39701

Discovered and developed in our lab, a novel "Stir and Filter Approach" (SAFA) is currently under development as an alternative separation method for isolating Metallic Nitride Fullerenes (MNFs) nanomaterials. With SAFA, the plasma soot extract is dissolved in xylene, and reactive aminosilica is added. The amino functionality on the silica support selectively binds to contaminant fullerenes (e.g. C60, C70) and classical metallofullerenes (e.g. Sc2@C84). The more chemically inert MNFs are more resistant to attack by the amino groups. Hence, the filtrate of the slurry is purified MNFs. Results indicate that the SAFA approach is a scalable method for isolating MNF nanomaterials.

10:00 Break

10:15 SYNTHESIS OF INTERCALATIVE DNA CLEAVING REAGENTS

Wolfgang Kramer*, Bentley Woods Curry, Amanda Mayo, and Andrew S. Olinger, Millsaps College, Jackson, MS 39210

The design of a photoactivated DNA-cleaving reagent has to combine the actual cleaving functionality and the DNA-binding properties in the same molecule. We used a fragmentable N-O bond as the cleaving functionality that produces an alkoxy radical and an heteroaromatic radical cation. Intercalators such as ethidium bromide have been widely used to bind to DNA but the actual binding properties of a variety of synthesized derivatives have been poor. Carriers moieties like naphthalene diimides were attached to improve DNA binding.

10:30 BINDING STUDIES OF POTENTIAL DNA INTERCALATORS

Bentley Woods Curry*, Neha S. Solanki, Jonathan P. Giurintano, and Wolfgang H. Kramer, Millsaps. College, Jackson, MS 39210

The DNA binding properties of a series of potential DNA intercalators based on the quinoline, isoquinoline and phenanthridine skeleton have been tested. Fluorescence, UV/VIS, CD and viscometry studies show different binding behavior and suggest different binding modes.

10:45 KINETIC AND MECHANICAL ANALYSIS OF NANO-GOLD-THIOL-ENE COMPOSITE FILMS

Nicole Mackey*,Bridget Confait, Xiao Deng, Hui Zhou, Charles Hoyle, and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

Well-dispersed gold nanoparticles in UV-cure thiol-ene films produces optically clear samples with interesting mechanical and kinetic properties. Characterization techniques used in assessing the mechanical properties of the composite films include DMA and bulk tack analysis, using a texture analyzer. DMA measurements indicate that the glass transition temperature (Tg) of the thiol-ene matrix remains relatively constant over the range of 0 to 10 % gold by weight. By monitoring film tack and hardness, samples are considered fully cured at the point where force measurements versus exposure time reached a constant value. Dynamic light scattering measurements are performed on casting solutions to monitor gold particle aggregation, and real-time IR measurements provide kinetic information regarding the rate of polymerization and extent of monomer conversion.

11:00 MECHANISM OF LIGHT-RESPONSIVE POLYMER-FULLERENE ADHESIVES

Xiao Deng*, Meredith Todd, Steven Stevenson, and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

Triblock copolymers polystyrene-block-polybutadiene-block-polystyrene (SBS) and polystyrene-block-polyisoprene-block-polystyrene (SIS) are common rubber-based pressure sensitive adhesives (PSAs). When blended with C60 fullerenes, they produce easy-release systems, switching quickly from a tacky “on” state to an un-tacky “off” state when irradiated with visible light. Although, the idea of a radiation activated releasable adhesive for medical applications is not new, our system has distinct advantages: visible light radiation source instead of UV or e-beam, and the kinetics are accelerated by the

presence of oxygen, unlike radical-based curing mechanisms which are depressed by oxygen. C60 fullerene is used as a sensitizer to generate singlet oxygen, which is believed to cause the fast and irreversible crosslinking of the polymer soft blocks and leads to the loss of adhesive properties in the resulting films. The participation of singlet oxygen in the mechanism was supported by the addition of accepted singlet oxygen generators, quenchers, and the use of inert oxygen-free environments.

11:15 PEEL AND TACK FORCE ANALYSIS OF RUBBER-BASED PRESSURE SENSITIVE ADHESIVES

Meredith Todd*, Xiao Deng, Steven Stevenson, and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

Peel and tack forces are important mechanical quantities for adhesives, and the resulting force measurements can be correlated to sample properties such as hardness, cohesiveness, elasticity, adhesiveness, and viscosity. In these tests a material is subjected to a controlled force from which a deformation curve of the samples response is generated. Pressure sensitive adhesives (PSAs) have found wide application in tape and label manufacturing – for home, office, electric and medical purposes. Polystyrene-block-polybutadiene-block-polystyrene (SBS) and polystyrene-block-polyisoprene-block-polystyrene (SIS) copolymers are commonly applied rubber-based PSAs. These block copolymers have high cohesive strength due to the styrene composition and elastic portions derived from the unsaturated polybutadiene and polyisoprene. In this work, we report the peel and tack forces measured by Texture Analysis of these triblock polymers as pure samples and in blends with C60 fullerenes. The peel and tack forces of SIS and SBS polymers decrease dramatically when blended with C60 fullerene sensitizer and irradiated with visible light. C60 – in the presence of visible light and molecular oxygen – generates singlet oxygen, which is likely responsible for the rapid and irreversible oxidative crosslinking of SIS and SBS polymers and subsequent loss in adhesion.

FRIDAY AFTERNOON

Hunter Henry Ballroom A

1:15 STUDY OF DEGRADATION OF ORGNAOPHOSPHORUS PESTICIDES IN NATURAL W ATERS AND TOXICITY OF TRANSFORMATION PRODUCTS

Xueheng Zhao*, Xiaoke Hu, and Huey-Min Hwang, Jackson State University, Jackson, MS 39217

Malathion and parathion are widely used organophosphate insecticides in the United States and throughout the world. Synthetic in origin, these organophosphates are persistent in the environment. It is of health concern about their transformation in the natural waters and the toxicity of pesticides and their transformation products to the environment. The objective of this study is to determine the effects of pH, photoirradiation and photosensitizer (riboflavin) on the degradation of these organophosphorus compounds. Our results showed that malathion was degraded slowly in water at pH = 3. It takes almost 3 months to degrade 50% of added marathion. The degradation rate was very fast in water at pH = 11. Over 50% malathion can be degraded within 10 minutes. Microorganisms in waters ehancedthe rate of parathion degradation and up to 50 % parathion was degraded in 10 days. Degradation products from malathion and parathion were identified by GC/MS and HPLC/MS, which included araoxon, aminoparathion, and 4-nitrophenol etc. Further degradation of paraoxon in natural water showed that it was transformed into 4-nitrophenol under aerobic condition. Cytotoxicity and genotoxicity tests of the studied pesticides and their transformation products, i.e. malaoxon, paraoxon, 4-nitrophenol, were carried out with human HaCaT cell and lymphocytes. Results show that cytotoxicity of transformation products such as malaoxon and paraoxon are increased compared to the parent pesticides. The exposure-induced DNA damage can not be found by Comet assay using the mentioned cells. This research was funded by the U.S. Department of the Army Research and Development grant # W912H2-04-2-0002 to JSU.

1:30 HAZARD ASSESSMENT OF DRINKING WATER IN THE DELTA

Terrica T. Ragland* and William Mahone, Mississippi Valley State University, Itta Bena, MS 38941

Organic contaminants in drinking water have long been a concern. These contaminants can include pesticides from agriculture run off and gasoline components from leaking underground storage tanks. The health effects involved include carcinogenic, mutanogenics, and teratogenic. In the current study, drinking water samples were acquired from various sources and were subjected to GCFID and GCMS analysis. Previous studies include UV-vis absorption spectra-photometric scanning and showed few contaminants at the ppm level. When detection levels were adjusted to the ppb level by modification of sample preparation methods, numerous trace organics began to appear. In this study, we are currently performing GCMS analysis to determine the identities of these contaminants. These contaminants, once identified are then subjected to MSDS screening using standard database. Using this information together with our data, we were able to make an assessment as to the hazard potential of these drinking water sources.

1:45 SELECTIVE PHOSPHATE ESTER CLEAVAGE IN PHOSPHOLIPIDS

Vijitha Mohan*, Laura Hubbard, Keisha B. Walters, and Dave C. Swalm, Mississippi State University, Mississippi State, MS 39762

Phospholipids with a glycerol backbone are known as glycerophospholipids or Phosphoglycerides. In all phosphoglycerides, there are two fatty acid chains and one Phosphorylated alcohol functionality on a glycerol backbone. Our goal is the selective Cleavage of the phosphate ester bond which will produce two materials, the di-fatty acid and the phosphate-containing molecule. The fatty acid portion can be used in the manufacture of biodiesel and other bio-fuels. We plan to use the phosphate molecule to functionalize polymeric surfaces for pH-responsive and bioaffinity applications. The Phosphate ester cleavage reaction conditions have been studied and the results are analyzed. The phosphoglycerides investigated include Phosphatidyl Choline Phosphatidyl ethanolamine and Phosphatidyl serine. The catalytic effect of lithium and Zinc hydroxide in the ester cleavage was also evaluated. Zinc or lithium halides, Potassium hydroxide was combined in chloroform to form the reaction solution. The selectivity and efficacy of the cleavage reaction was monitored as a function of reaction time and temperature using gel permeation chromatography (GPC), transmission and attenuated total reflectance (ATR)-FTIR spectroscopy, and x-ray photoelectron spectroscopy (XPS).

2:00 DEVELOPMENT OF RENEWABLE POLYMERS FROM 1,3-PROPANE DIOL AND MALONIC ACID

Mathew D. Rowe*, Erin M. Smith, and Keisha B. Walters, Mississippi State University, Mississippi State, MS 39762

The goal of this research is to develop biodegradable copolymers from biomass-derived starting materials. The monomers, 1,3-propane diol and malonic acid, were selected based on the presence of reactive functional groups and accessibility to materials. Catalyst function, synthesis conditions, and polymer characterization of the polycondenstation reactions will be presented. Catalyst, temperature, and monomer ratio were varied and the effect on copolymer yield and properties studied. The catalysts were selected based on the criteria of being environmentally benign and biocompatible and include zinc chloride, aluminum chloride, iron(III) chloride, and tin(II) chloride. Polymer synthesis was verified and the chemical composition characterized using Fourier transform infrared spectroscopy (FTIR) and nuclear magnetic resonance (NMR). Differential scanning calorimetry (DSC) was used to determine the glass transition and melting temperatures of these polymers. The average molecular weight and molecular weight distribution was determined by gel permeation chromatography (GPC). By varying the monomer ratio, we have produced copolymers with varying chemical composition, molecular weights, and bulk properties. Using environmentally benign catalysts, the synthesis of renewable polymers from 1,3-propane diol and malonic acid has been successfully achieved. These renewable polymers will be evaluated for their potential use in commercial film and fiber production.

2:15 Break

2:30 COMPARISON OF STORAGE STABILITY OF CATFISH BIODIESEL WITH AND WITHOUT ANTIOXIDANT

Supanee Danviriyakul [1], Saowalee Jongrattananon [2], and Juan Silva [2]*, Chandrakasem Rajabhat University. Bangkok, Thailand and Mississippi State University, Mississippi State, MS 39762

The effect of an antioxidant on the properties of catfish biodiesel under accelerated storage conditions was studied. The samples with (800 ppm TBHQ) and without antioxidant (control) were stored at 80oC for 28 days. At specified time intervas, samples were taken out for analysis of peroxide value, anisidine value, TBARs, acid value, iodine value, UV absorbance, and induction time. The progress in the oxidation was slow at the beginning of the storage. Only small increases in peroxide value, anisidine value, acid value, and UV absorbance were observed from both control and TBHQ added samples. The changes were, however, more pronounced in the control sample. After 21 days, peroxide value, acid value, and UV absorbance started to rise very rapidly. The induction time was increased by the addition of TBHQ at 800 ppm. Changes during storage were not conclusive due to the variations in the measured value, especially at higher values. With the addition of an antioxidant, catfish biodiesel can withstand adverse conditions much better than the control, showing only slight changes in the measured values. Anisidine value, acid value, and UV absorbance were among the potentially oxidative index candidates that can be used to predict the quality of biodiesel related to its effect on engine performance.

2:45 SYNTHESIS, CHARACTERIZATION OF TRIS(2,2'-BIPYRIDYL)RUTHENIUM(II)-LOADED MICROCAPSULES AND THEIR BI0-RELATED APPLICATIONS BASED ON ELECTROGENERATED CHEMILUMINESCENT (ECL) DETECTION

Tommie Pittman*, Laura G. Kolibal, Marek W. Urban, and Wujian Miao, University of Southern Mississippi, Hattiesburg, MS 39406

An ultrasensitive DNA hybridization detection and a sandwich-type immunoassay methodology using polymerized liposome-based microcapsules loaded with water soluble ECL labels of tris(2,2\'-bipyridyl)ruthenium(II) ($Ru(bpy)_32+$) is reported. $Ru(bpy)_32+$-loaded liposomes with surface functional groups, such as –COOH or $–NH_2$, were prepared on the basis of our recently reported technique. The lipsomes were produced from phospholipid molecules such as phosphatidylserine (DOPS) and phosphatidylethanolamine (DOPE) after solubilization in chloroform and subsequent evaporation forming a lipid film. This film was rehydrated with a 20 mM $Ru(bpy)_3Cl_2$ aqueous solution along with low concentrations of styrene monomer and photoinitiator species before proceeding to gently agitation to form Ru(bpy)3Cl2 multilamellar vesicles. A micro-extruder with 3-5 μm polycarbonate membranes was then used to produce monodisperse unilamellar vesicles while allowing the styrene monomer and photoinitiator species to penetrate through the outside lipid layer and remain in the hydrophobic zone of the liposome. Photo-polymerization process was carried out and

$Ru(bpy)_3$2+-loaded microcapsules with a layer of polystyrene were produced. The characterization of the liposomes was carried out with transmission electron, scanning electron, and optical microscopy etc. The detection of DNA and protein with above prepared microcapsules using ECL will be presented. Financial support through USM-MRSEC (NSF-DMR 0213883) program is gratefully acknowledged.

3:00 ADVANCES TOWARD BIOLOGICALLY ACTIVE CORE-SHELL FERROFLUIDS

Erin Fortenberry*, David Heaps, Steven Stevenson, and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

Functional ferrofluids are prepared having core-shell structures with surface-active groups, which may serve as chemical agents such as catalysts. These magnetic particles allow for easy removal of the agent on command, by using a simple bar magnet extraction procedure. Composition of core-shell agents consists of a magnetite core material due to its low toxicity and well-characterized magnetic behavior and inorganic or polymer shell. Recent efforts to prepare biologically active core-shell magnetite particles are described. Dynamic light scattering techniques are used to monitor particle size in aqueous media, and zeta potential measurements are used to describe surface charge.

3:15 Divisional Awards Presentation

ECOLOGY AND EVOLUTIONARY BIOLOGY
Chair: Robert Hamilton, Mississippi College
Vice-chair: Clifford Ochs, University of Mississippi

THURSDAY AFTERNOON

Hunter Henry Executive Room 8

1:30 AVIAN RESPONSES TO PRESCRIBED FIRE AND SELECTIVE HERBICIDES IN INTENSIVELY MANAGED PINE OF MISSISSIPPI

Raymond Iglay [1]*, B. D. Leopold [1], L. W. Burger, Jr. [1], and D. A. Miller [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Weyerhaeuser Company, Columbus, MS 39704

With limited knowledge on the independent and combined effects of burning and herbicides on avian communities in mid-rotation loblolly pine (Pinus taeda) plantations, it is essential to understand their interactions to enhance silviculture management for sustainable forestry. We investigated long-term effects of prescribed fire and selective herbicides on avian communities in thinned, intensively managed loblolly pine through 2, 3-year burning rotations in Mississippi using 4 treatment regimes (burn, herbicide, burn*herbicide, control). Seventeen of 47 species with > 5 observations/year revealed heterogeneous use of each treatment within nesting guilds with most influence in burn*herbicide and control treatments. Mean total bird abundance and total avian conservation value decreased from one year pre-treatment until one year post second burn when they began to increase with greatest abundance and priority score in burn*herbicide plots. Mean species richness did not significantly differ among treatments across years but increased across all treatments beginning one year post second burn. Avifauna would generally benefit from use of prescribed fire and selective herbicides, particularly species of high conservation concern in the southeast. However, treatment regimes should vary across a landscape to offer a myriad of vegetation types to benefit multiple species and nesting guilds.

1:45 CYTOTOXICITY AND GENOTOXICITY OF BENZO[a]PYRENE AND ITS ENZYMATIC DEGRADATION INTERMEDIATES IN HACAT AND A3 CELLS

Xiaoke Hu*, Yi Zhang, Xueheng Zhao, and Huey-Min Hwang, Jackson State University, Jackson, MS 39217

Benzo[a]pyrene (BaP) is listed as a priority pollutant by the US Environmental Protection Agency. In the present study, BaP was oxidized with a *Trametes versicolor* laccase that was immobilized on functionalized kaolinite particles, and the cytotoxicity and genotoxicity of BaP and its degradation intermediates were measured in human HaCaT keratinocytes and A3 T lymphocytes. Cytotoxicity was assessed with fluorescein diacetate (FDA) uptake, while the alkaline Comet assay measured the genotoxicity, using tail moment, tail DNA content, and tail length as metrics for quantifying DNA damage. Based on the assumption that the oxidation reaction was first order, the half life ($t_{1/2}$) for the oxidization of BaP by immobilized laccase was computed to be 58.5 hr. After 87 hr of oxidation, 20 µM of BaP decreased to 9.6 µM . HPLC analysis identified 1,6-benzo[a]pyrene quinone (1,6-BaQ), 3,6-benzo[a]pyrene quinone (3,6-BaQ), and 6,12-benzo[a]pyrene quinone (6,12-BaQ) among the oxidation products. Most treatments of HaCaT cells and A3 lymphocytes with BaP or its quinone intermediates resulted in significant decreases in viability ($P<0.05$); dose-dependent decreases in cell viability were detected at concentrations of 0.1, 1 and 5 µM . While treatment of HaCaT cells with as little as 0.1 µM 6,12-BaQ caused significant DNA damage, DNA damage was detected in HaCaT cells only with 1 and 5 µM 1,6-BaQ and 3,6-BaQ and 5 µM BaP. In Comet assays conducted with A3 lymphocytes, all three quinone intermediates caused significant increases in tail DNA content at 1 and 5 µM. The results indicate that immobilized laccase is capable of degrading BaP, but several of those biodegradation products caused significant DNA damage in human cells.

2:00 DO ABUNDANCE AND DISTRIBUTION EXPLAIN YEAR-TO-YEAR INCONSISTENCIES IN BIRD-LANDSCAPE RELATIONS?

Samuel Riffell [1]* and Kevin Gutzwiller [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Baylor University, Waco, TX 76798

Modeling bird-landscape relations is a commonly-used method for identifying and describing relationships between birds (or other animals) and large-scale habitat features. However, modeled relations for a particular species are often inconsistent from yr-to-yr (i.e., specific landscape features are important some years, but not others). The causes of inter-annual inconsistency have not been identified. We predicted more consistent bird-landscape relations for (1) species with high abundance and/or wide distributions; (2) species with smaller fluctuations in abundance and distribution; and (3) species with positive regional population trends. We built logistic (presence-absence) bird-landscape models for 72 species of birds in the Appalachian Mountains and calculated model consistency over a 5-year period. Before testing our predictions, we adjusted model consistency for effects of model selection uncertainty and model complexity, and these factors explained a large proportion of the variation in model consistency. Model consistency increased slightly with species' abundance, but we found no evidence that population fluctuations or regional trends influenced model consistency. Thus, management decisions and descriptions of landscape relations for species with low abundance should be based on as many different years of data as possible. However, we show that uncertainty involved in the model selection process contributes heavily to inter-annual model consistency. Our results highlight the need for continued research about improving model selection techniques and reducing methodological sources of model selection uncertainty.

2:15 Break

2:30 FERAL HOGS IN MISSISSIPPI: HABITAT SELECTION AND SURVIVAL

Clay Hayes*, Samuel Riffell, Richard B. Minnis, and Brad D. Holder, Mississippi State University, Mississippi State, MS 39762

Feral hogs have the potential to negatively impact native wildlife and sensitive plant communities, and they have steadily increased their range since their introduction into North America. We examined home range, habitat use, and survival of feral hogs in central Mississippi from April 2005 through April 2006 using radio telemetry. Habitats with dense vegetation were very important in home range placement (2nd order habitat selection) with selection favoring seasonally-flooded old fields, followed by old fields and managed openings, during the dry season. During the wet season, old field habitats were still preferentially-selected followed by agricultural fields, but flooded old fields were not preferentially-selected. For 3rd order habitat selection (within the home range), hogs preferentially used old field and managed openings during the dry season. All habitat types were used randomly within home ranges during the wet season. Seasonal differences in survival were also apparent as the best approximating model was a reduced 2-season model with seasonal survival rates for the dry and wet seasons being 80.8% and 41.4%, respectively. Sex and initial weight did not affect survival. The major cause of mortality was hunting (12 of 15 deaths). Seasonal differences in habitat selection and were apparently caused flooding of preferred habitats, food availability and hunting pressure. Future management activities should focus on hunting hogs and protecting key habitats at sensitive times of the year.

2:45 PARASITISM OF SABAL MINOR BY CARYOBRUCHUS GLEDITSIAE IS INTRODUCED IN MISSISSIPPI.

Robert Hamilton*, Chaz Seyfarth, April Jones, Constance Washington, and Chasity Kent, Mississippi College, Clinton, MS 39058

Caryobruchus gleditsiae, the palm seed Bruchid weevil, infects monocot plants throughout the southeast. We observed the infestation of *Sabal minor* (dwarf palmetto) in plants in Boyle, Mississippi. The weevil lays eggs on developing seeds. Upon hatching, weevil larvae burrow into the seed and consume the seed. We observed over 90% seed mortality on plants in Boyle, MS. We surveyed other populations of S. minor in Mississippi. None of the natural populations showed any indication of infection. One other cultivated population was infected. Infestations appear to be imported. We recommend that the inflorescences of cultivated S. minor be removed to prevent the spread of C. gleditsiae in Mississippi, particularly the spread into natural populations, where infestations could be devastating.

3:00 THE EFFECT OF NUTRIENT LEVELS ON GENDER EXPRESSION IN GAMETOPHYTES OF CERATOPTERIS RICHARDII.

Robert Hamilton*, Heather Kelly, and Gary L. Williams, Mississippi College, Clinton, MS 39058

Ceratopteris richardii, Horned Fern, occurs in southern Louisiana and southern Alabama. Gametophytes of this species possess two distinct morphologies; large hermaphrodite and a small male. The small male morphology develops only in the presence of other gametophytes in vitro. The appearance of small males in multispore cultures in vitro is called the antheridiogen response. *C. richardii* gametophytes were cultured in a full nutrient medium, 1/10,000, 1/100,000, 1/1,000,000 and zero nutrient on standard agar plates. Gametophytes grew to sexual maturity on all plates within 13 days of inoculation onto plates. A reduction in gametophyte size and a reduction in the expression of the male gender were observed as nutrient levels declined. The antheridiogen response may be a response that only occurs in high quality (high nutrient) microhabitats.

3:15 COMPARATIVE POPULATION DYNAMICS OF *PEROMYSCUS LEUCOPUS* IN NORTH AMERICA: A SPATIAL GRADIENT OF CLIMATE, ACORN PRODUCTION, AND DENSITY DEPENDENCE

Guiming Wang [1]*, Jerry O. Wolff [2], Stephen H. Vessey [3], Norman A. Slade [4], Jack W. Witham [5], Joseph F. Merritt [6], and Malcolm L. Hunter, Jr. [7], [1]Mississippi State University, Mississippi State, MS 39762, [2]University of Memphis, Memphis, TN 38152, [3]Bowling Green State University, Bowling Green, OH 43403, [4]University of Kansas, Lawrence, KS 66045, [5]University of Maine, Arrowsic, ME 04530, [6]Ligonier, PA 15658, [7]University of Maine, Orono, ME 04469

Temporal variation in population size is regulated by density dependent feedbacks and exogenous forces. Accumulating evidence has emerged that temporal and spatial variation in climate and resources can modify the strength of density dependence in animal populations. We analyzed eight long-term time series estimates of *Peromyscus leucopus* abundance from Kansas, Ohio, Pennsylvania, Virginia, Vermont, and Maine, USA, using the Kalman filter and spectral analysis. Model-averaged estimates of the strength of direct density dependence increased from south to north; and the strength of delayed density dependence increased from west to east and from south to north. Longer, colder winter and more variable climate in northerly latitudes might result in stronger density dependence in mouse populations. *P. leucopus* populations show more pronounced cyclicity from west to east, and the spatial gradient of cyclicity parallels the increased presence and dominance of red oaks (*Quercus rubra*) among the eight study sites. Furthermore, variable coefficient models link acorn production to the strength of delayed density dependence in *P. leucopus* populations of Maine: increased acorn crops reduce the strength of direct and delayed density dependence. An acorn failure occurring after peak densities of mice might intensify delayed density dependence and result in a mouse population crash after about a 2-year delay. Our results suggest that in seed-eating *Peromyscus*, cyclicity is regulated from the bottom up.

3:30 Divisional Business Meeting

6:00 Divisional Poster Session
Location: Bost Auditorium North
Posters may be set up between 4:00p and 4:30p

CAMPUS LANDSCAPING CAN BE MORE ENVIRONMENTALLY SOUND

Alston Parker and Wendy Garrison*, University of Mississippi, University, MS 38677

Landscaping on the campus of The University of Mississippi, while aesthetically pleasing to some, may have unintended ecological consequences. The objective of this study was to see if a more environmentally friendly landscaping approach would be feasible in selected areas of campus. The campus turf management crew typically mows and applies the herbicides Barricade (pre-emergent grasses), MSMA (grasses), Princep (broadleaf and grasses) and Trimec 992 (broadleaf). Runoff flows to the Yocona River via drains. A roped off 300m^2 plot, designated as the Biology Study Area was not mown or sprayed beginning in April 2006 and continuing throughout Fall 2006. We catalogued dicots (broadleaves) appearing as volunteers from August through October 2006. Each week plants were photographed and identified. Native showy and attractive dicot volunteers included: *Chamaecrista fasciculata, Eupatorium capillifolium, Helenium amarum*, and *Solidago sp.*; Native volunteers appropriate as groundcover: *Diodia virginiana, Euphorbia maculata;* Native volunteers not suitable for landscaping: *Ambrosia artemisiifolia* (ragweed). The non native invasive but showy *Ipomoea purpurea* (tall morning glory) also appeared. Pollinators (Coleoptera) identified in the Biology Study Area were absent from a control maintained campus lawn plot. We conclude that for some areas, selective weeding and mowing should be considered as alternatives to herbicide application, but that some maintenance would still be required.Acknowledgements: Gloria Kellum, Jeffery McManus

SOCIAL BEHAVIOR OF SMILISCA BAUDINII

Crystie Baker* and Aimée T. Lee, University of Southern Mississippi, Hattiesburg, MS 39406

Smilisca baudinii, the Common Mexican Treefrog, ranges from the southernmost tip of Texas south to Costa Rica in Central America. Smilisca baudinii is prevalent within its range, especially in populated areas, justifying its common name. When faced with human contact, this frog's behavior is different from other species the researcher has encountered in that it does not jump away or act threatened when handled. The researcher has been unable to locate any extensive research on the behavior of this species. Most of the research found included only physical characteristics and locations in which it had been found. The only type of behavior comments found referenced their breeding habits. The purpose of this project was to contribute to the knowledge of the behavior of this species. The researcher accomplished this by performing experiments to record and compare the frogs' reactions to humans, other animals, and inanimate objects. Using a controlled environment, the researcher placed the frogs in a pre-built testing area and allowed an acclimation period between trials. The variables (the researcher's hand, another person's hand, a figurine, and a fat-tailed gecko) were then introduced and their reactions were recorded. Results indicated that the most common reaction was to not react at all. The reactions varied among all four stimuli which may suggest different reactions between living and non-living objects and may further suggest different reactions between humans and other animals.

GEOLOGY AND GEOGRAPHY
Chair: David Ufnar, University of Southern Mississippi
Vice-chair: James Starnes, MS Department of Environmental Quality

FRIDAY MORNING

Hunter Henry Brunson

9:00 HYDROGEOLOGIC ASSESSMENT OF A PROPOSED RESERVOIR SITE, SMITH COUNTY, MISSISSIPPI

Jason A. McIlwain*, Darrel W. Schmitz, and James H. May, Mississippi State University, Mississippi State, MS 39762

The Oakohay Creek watershed in Smith County, Mississippi, is a proposed site for the development of a reservoir intended to boost the county's economy. The site is being assessed for suitability based on the hydrogeology of the area. There are three components to the site assessment. The first component involves examining the hydrologic characteristics of the drainage basin. Stream discharge is monitored at eight locations along Oakohay Creek and its tributaries. Stage-discharge hydrographs are constructed based on the obtained data. The second component of the study is based on studying the site's geology. The geology is being studied through field reconnaissance, surface mapping, and examination of geophysical well log data from the MDEQ as well as drillers' logs from seismic exploration. Cross-sections have been constructed based on the available data. Surface mapping of the Glendon/Marianna formations (limestones and marls) of the Vicksburg Group is being conducted. Outcrops of the Glendon/Marianna formations are present along Oakohay Creek near the proposed dam site. Potential dissolution of the Glendon/Marianna formations could cause leakage and instability of the dam. Currently, drilling, along with coring of the Glendon/Marianna formations, is taking place that will provide information for the project. The third component of the study involves the assessment of water quality within the basin. Samples are taken for analysis by the Mississippi State Chemical Laboratory.

9:20 DETERMINING THE POTENTIAL FOR DIRECT RECHARGE IN THE MISSISSIPPI RIVER ALLUVIAL AQUIFER USING SOIL CORE ANALYSES, WASHINGTON CO., MS

Claire E. Rose [1], Jeannie Bryson [2], and Stan Galicki [1], [1]Millsaps College, Jackson, MS 39210 and [2] USGS, Pearl, MS 39208

The potential for water and chemical transport to the Mississippi River Alluvial Aquifer in the Bogue Phalia watershed via vertical recharge was investigated by determining the hydraulic conductivity of sediment in the upper 6 m. Three methods were used; direct measurement of core segments using a falling head permeameter, bulk density and sediment composition data in conjunction with the Rosetta Stone software, and the Hazen method using particle size distribution data. The upper 3 m of topostratum consists of a clay loam with vertical hydraulic conductivity values ranging from 10^{-5} to as low as 10^{-7} cm/s. The interval from 3 m to approximately 6 m was a sandy loam with hydraulic conductivity values ranging from 10^{-3} to 10^{-4} cm/s. The sediment composition, bulk density values, and vertical hydraulic conductivity values in the upper 3 m indicate that a relatively homogenous blanket of lower permeability clay loam persists in the area and that that the potential for vertical recharge is low. Appreciable lateral recharge from the nearby Bogue Phalia River is likely as the river incises through the clay loam to the higher conductivity fine, sandy loam interval.

9:40 NON-POINT SOURCE CONTAMINATION OF WETLAND SEDIMENT, LEFLUER'S BLUFF STATE PARK, JACKSON, MS

Becky D. McDole and Stan Galicki, Millsaps College, Jackson, MS 39210

Runoff and overland flow from the 40 hectare Lefluer's Bluff Golf Course contribute to Eubanks Creek and the Pearl River within the Jackson Watershed. The area of study is situated in a cypress-tupelo alluvial swamp adjacent to the golf course. Two sediment cores were dated using ^{210}Pb and ^{137}Cs. One core was immediately adjacent to the golf course drainage; the second was at a remote location in the floodplain. Carbon, nitrogen, and phosphorus concentrations were determined at regular intervals from the cores. Based on a calculated sediment accumulation rate of approximately 2 cm/yr, element concentration profiles were constructed for each core. Phosphorus and N concentrations in the core adjacent to the golf course are typically greater overall, but also display a notable increase in concentration from horizons that post date golf course construction; nutrient concentration increases in the remote core are more gradual. Correlations between nutrient concentrations in each sample also reflect a difference; values in the remote core typically maintain higher correlation coefficients which range from 0.77 to 0.93, while correlation coefficients from the remote core only range from 0.17 to 0.54. A similar relationship is also observed for pre and post construction intervals in the core most influenced by runoff. The difference observed between cores is attributed to the increased availability of N and P in stormwater in the area most heavily influenced by runoff.

10:00 THE GEOLOGY AND HYDROLOGY OF A PROPOSED IMPOUNDMENT OF THE UPPER SAND CREEK, CHOCTAW COUNTY, MISSISSIPPI

Jonathan R McMillin*, Darrel W. Schmitz, and James H. May, Mississippi State University, Mississippi State, MS 39762

The Sand Creek watershed, Choctaw County, Mississippi, constitutes a proposed site for a recreational and water management reservoir. Prior to the development of the site, the

geology and hydrogeology of the watershed must be investigated to determine suitability for impoundment. The proposed site is located within the Wilcox Group, a sequence of interbedded sands, silts, clays and lignites of Eocene age. Geological cross sections derived from geophysical logs and field exploration provides information regarding facies distributions within the proposed site area. Discharge characteristics of both perennial and ephemeral streams at seven locations provide data concerning surface runoff that can then be related to infiltration into the Lower Wilcox Aquifer. These measurements will aid in determining if there is sufficient water flow for impoundment. All data collected and the characteristics of the reservoir are mapped using ArcGIS 9.1 software. Analysis of the study area suggests that the proposed site is suitable for the location of a reservoir. Mitigation of permeable sands should be accomplished by the construction of a levee at the mouth of the reservoir.

10:20 Break

10:40 THE TOMBIGBEE RIVER TERRACE SYSTEM

E. Russell and D. Schmitz*, Mississippi State University, Mississippi State, MS 39762

The Tombigbee River in Mississippi has three to four well developed and one poorly preserved terrace deposits. Near Amory the relatively flat surface of the modern alluvium ranges from 190 to 200 feet MSL. The terrace surfaces are progressively more dissected with age and the average elevation of the basal gravels in the first terrace deposit is ~230 feet MSL, the second at ~260 feet MSL, third at ~290 feet MSL, and the fourth at ~320 feet MSL. The uppermost fifth terrace deposit outcrop has no topographic expression. Downstream the base of the terrace deposits decrease in elevation. Typically, the Tombigbee River alluvium is about 30 feet (9 meters) thick as are the first four terrace deposits. The basal horizon consists of iron stained, poorly sorted chert gravel with small rounded pebbles of quartzite and fine- to coarse-grained quartz sands that grade upward into quartz sand that, in turn, grades upward into yellowish-orange, sandy silts and clays, a typical meandering stream deposit. The fifth terrace deposit consists locally of remnants of quartz sand with small, well-rounded, chert pebbles, and rare quartzite pebbles in the basal beds. Like the alluvium, the gravels in the terrace deposits diminish down stream away from the source beds, the Gordo Formation. The terraces are best developed where the chert gravels defend the terraces below the confluence of Bull Mountain Creek and Buttahatchie River.

11:00 PRE- POST KATRINA BACTERIAL POLLUTION OF THE MISSISSIPPI SOUND

David F. Ufnar, University of Southern Mississippi, Hattiesburg, MS 39406

Microbial source tracking efforts have traditionally focused on the input of fecal bacteria from sources such as storm drains, sewers, and runoff. Fecal coliform levels in the Mississippi Sound have been analyzed and compared to physical factors in an attempt to characterize possible non-point sources of pollution. Results from this study show that a primary factor in elevated levels of fecal coliforms is barometric pressure and the resulting changes in wind direction. Fecal coliform counts collected from monitoring stations along the Harrison County, Mississippi coast during May-August, 2005 prior to Hurrican Katrina, 8/29/05, and following Katrina (9/24/05 - present) have been compared with barometric pressure readings over that time interval. The occurrence of high fecal coliform counts can be qualitatively correlated with low barometric pressure. Statistically, there is a correlation between high barometric pressure (>1019 mb) and low bacterial counts. The low bacterial counts are most likely to occur when the winds are from a northerly direction. The passage of warm and cold fronts through the northern Gulf of Mexico cause excursions in barometric pressure, and numerous 90º-180° shifts in wind directions over a period of 6-8 days. Commonly, a rise in fecal coliform counts is observed at coastal monitoring stations after an abrupt change in barometric pressure, and a shift in wind directions and wind speeds. When these trends of increased fecal coliform levels occur prior to rainfall, it is inferred that the sediment may be a source of the fecal coliform bacteria observed in the water column. The changes in wind direction and speed may induce more energetic conditions at the shoreline (e.g. increased wave heights, and increased nearshore current velocities).

11:20 Poster

LOESS CAVES OF VICKSBURG

Amber L. Bufkin and Danny Harrelson*, U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS 39180

The loess caves of Vicksburg were made famous during the Siege of Vicksburg in the American Civil War. They were not true caves in the geologic sense because none were naturally formed subterranean openings. The caves uniqueness lies in the fact that they were made in loess materials as shelters to avoid artillery bombardments during the Vicksburg Campaign. Because of loess's ability to hold a vertical cut, the material made easily excavated bombardment shelters with walls that could stand for many years without slumping. However, a few of the caves did become unstable during constant bombardment and it was reported some collapsed and buried alive some unfortunate souls. Loughborough, 1990, describes in details life in these caves and recounts how many persons tried to live their lives "normally" in a loess cave during the siege operations. Contemporary accounts reported the caves to be large enough for several humans to enter and some even large enough to accommodate 200 people. Because of the ability to hold stable vertical slopes, loess caves are still a popular form of dwelling that is still in use today in many countries (e.g. China) for human habitation.

FRIDAY AFTERNOON

Hunter Henry Brunson

1:30 HOUSING THE STATE GEOLOGICAL SURVEY

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

The Mississippi Geological Survey, now the Office of Geology, Mississippi Department of Environmental Quality (MDEQ), has been housed in several locations since 1850. Some moves followed changes in enabling legislation. The first location was a prominent second-floor room in the Lyceum at the University of Mississippi (UM) where the State Geologist was professor of geology. State Geologist Lewis Harper moved the Survey to the State Penitentiary in Jackson and had a prisoner on staff. Dr. Eugene Hilgard, who is credited with convincing Union troops not to burn the UM campus, had offices at UM and in the State Capitol. After a hiatus during Reconstruction, the Survey was reestablished in 1906 with State Geologist Albert Crider at Biloxi, and his staff Calvin Brown at UM and William Logan at Mississippi A&M College. From 1909 to 1924 the Survey was in the New and then Old Capitol at Jackson. From 1924 to 1963 the Survey was housed at UM's Old Library Building, the most attractive building on campus. In 1960 the Survey opened a core and sample library at 2525 North West Street in Jackson to better serve the state's oil industry; the entire agency moved to that building in 1963. Most staff moved in 1991 to the MDEQ headquarters in Southport Center at Ellis Avenue and Highway 80 in Jackson. MDEQ hopes new quarters off the flood plain of Lynch Creek will be found soon.

1:50 THE GEOLOGY OF MISSISSIPPI; A DVD PUBLICATION STATUS REPORT

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

The Geology of Mississippi text is an 891-page (single-spaced) WordPerfect file containing 462,606 words and over 4,000 references. A separate file contains several hundred captioned illustrations in tiff format to accompany the text. These files will be merged, with connecting links, in a DVD publication. An abridged version is planned for a color hardcopy publication. Both the DVD and hardcopy publications will contain many illustrations of historical value, depicting outcrops no longer exposed today. The book contains introductory chapters, the largest of which are on groundwater, physiographic provinces, and ecoregions, followed by a systematic discussion of the state's geology from the oldest to the youngest rocks. Discussions of global time-rock units and the geologic column contain important references published in *Nature* and *Science*, as well as information on global boundary stratotypes. The discussion of Mississippi's local geology is based on personal experience, institutional knowledge, and a review of relevant literature, including a complete review of the following: all publications of the Mississippi Geological Survey (now Office of Geology), all publications of the Mississippi Mineral Resources Institute, all volumes of *Gulf Coast Association of Geological Societies Transactions*, and all issues of *Geology* and the *Journal of Paleontology*. The societal impact of the state's geology is reflected in the citation of numerous newspaper articles. Significant geologic outcrops in the state are described as Mississippi Geological Survey (MGS) localities 1-166.

2:10 THE DEFINING OF CITRONELLE SURFACES IN SOUTH MISSISSIPPI AND THE SURFACE EXPRESSION OF RUTH SALT DOME

James E. Starnes* and Patricia Mason, Mississippi Office of Geology, Jackson, Mississippi 39289 and Mississippi Office of Land and Water Resources, Jackson, MS 39289

The use of the Mississippi Automated Resource Information Systems (MARIS) 10-meter Digital Elevation Model (DEM) allows for accurate identification and mapping of Pliocene age alluvial surfaces of the Citronelle Formation. These surfaces consist predominantly of tan to yellow silt with a minor constituent of fine sand, which is indicative of a floodplain depositional environment. The highest of these surfaces is 550 feet MSL in southwestern Simpson County and is typified at the Magee Municipal Airport in Section 3, Township 10 North, Range 18 West. The next highest, for which remnants can be found capping much of Lincoln County, is about 500 feet MSL. This is typified near Brookhaven in Section 5, Township 7 North, Range 8 East. Centered in the northwest ¼ of Section 22, Township 5 North, Range 9 East, in southeastern Lincoln County, a roughly circular area approximately 1 mile in diameter is expressed above the local Citronelle alluvial surface, with a hilltop reaching an elevation of 570 feet MSL. This is 70 feet above the local Citronelle alluvial surface at 500 feet MSL. Gravity data centers this feature directly above Ruth Salt Dome, a shallow piercement type salt dome. Radial drainage off this feature and coarse sand and gravel exposed on the hilltop also support the presence of a geological structure.

2:30 GRAVEL PETROLOGY OF THE PRE-LOESS TERRACE DEPOSITS

James E. Starnes, Mississippi Office of Geology, Jackson, MS 39289

The Pre-loess Terrace Deposits are early Pleistocene sand and gravel deposits overlain by loess that border the current floodplain of the Mississippi River in Mississippi and are probably equivalent to the Mounds Gravel Fm. of Missouri. The gravel portion of the deposits are dominantly composed of chert commonly containing Paleozoic fossils of crinoids, brachiopods, corals, bryozoans, gastropods, stromatolites, stromotoporids, and rare trilobites. Chert varieties include oolitic, chalcedony, cornelian, lace agate, jasper, banded chert, and tripolitic chert. Chert breccias and conglomerates are also common. In addition to chert and its varieties, the following gravel clasts have been identified in Pre-loess Terrace Deposits:

Sioux and Baraboo Quartzite (fine to coarse-grained, pink to purple and often banded, occasionally brecciate, pebble to boulder size), St. Francis Mountain rhyolite (fine to coarse-grained; pink, red, green, gray; massive or flow banded, pebble to cobble size), Keokuk geodes (cauliflower cherts lined inside with rock crystal quartz , quartz druse, or chalcedony; pebble to large cobble size), sandstone (fine to coarse-grained; white, pink, red, green, gray; cobble to boulder size; some sandstones are loosely cemented as a result of quartz overgrowths displaying prismatic crystal faces on individual grains and commonly containing authigenic feldspars), Arkose and weathered granite (pink, coarse-grained, pebble to cobble size, very rare), quartz (milky, pink, clear, gray; pebble to large cobble size). Authogentic and allogentic silicified wood, including fossil palm, is common.

3:10 LATE CRETACEOUS ECHINODERMS IN THE CENTRAL GULF STATES: AN UPDATE

George E. Phillips* and Charles N. Ciampaglio, Mississippi Museum of Natural Science, Jackson, MS 39202, and Wright State University, Celina, OH 45822

With the recent discovery of new species and new species occurrences, Late Cretaceous echinoderm paleontology in Mississippi, Alabama, and Arkansas is in need of significant updating. Given that no one has looked at any particular echinoderm group in the region in the last 50 years, a closer examination of echinoderms in the north-central Gulf is long overdue. For example, several new species of the cassiduloid Hardouinia have recently been identified in Santonian and Campanian deposits in the region. A pair of small burrowing spatangoids is abundant in a sandy marl horizon just above the b asal lag of the Maastrichtian Prairie Bluff Formation in Pontotoc County, Mississippi. The crinoid Uintacrinus socialis, an important stratigraphic marker for Late Santonian deposits in the Western Interior and Europe, has now been found in the Tombigbee Sand Member of the Eutaw Formation in Mississippi. The bourgueticrinid Dunnicrinus, published from Late Maastrichtian deposits in Mississippi, the Netherlands, and Delaware, is now recorded from earlier Gulfian deposits in Mississippi. The type of Bourgueticrinus alabame nsis, the only specimen known to exist of this species, is now officially lost, requiring a search for a neotype. Asteroids, never before described from Mississippi or Alabama, are now documented. Articulated goniasterids have been recovered from the Campanian Mooreville Formation of Alabama, and Maastrichtian units in the north-central Gulf have yielded individual goniasterid ossicles.

3:30 EARLY CENOMANIAN PALEOCLIMATOLOGY AND PEDOGENIC PROCESSES IN THE NORTH AMERICAN WESTERN INTERIOR BASIN

David F. Ufnar, University of Southern Mississippi, Hattiesburg, MS 39406

Stable isotope mass balance modeling results of meteoric $\delta^{18}O$ values from the Cenomanian Stage of the Cretaceous Western Interior Basin (KWIB) suggest that precipitation and evaporation fluxes were greater than that of the present. Sphaerosiderite meteoric $\delta^{18}O$ values have been compiled from the Lower Tuscaloosa Formation of Mississippi (25˚N paleolatitude), The Dakota Formation of Nebraska (35˚N) and the Dunvegan Formation of British Columbia (55˚N paleolatitude). These paleosol siderite $\delta^{18}O$ values define a paleolatitudinal gradient ranging from -4.2 ‰ VPDB at 25˚N to -12.5 ‰ VPDB at 55˚N. This trend is significantly steeper and more depleted than a Holocene meteoric calcite trend (27˚N: -3.6 ‰; 67˚N: -7.4 ‰ VPDB). The steep latitudinal trend in meteoric $\delta^{18}O$ values may be the result of increased precipitation and evaporation fluxes (amount effects) under a more vigorous greenhouse-world hydrologic cycle. A stable-isotope mass balance model has been used to generate estimates of Cenomanian precipitation rates that range from 1500 mm/yr at 25˚N paleolatitude to 3200 mm/yr at 45˚N paleolatitude. Comparisons between Cenomanian siderite and Holocene calcite latitudinal trends show an amplification of Cretaceous low-latitude moisture deficits between 5-25˚N paleolatitude and moisture surpluses between 40-60˚N paleolatitude. The low latitude moisture deficits correlate with a mean annual average heat loss of 71 W/m^2 at 10˚N paleolatitude (present, 16 W/m^2). The increased precipitation flux and moisture surplus in the mid-latitudes corresponds to a mean average annual heat gain of 160 W/m2 at 50˚N paleolatitude (present, 21 W/m^2). The heat transferred to the atmosphere via latent heat of condensation was 7.0 x that of the present at 50˚N. The intensified hydrologic cycle of the mid-Cretaceous greenhouse warming may have played a significant role in the poleward transfer of heat and more equable global conditions.

3:50 Divisional Business Meeting

HEALTH SCIENCES

Co-Chair: Lisa Haynie, University of Mississippi Medical Center
Co-Chair: Tina Martin, University of Mississippi Medical Center
Co-Vice Chair: Mary Tan, Holmes Community College
Co-Vice Chair: Edwin Swiatlo, University of Mississippi Medical Center

THURSDAY MORNING

Bost Auditorium North

Session I: Oncology Research

8:00 Opening Remarks

8:15 PHENOXAZINES INHIBIT AKT AND INDUCE APOPTOSIS IN CANCER CELLS

K. N. Thimmaiah [1*], H Simmons [1], A Rinaldy [1], L Sylvester [1], P Grisham [1], and Peter J. Houghton [2], [1]Northwest Mississippi Community College, Southaven, Mississippi 38671 and [2]St Jude Children's Research Hospital, Memphis, Tennessee, 38105

Phenoxazines shut down the activation of Akt/mTOR/p70S6/S6 kinase pathway and induce apoptosis to a significant extent in rhabdomyosarcoma cells. Within the series, compounds having 3 carbon alkyl bridge were less potent than compounds with 4 carbon chain length. We proposed that by increasing the alkyl chain length to $(-CH_2)_5$ or $(-CH_2)_6$ at N^{10}-position, the potency will be increased to a significant extent. Towards this goal, thirteen new derivatives have been synthesized and the parent 2-chlorophenoxazine was reacted with chlorobromoalkanes which resulted in N^{10}-(chloroalkyl)-derivatives. Nucleophilic substitution reactions of these compounds with various secondary amines resulted in the desired products which were investigated to determine whether they would inhibit the phosphorylation of Akt. Serum starved cells were exposed to 100 nM - 2000 nM phenoxazine derivatives before stimulating with IGF-I (10 ng/mL) for 10 min. Akt or Erk-1/2 phosphorylation was detected. Indeed, an increase in the expression of phosphorylated form of Akt at Ser 473 or Erk-1/2 was observed in response to IGF-I stimulation. These compounds at 100 nM inhibited the phosphorylation of Akt without affecting the phosphorylation of Erk-1/2. The potency of these compounds has been increased by 10-fold, and additional experiments are in progress (Supported by NIH grant CA 115404-01 to KNT).

8:30 COMPARISON OF POTENTIAL CHEMOTHERAPEUTIC AGENTS, 5-FLUOURACIL, GREEN TEA, AND THYMOQUINONE ON COLON CANCER CELLS

Anne A. Norwood*, Mary Tan, Marilyn May, Michelle Tucci, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Antioxidants have been found to be quite successful in deterring certain disease processes for years, especially cancer. Antioxidants protect the body by neutralizing the free radicals and donating one of their own electrons, thus ending the scavenger reaction. Epigallocatechin-3-gallate (EGCG), the most abundant catechin found in green tea, is a valuable scavenger of reactive oxygen species *in vitro* as well as *in vivo*. Thymoquinone (TQ), a major active component of black seed (Nigella sativa), is also known for its powerful scavenger abilities as an inhibitor of oxidative stress and has been utilized in the Middle East for centuries for healing properties. These two potent antioxidants when compared to the chemotherapeutic drug of choice, 5-fluorouracil (5-FU), have demonstrated incredible chemotherapeutic responses to the SW-626 cell line. The objective of this study was to evaluate and compare the effects of SW-626 colon cancer cells after a 24, 48, and 72 hour incubation periods with low, medium, and high doses of EGCG, TQ, and 5-FU. Cell viability, cell number, cellular morphology, and cellular metabolism were compared for the control and treatment groups. The results of this study evidenced a similar significant decrease in cell number as early as 24 hours in the groups treated with TQ and EGCG compared to 5-FU. Increases in cellular damage were evident after 24, 48, and 72 hours and in all treated groups compared with the control. Reduced cell numbers in the treated groups suggests the possibility that TQ and EGCG may have similar chemotherapeutic effects on cancer cells as 5-FU.

8:45 POTENTIAL EFFECT OF Â-ESTRADIOL IN HUMAN JURKAT T-CELLS

Michael Johnson [1]*, Danielle Wells [1], Erika Brown [2], Clement Yedjou [2], and Joseph A. Cameron [2], [1]Hinds Community College, Raymond, MS 39154 and [2]Jackson State Universtiy, Jackson, MS 39216

â-estradiol is the most potent estrogen of a group of endogenous estrogen steroids, which includes estrone and estriol. This steroid hormone is the most potent natural estrogen, produced mainly by the ovary, placenta, and in smaller amounts by the adrenal cortex, and the male testes. Although â-estradiol protects the renal and cardiovascular systems, the mechanisms involved remain unclear. In this research, we performed both MTT assay and trypan blue exclusion test to evaluate the effect of â-estradiol in HL-60 and Jurkat T-cells; and to compare the sensitivity of these two cells types. The results from both MTT assay and trypan blue exclusion test demonstrated that low, physiological levels of â-estradiol induce cellular proliferation in Jurkat T-cells. At higher dose of exposure (16 uM), â-estradiol decreases the viability of Jurkat T-cells compared to the control cells. Similar trend was obtained with the trypan blue exclusion test using the hemacytometer to count the cells manually. In

summary, the results of the present study demonstrate that physiological levels of â-estradiol induce cell growth, and cellular proliferation of HL-60 and Jurkat T-cells.

9:00 COMPARISON OF GENE EXPRESSION IN MALIGNANT GASTRIC AND ENDOMETRIAL TUMORS

Sireesha Chinthaparthi Reddy [1*], Margot Kaelbling [2], Warren May [2], John Cleary [2],[1]Mississippi College, Clinton, MS 39058 and [2] University of Mississippi Medical Center, Jackson, MS 39216

We aimed to (1) identify genes that are differentially expressed in gastric adenocarcinoma, the second most common cause of cancer-related death worldwide, *versus* uninvolved tissue of the same patients and (2) assess if genes that are differentially expressed in gastric tumors were similarly expressed in endometrial tumors that were analyzed previously (MK).Total RNA was isolated from six tissue panels. RNAs from tumor and uninvolved tissue were separately reverse-transcribed and simultaneously hybridized onto a glass microarray spotted with 19,008 human ESTs. Detection was with Cy3™ (tumor) and Cy5™ (uninvolved tissue). Scanned arrays were analyzed with QuantArray® software. Statistical analysis involved correction of unequal dye intensity, $base_2$ transformation, LOESS normalization, SAM-type analysis, and volcano plots. Spots lacking gene information were eliminated. Seventeen genes were upregulated and 63 were downregulated in at least three of the six analyses. Two upregulated genes (CASP4 and ARL6IP) are at loci reported by other investigators to have gained chromosomal material in gastric tumors while six downregulated genes (SYNPO2, COX7C, SNAPC3, CDH5, DHX33, and CNN1) had chromosomal loss. Genes that were differentially regulated in both our gastric and endometrial tumor studies were CASP4 and ARL6IP (upregulated) and SYNPO2 (downregulated). Supported by NIH grant RR106476 from the MFGN INBRE Program of the National Center for Research Resources and the Cooperative Human Tissue Network.

9:15 PHARMACOPHORE MODEL FOR ANTIMALARIAL FARNESYLTRANSFERASE INHIBITION

Prasanna Sivaprakasam*, Aihua Xie, and Robert J. Doerksen, University of Mississippi, University, MS 38677

A very promising anticancer and antimalarial target is the heterodimeric zinc-containing protein farnesyltransferase (FT), which is one of the key enzymes in post-translational modification of proteins by prenylation, an important mechanism of cellular regulation. In order to help understand the balance of forces responsible for protein-ligand interaction, a useful approach is to prepare a pharmacophore model which summarizes the key interaction elements from amongst a group of diverse ligands. We selected representative antimalarial FT inhibitors including a potent benzophenone derivative and tetrahydroquinolines plus the known antimalarials chloroquine and artemisinin and prepared pharmacophore models using Catalyst software. One hydrogen bond acceptor and two hydrophobic features were found to be essential for *in vitro* growth inhibition of Dd2 strain of *Plasmodium falciparum* (*Pf*). We also developed a 3D pharmacophore model exclusively for benzophenones that are reported to be FT as well as *Pf* inhibitors. Several pharmacophore models either for FT inhibition or antimalarial activity exist in literature but to our knowledge this is the first report on a pharmacophore model for antimalarial FT inhibition. Our results showed four important pharmacophoric elements for antimalarial FT inhibitory activity of these benzophenones: one ring aromatic, one hydrophobic and two hydrogen bond accepting features. We will use these models for identifying novel lead antimalarial FT inhibitors using virtual screening.

9:30 Break

9:45 Session II: Posters

THE EFFECTS OF H2O2 ON CELL VIABILITY, CELLULAR MORPHOLOGY AND CELLULAR MEMBRANE DAMAGE USING TYPE II PNEUMOCYTES

Alicia Martin [1]*, Michelle Tucci [2], Hamed Benghuzzi [2], and Joseph A. Cameron [3], [1]Hinds Community College, Raymond, MS 39154, [2]University of Mississippi Medical Center, Jackson, MS 39216 and [3]Jackson State University, Jackson, MS 39217

Oxygen supplementation at supraphysiologic levels is necessary in patients with respiratory failure, especially in those with acute lung injury. Oxygen in these settings is a life-preserving supportive measure until the initial pathologic process that elicited the respiratory disease subsides. It has been suggested that the toxic effect of oxygen is mediated by increased reactive oxygen intermediates, such as superoxide anion (O_2^-), hydrogen peroxide ($H2O_2$), and hydroxyl radical (OH^-). In this study, administration of low, medium and high doses of hydrogen peroxide to mimic oxygen overload or hyperoxia was investigated. In this study, increasing concentrations of H_2O_2 predisposed cells to lipid peroxidation, cellular damage, and increased membrane phosphatidylserine a sign of cellular apoptosis. Injury to the respiratory cells resulted in distortion of the alveolar architecture such as morphologic changes characterized by cell flattening/stretching, hyperchromasia, and cellular death. Increasing concentrations resulted in reduced cell numbers with time as well as increased levels of MDA and annexin V staining. Low-level administration of H_2O_2 did not induce alteration in cell numbers or cellular damage. The data indicates that type II pneumocytes have cellular machinery capable of detoxifying H_2O_2 below 80 FM, and as the dose reaches 220 FM cellular toxicity results and cells undergo cell death by apoptosis as evidenced by an increase in Annexin V staining.

THE EFFECTS OF SUSTAINED DELIVERY OF IGF-1 ON KIDNEY AND TESTICULAR TISSUES USING ADULT

MALE RATS AS A MODEL

Phatia Wells [1]*, Michelle Tucci [2], and Hamed Benghuzzi [2], and Joseph A. Cameron [3], [1]Hinds Community College, Raymond, MS 39154, [2]University of Mississippi Medical Center, and [3]Jackson State University, Jackson, MS 39217

It's common knowledge that growth hormone (GH) and insulin-like growth factor-1 (IGF-1) are some of the agents used by bodybuilders, athletes. These agents are banned from being used by athletes in most international sport federations, including the International Olympic Committee (IOC). Since 1990, the use of these agents has increased tremendously because of their potential use to produce gains in lean body mass and strength with concurrent loses in fat mass. Supplement companies, sensing the public demand for GH and IGF-1, have released all kinds of supplements that allegedly elevate these anabolic hormones. IGF-1 has been shown in vitro to produce changes in kidney epithelial cells and it is known that GH and IGF-1 play major roles in the development of tissues such as pancreas, kidney and testes. This study evaluated the effects of sustained administration of 5ng/day IGF-1 for 4 weeks on body weights, organ weights and morphology of vital and reproductive organs. Body weights over the 4-week period did not differ from control or sham operated rats. Decreased testicular and kidney weights were observed in the IGF-1 treated rats when compared with control and sham operated rats. Epididymal and seminal vesicle weights were increased at 4 weeks in animals treated with IGF-1. Morphological evaluations revealed structural changes in the proximal tubules of the kidney with increased area and length when compared to control and sham operated animals. In addition to changes within the kidney, there was an increase in the area of the seminiferous tubules as well as marked reduction in sperm by four weeks. The data suggests that doses of 5ng/day IGF-1 does play a significant role in kidney function and can alter reproductive tissues when given over long periods of time.

PASSIVE IMMUNIZATION WITH PNEUMOLYSIN ANTISERUM AS TREATMENT FOR *STREPTOCOCCUS PNEUMONIAE* KERATITIS

Sherrina Robinson*, Sherrina N. Dixon, Melissa Sanders, Kathryn S. Monds, Armando R. Caballero, Larry S. McDaniel, and Mary E. Marquart, University of Mississippi Medical Center, Jackson, MS 39216

Streptococcus pneumoniae (pneumococcus) is one of the top three causes of bacterial keratitis. Though pneumococcus can be treated with antibiotics, alternatives are necessary due to the increase in antibiotic resistance. Pneumolysin is a pneumococcal cytotoxin that stimulates the host inflammatory response and forms pores in host cell membranes. Antibiotics are prescribed to treat pneumococcal infections, however, pneumolysin remains and continues to damage the eye. Immunization methods to prevent or treat pneumococcal ocular infections could be beneficial in providing protection against the bacteria. The aim of this study was to determine if passive immunization with antiserum to pneumolysin could protect rabbit corneas from the damage associated with pneumococcal keratitis. Two forms of pneumolysin were used for immunization, heat-inactivated pneumolysin and non-heat-inactivated pneumolysin with a single amino acid change that renders it non-cytolytic. High titer antiserum to each immunogen was produced in rabbits by three monthly subcutaneous injections of each immunogen. Control serum was produced by three monthly subcutaneous injections of PBS. The corneas of new rabbits were injected with 10^5 colony-forming units of *S. pneumoniae* strain WU2, and then these rabbits were immediately injected intravenously with control serum, antiserum to each of the immunogens. Clinical examination of the corneas was performed at 24, 36, and 48 hours post-infection, and the rabbits were sacrificed. The clinical scores of the corneas from rabbits that received passive immunization with either antiserum to the heat-inactivated toxin or antiserum to the cytolytic-negative toxoid were significantly lower than the scores from rabbits that received control serum. The bacterial colony-forming units recovered from all of the corneas harvested after sacrifice were not significantly different between experimental groups and control groups. These data show that passive immunization with antiserum to pneumolysin is an effective means to treat *S. pneumoniae* keratitis. (Supported in part by the Howard Hughes Medical Institute)

INFLUENCE OF TERMINALIA CHEBULA ON PHARMACODYNAMIC AND PHARMOCOKINETICS OF GLICLAZIDE IN NORMAL AND DIABETIC RATS

Clareice Stewart [1]*, S. Satyanarayana [2], J Rajasekhar [2], T Sailaja [2], Bettaiya Rajanna [1], and Sharada Rajanna [1], [1]Alcorn State, Lorman, MS 39096 and [2]Visakhapatnam, India

It is a fact that countries like India and China with large populations use drugs from oriental medicine along with allopathic drugs. We are also aware of the fact that optimal blood sugar control is needed in diabetes. Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia caused by inadequate secretion of the hormone insulin, an inadequate response of target cells to insulin, or a combination of these factors. Albino rats (Wistar strain) of either sex were divided into 3 groups of 6 each and fasted for 18h prior to the experiment. Water was provided to the animals ad libitum. During the experiment they were withdrawn from food and water. Animals in Group-I, II and III were treated with gliclazide with doses equal to pre-determined Therapeutic Dose (TD), 1/2TD & sub TD respectively. Following these treatments, animals in group I, II and III were treated with Terminalia Chebula (TC) at 30 mg/kg, 100mg/kg and 300 mg/kg respectively with a washout period of one week between the treatments. Then, animals in group II were selected and treated with the combination of TC 100 mg/kg + gliclazide ½ TD after a washout period of one week. Diabetes was induced by alloxan monohydrate 100 -150 mg / kg body weight i.p. A group of 6 diabetic rats were treated with TC 100mg/kg, gliclazide ½ TD and the combination with a washout period of one week between the treatments. Blood samples were collected from retro-orbital plexus at 0, 1, 2, 3, 4, 6, 8, 10 and 12 h. and were analyzed for blood glucose by GOD-POD method using Semi Auto analyzer

(Screen Master 3000). Gliclazide levels were estimated by HPLC. The results suggested that Gliclazide & TC produced hypoglycemia dose dependently in rats. Bi-phasic Peak effects were observed in gliclazide and terminalia chebula. TC produced hypoglycemia when given alone and enhanced the effect of gliclazide in normal and diabetic rats. The pharmacokinetics of gliclazide was not altered in the presence of TC. The results of this study indicate that TC enhances the effects of gliclazide, which is of pharmacodynamic in nature and varies with species. Hence, we plan to conduct further studies in humans to establish the clinical significance of the interaction.

SYNTHESIS AND CHARACTERIZATION OF DIORGANOTIN(IV) COMPLEX OF 2-ACETYLPYRAZINE N(4) –3-THIOSEMICARBAZONE

Tramarea Adams [1]*, Lugile Sitole [2], Ramaiyer Venkatraman [2], and Joseph A. Cameron [2], [1]Hinds Community College, Raymond, MS 39154 and [2]Jackson State University, Jackson, MS 39216

Thiosemicarbazones exhibit a broad spectrum of pharmacological properties, including antibacterial, antiviral, antifungal, antimalarial, and antineoplastic activities. In solution, thiosemicarbazone molecules can exist in thione – thiol tautomeric form. The unique property of thiosemicarbazone is not only the presence of many electron donors centers in the structure but also the bonding characteristics. As a ligand, thiosemicarbazones are well known to behave as chelating agents towards a wide range of metallic ions forming structurally different complexes. In many instances, thiosemicarbazones act as a bidentate ligand and bind to the metals through the sulfur and hydrazinic nitrogen atom. Further, metal complexes often display enhanced activities when compared with the parent compound. Thiosemicarbazones can easily be modified by variation of the parent aldehyde or ketone used for their synthesis, and reactivity studies of thiosemicarbazones and their metal complexes. Among the metal ions that complex with thiosemicarbazones organotin compounds are of current interest due to their industrial, agricultural and biological applications. Relatively few studies on tin compounds were reported in the literature. In this research, we synthesized 2-acetylpyrazine N(4)-ethyl-3-thiosemicarbzone, [Hapetsc], by using 2-acetylpyrazine and 4-ethyl-3-thiosemicarbazide in a 1:1 molar ratio in ethanol. The tin(IV) complex of the ligand, [Sn Ph2Cl2(Hapetsc)2], was synthesized by using diphenyltin(IV) dichloride and 2-acetylpyrazine N(4)-ethyl 3-thiosemicarbazone in a 1:2 mole ratio in ethanol. The synthesized compounds were characterized by X-ray diffraction, and IR spectroscopy in the solid state. Electrical conductance, UV/Vis and by multinuclear (1H, 13C) NMR spectroscopic studies were carried out in DMSO. The ligand revealed to be monomeric with orthorhombic crystal system and Pnama space group with Z configuration. The crystal structures of the tin complex revealed it to be a monomeric six-co-ordinate complex with monoclinic crystal system and P21/c space group. Each of the two apetsc molecules functions as a monodentate ligand, co-ordinating to the Sn atom through the pyrazine ring nitrogen atom and conferring a distorted-octahedral geometry upon tin.

SURVIVAL RESPONSES OF A549 AND MRC-5 CELLS TO D- GLUCOSE AND D-FRUCTOSE DIPHOSPHATE EXPOSURE

Ashley Stowers [1]*, Ashley Blackwell [2], Clement Yedjou [2], Ibrahim O. Farah [2], and Joseph A.Cameron [2], [1]Hinds Community College, Raymond, MS 39154 and [2]Jackson State University, Jackson, MS 39216

Many studies showed that tumor growth and abnormal cell survival is associated with a number of metabolic abnormalities. Glucose metabolism is known to be deranged as frequently revealed by an impaired oral glucose tolerance test on patients. Protein metabolism was also found to be deranged in cancer patients as revealed by changes in plasma amino acid profile and evidenced by an increased plasma free tryptophan levels in cancer patients and depressed lipoprotein lipase activity, depressed, resulting in hypertriglyceridemia. The above findings seem to relate to or pose as a consequence of a shift to non-oxidative metabolic pathways. The role of carbohydrate metabolism in cancer was not clearly established in the literature. Therefore the purpose of this study was to evaluate differential metabolic toxicity/enhancement as well as survival responses of A549 (lung cancer) and MRC-5 (normal lung fibroblast) cells exposed to different concentrations for different times of D-glucose and D-Fructose diphosphate (FDP), in growth media. Tests were conducted using phase contrast micro scanning, a vital Mito-PT staining for survival/death indices as well as digitizing of cellular morphology assessments. Results showed that, both sugars have a range of different effects on cell survival. The effects seen on these cells could be attributed to either an increase in the pro-oxidant activity leading to increased ROS or the increase in internal pH (lactic acid) due to glycolytic metabolism that would differentially target cancer cells. Future studies will focus on the mechanisms of death due to the differential manipulation of non-oxidative metabolism and glucose transport mechanisms in cancer prevention /control.

AGE-RELATED DIFFERENCES IN DETOXICATION AND ACUTE TOXICITY LEVELS OF THREE ORGANOPHOSPHATE COMPOUNDS IN RATS

Edward Meek*, Valerie C. Beasley, Russell L. Carr, Howard W. Chambers, Jennifer Wagner, and Janice E. Chambers, Center for Environmental Health Sciences, Mississippi State University, Mississippi State, MS 39762

The organophosphorus (OP) insecticides which cause acetylcholinesterase (AChE) inhibition, display greater acute toxicity in juveniles than in adults. Active metabolites (oxons) of three of these insecticides, chlorpyrifos, methyl parathion, and parathion, were used to investigate esterase-mediated detoxica-

tion. The roles of carboxylesterases (CbxE) in stoichiometric detoxication and A-esterases (paraoxonases) in catalytic detoxication were investigated in liver and serum from adult (70 days of age) and juvenile (1 and 12 days of age) rats using spectrophotometric and HPLC methods. Detoxication ability of all 3 compounds by both esterases increased with age. Chlorpyrifos-oxon was detoxified to the greatest extent (both CbxE and A-esterases) followed by paraoxon (CbxE only), and methyl paraoxon the least (neither esterase). Rats of the same 3 ages were exposed IP to each of the oxons to determine the dosages required to inhibit brain AChE at 3 levels (80-90%, 40-50%, and 10-20%). The dosages producing the same level of AChE inhibition in adults and juveniles were most different for chlorpyrifos-oxon and least different for methyl paraoxon. These results support the concept that the greater detoxication of organophosphates in adults is an important factor in the greater tolerance of OP's by adults, and that the extent of esterase-mediated detoxication among compounds is critical in determining toxicity levels. (Supported by NIH R01 ES11287).

SEX DIFFERENCES IN ANGIOTENSIN-II INDUCED HYPERTENSION

Rachel Lockhart [1]*, Julio Sartori-Valinotti [2], and Jane F. Reckelhoff [2], [1]Murrah High School,Jackson, MS 39202 and [2]University of Mississippi Medical Center, Jackson, MS, 39216

Angiotensin (Ang) II is capable of producing hypertension when given chronically. Sex hormones modulate the renin-angiotensin system (RAS). Whether there is a sexual dimorphism in the response to chronic Ang II when the endogenous RAS is blocked has not been determined. Objectives: 1) Determine whether there are sex differences in Ang-II induced hypertension in the presence of endogenous RAS blockade; and 2) Determine whether sex differences in the pressor responses to Ang II are exacerbated by high salt diet. Methods: Age matched (12 weeks old) male and female rats were assigned to receive either Ang II (150 ng/kg/min SC) or vehicle for 3 weeks. To block the endogenous RAS, enalapril was given in the drinking water. The rats were kept on regular diet (1% NaCl) during the first week of Ang II infusion, and thereafter, were challenged to 4% NaCl diet. Blood pressure (BP) was recorded by telemetry. Results: We found no sex differences in Ang-II induced hypertension when rats were fed a regular diet. On high sodium diet, males exhibited higher BP than did females. Conclusions: When the endogenous renin-angiotensin system is blocked and rats are kept on a normal salt diet, Ang II increases BP to a similar extent in males and females. In contrast, when placed on a high salt diet, males exhibit higher BP than females during the second week of high salt intake. We speculate that testosterone in males promotes proximal tubular reabsorption of sodium and water, leading to increased BP compared to females. (Supported in part by the Howard Hughes Medical Institute)

INFLUENCE OF GENDER, ETHNIC, AND SOCIOECONOMIC FACTORS ON PATIENTS WITH EPILEPSY

Manju Pande [1]*, Veronica Scott [1]*, Ruby Mason [1], Ravi Pande [2], and Parminder J.S. Vig [3], [1]Mississippi Valley State University, Itta Bena, MS 38941, [2]Neurology Clinic, Greenwood Leflore Hospital, Greenwood, MS 38930, and [3]University of Mississippi Medical Center, Jackson, MS 39216

Epilepsy a chronic condition of the nervous system, often leads to substantial disability and thus has a major socio-economic impact. The present study was done to evaluate prevalence in different ethnic groups and gender susceptibility to the development of epilepsy in patient population in delta. The information was obtained form Greenwood neurology clinic. This clinic has a large patient population from all surrounding areas. The data was collected for 117 patients visiting over the last two years. First looking at the gender differences, there was a slightly higher occurrence in females (56%) than males (44%). However, there was no difference in the two ethnic groups whites (34) versus blacks (31). In contrast, a marked difference was observed in male ethnic groups (36bl versus 15wh), which resulted in overall difference in the two ethnic groups (58% in black compared to 42% in whites). Evaluation of the patients age showed a uniform distribution between the age groups of 18-45 and 45 and over, but interestingly the number of female patients increased in the age group of 45 and above. It will be interesting to find out if hormone or stress has any relationship with the higher incidence of seizures in females in the older age group. In order to evaluate the socioeconomic impact of epilepsy on the region, we found only 17% of the total patients had insurance while 83% of the patient population was mainly on medicare or medicaid. It is difficult to say if socioeconomic stress in these patients, was a contributing factor to the already existing epileptic seizures.

THE OZONE LAYER - EARTH'S NATURAL SUNSCREEN

Amin Haque, Alcorn State University, Lorman, MS 39096

The ozone layer is a concentration of ozone (O3) located in the stratosphere about 30 km above the surface of the Earth. It is considered the Earth's natural sunscreen because it absorbs most of the harmful ultraviolet (UV) radiation coming from the sun. O3 is produced due to the photochemical reaction of oxygen molecules (O2) in the stratosphere. Each particle of UV radiation, called a photon, has about 5.2 eV energy, which is enough to break O2 into two atoms of oxygen (O) or produce free hydroxyl radicals from water (H2O). Thus, an ozone layer is formed when a large number of O2 in the stratosphere absorb UV radiation from the sun and dissociate into two atoms of oxygen. The oxygen atoms combine with O2 to form O3. While O3 are being formed, some of them are absorbing UV radiation of higher energy, which causes them to be broken down to form O and O2. A dynamic equilibrium is established, maintaining a fairly constant concentration of ozone in the stratosphere. The concentration varies with season and latitude but averages 10 parts per million. Although it is low, this concentration of ozone is sufficient to block 95 % to 99 % of the sun's dangerous UV radiation. Until recently, ozone was created at least as quickly as it was destroyed. A substantial reduction in the amount of ozone in the ozone layer could threaten all life on Earth.

THE EFFECTS OF CORTISOL ADMINISTRATION ON PHOSPHOLIPID PROFILES, CELLULAR VIABILITY, AND CELLULAR MORPHOLOGY USING TYPE II PNEUMOCYTES

Destiny Foster [1]*, Michelle Tucci [2], Hamed Benghuzzi [2], and Joseph A. Cameron [3], [1]Hinds Community College, Raymond, MS, 39154, [2]University of Mississippi Medical Center, Jackson, MS 39216, and [3]Jackson State University, Jackson, MS 39217

Neonates exhibit a high risk of developing acute and/or chronic lung disorder, often associated with surfactant deficiency. Alveolar type II cells synthesize dipalmitoyl phosphatidylcholine (DPC) as the main surfactant phospholipid. Cortisol stimulates the production of surfactant and is used to induce surfactant in premature infants. The objective of our study was to administer various concentrations of cortisol to A549 and MVLU1 mixture of cells and determine the level of cellular viability, cellular damage, cellular morphology, and degree of surfactant production at 24, 48 and 72 hours of incubation. The results of our study show increased cell numbers in the high dose treatment without increases in cell damage or alterations in cellular morphology. Analysis of the cellular lipids revealed an increase in the production of dipalmitoyl phosphatidylcholine in treated cells. The increase in DPC was in a time and dose dependent manner with the largest increase in the 72-hour treatment period. Overall, the results show that physiological and supraphysiological doses of cortisol induce surfactant production in type II pneumocytes without evidence of cell loss and destruction.

THE ROLE OF CAV 1.3 IN MECHANOTRANSDUCTION

Cheryl Bell [1]*, Jiliang Li [2], David Burr [2], and Joseph A. Cameron [1], [1]Jackson State Univerisity, Jackson, MS 39216 and [2]Indiana University School of Medicine, Indianapolis, IN 46202

The L-type voltage sensitive calcium channels (L-VSCCs) have been shown to be involved in bone mechanotransduction in vivo. Our previous studies have shown that blockers of VSCCs suppress the load-induced bone formation in vivo, suggesting that L-VSCCs play an important role in bone response to mechanical loading. In the present study, we investigated the in vivo effect of the Cav 1.3 subunit on bone formation induced by mechanical loading. The right forearms of sixteen, twenty-week old mice were mechanically loaded for three consecutive days, while the left forearms served as non-loaded controls. The fluorochrome bone labels calcein (30 mg/kg) and alizarin (50 mg/kg) were injected two and six days, respectively, after the last loading session. The ulnas were processed for bone histomorphometry and calculations were done to measure mineralizing surface (MS/bone surface [BS]), mineral apposition rate (MAR), and bone formation rate (BFR/BS) of the periosteal surface for both the loaded and non-loaded ulnas. We report a positive bone response to mechanical loading in both WT and KO for the parameters MS/BS, MAR, and BFR/BS; however there were no significant differences, in reference to genotype, between the loaded and non-loaded ulnas. Similar results were found when comparing male versus female WT and KO. This study shows that loss of the Cav 1.3 subunit of the L-VSCCs in vivo does not suppress the mechanically induced response to bone formation that has been previously shown. Our data suggests that the L-type calcium channel does not affect the mechanically induced bone adaptation in vivo.

INDUCTION OF VESTIBULAR DAMAGE IN THE RATS VIA INTRA-TYMPANIC OR TRANS-BULLAR APPLICATIONS OF AMINOGLYCOSIDES

Jay Culpepper*, Rob Cannon, Jadrien Young,James Randall Jordan, and Hong Zhu, University of Mississippi Medical Center, Jackson, MS 39216

The loss of primary vestibular afferent signals by destruction of one labyrinth causes characteristic ocular, postural, and autonomic symptoms. However, a remission of a large part of these symptoms occurs within a few days. This phenomenon is called vestibular compensation. To study the neural mechanism of vestibular compensation, it is important to develop an effective protocol to induce unilateral peripheral vestibular damage in animals. Aminoglycoside antibiotics are toxic to the sensory hair cells of the inner ear. Some aminoglycosides such as gentamicin and streptomycin have selective toxicity for vestibular hair cells. In the present study, intra-typanic or trans-bullar applications of aminoglycosides were performed in rats to induce unilateral vestibular damage. An elevated body rotation test was used to assess the abnormal rotation behavior induced by unilateral vestibular damage. Of the seven rats that received single or repeated intra-tympanic injection of gentamicin (150mg/ml), only one rat showed abnormal rotational behavior. The second method involved a placement of frozen streptomycin pellets (2 mg) into the mastoid bulla. The two rats that underwent the trans-bullar approach displayed significant asymmetrical behavioral changes following recovery from the surgery, including head tilt, spontaneous turning behavior and high score of the elevated body rotation test. The severe spontaneous turning behavior disappeared 3 days after the surgery. The score of the elevated body rotation test improved 2 weeks after the surgery. These results suggest that the trans-bullar approach produce more rapid and reliable unilateral vestibular damage compared to the intra-tympanic injection of aminoglycosides in rats.

IMPACT OF ALF-1 AND IL-18 GENE POLYMORPHISMS ON REJECTION EPISODES AND CORONARY VASCULOPATHY AFTER CARDIAC TRANSPLANTATION

Yolanda Jackson [1]*, Olga McDaniel [2], Charles Moore [2], Andy Barker [2], Tammy Thomas [2], Rae Calcote [2], and Michael Mitchell [2], [1]Tougaloo College, Tougaloo, Mississippi 39174 and [2]University of Mississippi Medical Center, Jackson, Mississippi 39216

Development of coronary vasculopathy (CV) plays a

major role in determining the clinical condition of cardiac allograft. Inflammatory factor-1 (AIF-1) and interleukin-18 (IL-18) was previously shown to be over-expressed in CV patients with severe rejection episodes. The role of gene polymorphism in the promoter regions of Alf-1 and IL-18 in association with allograft rejection was investigated to explore their prognostic marker capability. Using SNP assay, DNA samples of 113 patients and 76 controls (African American and Caucasian) were tested. The various levels of CV (grade I-III) and rejection scores 0-3A/3B were compared. Fisher's exact test analysis was significant; $p<0.05$. The C→?T AIF-1 mutation, position -932, produced three genotypes; IL-18 mutations, position -607 and -137, produced six genotypes. Globally, frequency distributions of genotypes were not significant between patients and controls when clinical conditions were excluded for both IL-18 and AIF-1 genes. Majority of patients with rejection score >3A carry AIF-1 C allele (88.2%) as compared with T allele (11.8%); $p<0.008$. These data provide evidence that IL-18 with AIF-1 association might predict clinical outcomes of cardiac allograft and with direct correlation between expression levels of AIF-1 and IL-18 in association with the clinical outcome may prove a useful prognostic marker in management of cardiac allograft rejections.

INTERFERON-B ANTI-VIRAL THERAPY INDUCED TYPE II DIABETES

Victoria Beck [1]*, Katherine S. Toomey [2], Andrew B. Strawbridge [2], Joseph A. Cameron [1], Ibrahim O. Farah [1], James P. Walsh [2], and Janice S. Blum [2], [1]Jackson State University, Jackson, MS 39217 and [2]Indiana University School of Medicine, Indianapolis, IN 46202

Studies have shown that extensive interferon treatment can trigger autoimmune disorders such as thyroiditis, systemic lupus erythematosus and diabetes. In all cases, patients exhibited no preexisting autoimmunity, suggesting that the induction of auto-reactive antibodies (Ab) was a result of the immunosuppressive therapy. In this study, we investigated the molecular events which may have lead to the development of insulin resistance in a 55 year-old African American male diagnosed with insulin-dependent type II diabetes after a 35 week treatment with polyethylene glycol (PEG) interferon/ribavirin therapy for hepatitis C virus. Patient serum and sera from healthy human male donors were tested for the presence of Abs reactive against human insulin receptor (hIR). Insulin receptor-specific Abs were monitored by immunoprecipitation and Western blotting lysates from Chinese Hamster Ovary (CHO) cells lacking or expressing the human receptor (the latter CHO/IR membrane fragments). While patient serum was not reactive with membrane fraction of CHO/IR cells on Western blots, the hIR from CHO/IR, the serum immunoprecipitated the hIR from CHO/IR membrane fragments such that IR was detected with commercial Abs insulin receptor-alpha and insulin receptor-beta subunits. We are currently, in the process of testing whether these Abs are capable of disrupting IR function in vitro and our results indicated that the patient has developed antibodies against his insulin receptors.

NEUTRALIZATION OF *STREPTOCOCCUS PNEUMONIAE* PNEUMOLYSIN BY ANTI-PNEUMOLYSIN IMMUNOGLOBULIN G

Melissa Sanders*, Sherrina N. Dixon, Larry S. McDaniel, and Mary E. Marquart, University of Mississippi Medical Center, Jackson, MS 39216

Pneumolysin is a cytolysin produced by *Streptococcus pneumoniae* that binds to cholesterol in host cell membranes and forms pores. These pores disrupt the cell membranes, leading to host cell lysis. In this study, antiserum to pneumolysin was produced in New Zealand white rabbits. This serum possessed a high anti-pneumolysin IgG titer of 819,200 as determined by ELISA. Control serum was also produced, generating a negligible anti-pneumolysin IgG titer of 1600. IgG was purified from both the antiserum and the control serum using Protein A-Sepharose, and was tested for its capacity to neutralize the ability of pneumolysin to lyse erythrocytes. IgG from the antiserum, but not from the control serum, was able to protect rabbit erythrocytes from lysis by pneumolysin. IgM from the antiserum was also tested, and did not produce high ELISA titers against pneumolysin or neutralize pneumolysin. These findings suggest that the host response to *S. pneumoniae* pneumolysin is predominated by IgG.

CHARACTERIZATION OF PEDIATRIC PNEUMOCOCCAL OTITIS MEDIA ISOLATES

Chinwendu Onwubiko*, Courtney Shires, Lisa R. Quin, Edwin Swiatlo, and Larry S. McDaniel, University of Mississippi Medical Center, Jackson MS 39216

Streptococcus pneumoniae is the main cause of otitis media infections in children. A vaccine based on capsule types is currently used in order to prevent this and other pneumococcal diseases. However, the efficacy of the current vaccine against otitis media was not as high as anticipated, so there is need to examine other possibilities. To further our understanding of pneumococcal otitis media, we examined 29 isolates obtained from children 5 years old or younger throughout Mississippi in the pre-vaccine era (1999-2000). The isolates were characterized based on pneumococcal surface protein A (PspA) family typing, capsular typing, antibiotic susceptibility, and DNA fingerprinting. We found that most of the strains studied were either vaccine- or vaccine-related serotypes and all belonged to either PspA family type 1 or 2. Over 65% of the strains were resistant to penicillin, with only 5 strains showing susceptibility to all of the antibiotics tested. Our study has shown that these strains have many genetic differences, except when it comes to PspA family type. These results indicate that development of a PspA-based vaccine could aid in the future prevention of otitis media.

IDENTIFICATION OF RRP2-CONTROLLED MAMMALIAN INFECTION ASSOCIATED PROTEINS IN BORRELIA BURGDORFERI

Kristen Hosey [1]*, Joseph A. Cameron [1], and Frank Yang [2], [1]Jackson State University, Jackson, MS 39217 and [2]Indiana University School of Medicine, Indianapolis, IN 46202

Lyme disease is the most commonly reported arthropod-borne illness in the United States and Europe. The infection is caused by the tick-borne spirochete, Borrelia burgdorferi, resulting in a multisystem, multistage, inflammatory illness. Despite its medical importance, very little is known about the virulence determinants of B. burgdorferi. In this regard, we recently identified a genetic regulatory network that is critical for B. burgdorferi infection in mammalian hosts. This network constitutes a bacterial two-component response regulator, Rrp2, and a novel cascade of the alternate sigma factors, RpoN and RpoS. This regulatory network modulates expression of numerous B. burgdorferi genes and has emerged as a central regulatory pathway for B. burgdorferi pathogenesis. Through microarray and sequencing analyses, we have identified five prospective target genes in Borrelia burgdorferi, bb0681, bb0844, bba05, bba07, and bbb09, upon which Rrp2 controls their transpcription. In this study, we have chosen three of those genes, bb0844, bba05, and bba07, to generate recombinant proteins and, subsequently, the respective antibodies to determine their regulation at the protein level.

EFFECTS OF CHLORPYRIFOS AND METHYL PARATHION ON CHOLINESTERASE AND MUSCARINIC ACETYLCHOLINE RECEPTOR IN YOUNG RAT BRAINS

Shirley X. Guo-Ross*, Russell L. Carr, Edward Meek, and Janice E. Chambers, Mississippi State University, Mississippi State, MS 39762

Organophosphorus (OP) insecticides are widely used in both the US and worldwide. The neurotoxic effects of these compounds in developing animal are necessary to characterize in order to protect human health. In this study, rats were orally gavaged with either chlorpyrifos (CPS) or methyl parathion (MPS) starting at postnatal day (PND) 1 until PND4 or PND8 with low, medium, and high dosages of CPS or MPS. Cholinesterase (ChE) activity and muscarinic acetylcholine receptor (mAChR) binding were investigated in three brain regions (anterior to optic chiasm, posterior to optic chiasm excluding medulla/pons and cerebellum, and medulla/pons) at PND4 or PND8 following treatment with either CPS or MPS. Radioactive ligands were used to measure the maximal binding of the M1, M2/M4, M3-subtype and total mAChRs. Overall, in the anterior and posterior forebrain, the levels of all mAChRs nearly doubled from PND4 to PND8. However, in the medulla/pons, M1/M3-subtype densities were low and remained same, while M2/M4- and total mAChR levels increased a relatively small amount from PND4 to PND8. Dose-dependent effects of CPS and MPS on ChE activity and mAChR binding were more evident in rats at PND8 than at PND4. These results demonstrate that OPs exert adverse effects on rat cholinergic development in an age- and region-dependent manner. (Supported by NIH R01 ES 10386).

SURVIVAL RESPONSES OF A549 AND MRC-5 CELLS TO SODIUM ASCORBATE AND SODIUM BICARBONATE EXPOSURE

Bradley Adams [1]*, Ashley Blackwell [2], Clement Yedjou [2], Ibrahim O. Farah [2], and Joseph A. Cameron [2], [1]Hinds Community College, Raymond, MS 39154 and [2]Jackson State University, Jackson, MS 39217

Tumor growth and abnormal cell survival was shown to be associated with a number of cellular metabolic abnormalities revealed by changes in plasma amino acid profiles in patients with breast, lung, colon, stomach, and other cancers from various origins. Glucose is the major energy source in cancer cells where it utilizes aerobic/anaerobic glycolysis with the resultant lactic acid formation. In contrast to normal cells, cancer cells may lose the ability to utilize aerobic respiration due to either defective mitochondria or hypoxia within the tumor microenvironments. The role of energetic modulations and use of glycolytic inhibitors on cancer / normal cell survival were not clearly established in the literature. Therefore, the purpose of this study was to evaluate two natural and potential glycolytic inhibitors namely, Sodium ascorbate and sodium bicarbonate on growing A549 and MRC-5 cell lines. The two cell types (cancer and normal) were exposed for various times to different concentrations of the chemicals in growth media. Exposed cells were tested with phase contrast micro scanning, a Mito-PT Kit, and cell digitizing to determine their differential influence on cell survival. Sodium bicarbonate and sodium ascorbate both showed various levels of modulation within the two cell lines. These studies show the potential for exploiting cellular metabolic differences in cancer control. Supported in part by JSU-Center for University Scholars and NIH-RISE.

THE ROLE OF VISUAL CUES IN THE LINEAR ACCELERATION-INDUCED BLOOD PRESSURE CHANGES IN RATS

Bowen Zhou [1]* and Hong Zhu [2], [1]Jackson Academy, Jackson, MS 39236 and [2]University of Mississippi Medical Center, Jackson, MS 39216

Vestibular function is not only essential for posture and balance, but also is important for maintaining stable blood presseure. Otolith is the part of the vestibular system that senses linear motion and head orientation with respect to gravity and it has been suggested to play a primary role in the vestibular-cardiovascular reflex. Our previous studies show that pure linear acceleration, which selectively activates otolith system, induces characteristic cardiovascular responses in rats. Since linear head motions not only activate the vestibular system, but also activate the visual system by generating retinal slips, in the present study, we investigated whether visual cues play a role in the linear acceleration-induced blood pressure responses. Conscious Sprague-Dawley rats were stabilized on a linear sled through a surgically implanted head holder. Blood pressure was measured via a chronically implanted abdominal aortic catheter. The linear motion consisted of an acceleration phase of 200ms (3m/s2)

followed by a deceleration phase of 200ms (3m/s2). The linear motion-induced blood pressure changes were monitored with visual cues present (light on) or visual cue absent (light off). Our data show that there was no significant difference in the linear motion-induced blood pressure change when visual information was available (light on condition) and when the visual cues were absent (light off condition). The results suggest that visual information may not play an important role in the linear acceleration-evoked autonomic responses.

CHRONIC BLOCKADE OF VEGFR-2 REVEALS NEGATIVE FEEDBACK REGULATION OF VEGF IN EXERCISING MUSCLES OF MICE

Janelle S. Pryor* and Thomas H. Adair, University of Mississippi Medical Center, Jackson, MS 39216

Exercise conditioning causes VEGF-mediated angiogenesis in skeletal muscle. Previous studies indicate that VEGF mRNA increases initially (days 1-7) in response to exercise-induced hypoxia, and then returns to nearly normal levels after 14-28 days when capillarity has increased and normoxic conditions have been achieved. This temporal relation between muscle capillarity and VEGF expression suggests that VEGF production may be subject to negative feedback regulation. To test this hypothesis, we used a VEGFR-2 inhibitor, PTK787 (Novartis), to prevent angiogenesis in skeletal muscle during exercise conditioning, i.e., to "open" the negative feedback loop. Male C57BL/6J mice were dosed with either PTK787 (50 mg/kg/day) or vehicle, and run on a motorized rodent treadmill for 1 hr/day (18 m/min, 10° incline); age-matched cage-confined mice dosed with PTK787 or vehicle served as additional control groups. mRNA expression was evaluated from gastrocnemius muscles collected at days 1, 4, 7 and 14. VEGF and VEGFR-1 expression were significantly higher in PTK787-exercise mice compared to cage-confined mice at all time points, whereas both factors returned to near normal levels in the vehicle-exercise mice by day 14. Because VEGF and VEGFR-1 are known to be upregulated by hypoxia, the results suggest that blocking the actions of VEGF prevents adaptation of skeletal muscles to exercise conditioning, and thus support our primary hypothesis that VEGF is subject to negative feedback regulation. NHLBI (HL-51971)

Session III: Nursing Education

11:15 Introduction

11:30 GENERATIONAL AGE DIFFERENCES IMPACT THE COLLEGE CLASSROOM

Lisa Haynie, Tina Martin, Jill White, Anne A. Norwood, and Jean T. Walker, University of Mississippi School of Nursing, Jackson, MS 39216

A generational age transformation is occurring across the country in higher education classrooms. Generation Y is coming to higher education in record numbers and merging with significant numbers of Generation X. Boomers remain a significant force as faculty and the combination of the generations in the classroom is yielding interesting results. Educators need to prepare for the different values and expectations of students from Generation X and the newly emerging Generation Y in the educational environment. This quantitative, descriptive research begins to examine these differences and the potential impact for the college classroom of the future.

11:45 PREDICTORS OF SUCCESS AND ATTRITION RATES IN AN ASSOCIATE DEGREE NURSING PROGRAM IN MISSISSIPPI

Joyce Vaughn, Mary Tan*, Cindi Eads, Merilyn Long, Alice Austin, Becky Daniels, Mary McNair, and Pam McCollum, Holmes Community College, Ridgeland, MS 39157

Prediction of variables for academic success in associate degree nursing programs has intrigued nursing educators for decades. Compounding this issue is the urgency for producing more than one million registered nurses by the year 2010. The identification of these variables would enable nursing admissions committees to formulate relevant admission criteria, identify and develop programs for failing students as well as implement advisory and academic support programs to increase the probability of passing NCLEX-RN. This study examined both academic and non-academic variables. Study variables included ACT composite scores, ACT sub-math scores, ACT sub-English scores, ACT sub-reading scores, successful passage of NCLEX-RN scores, age of students, race, gender, prior nursing school failures, GPA and NUR 2119 and NUR 2123 test scores. Although many of these variables have been explored in past studies the majority of the studies have examined baccalaureate of science nursing (BSN) populations. Currently there is a lack of studies of associate degree nursing program populations. The purpose of this study was to examine previous study variables identified in the literature and determine if these variables have relevance or predictability of success or failure of associate degree nursing (ADN) students on NCLEX-RN passage. Data were obtained from a convenience sample of thirty-five, May 2005 graduates from an urban Mississippi public community college ADN program. Results from the study indicated that ACT composite and sub-scores scores had significant relationships with NCLEX-RN passage rates ($p<0.05$).

THURSDAY AFTERNOON

Bost Auditorium North

Session IV: Drug Delivery Symposium

1:15 EFFECTS OF SUSTAINED DELIVERY OF EPIGALLOCATECHIN-3-GALLATE, THYMOQUINONE, AND TANNIC ACID ON LNCAP CELLS

La'Toya Ross Richards*, Pamala Jones, Hamed Benghuzzi, and

Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

Antioxidants are substances that play an essential role in protecting cells from damage caused by unstable free radicals, which are implicated in the development of cancer. A review of research on nutritional supplements and cancer risk has demonstrated that antioxidants have been reported to prevent prostate cancer development. High consumptions of antioxidants have been hypothesized to contribute to a reduced incidence of prostate cancer. The aim of this study was to utilize the drug delivery system to deliver antioxidants (epigallocatechin-3-gallate (EGCG), thymoquinone, and tannic acid) in a sustained manner and characterize the behavior and response of LNCaP prostate cancer cells after 24, 48 and 72 hours of treatments. Following treatment periods, cell number, cell damage and PSA levels were determined. Groups treated with EGCG + TCP had the largest reduction in cell number and the largest increase in membrane damage for the duration of the experiment. Cells treated with TA +TCP also showed significant damage to the cells membrane in comparison to the control group. Evaluation of prostate specific antigen (PSA) levels in the EGCG + TCP, TQ + TCP, and TA + TCP groups demonstrated significant decreases in the levels after 24, 48, and 72 hours of incubation ($p < 0.001$). The results of this study indicate that sustained delivery of antioxidant results indicate in addition to preventing cancer formation, they also have the ability to cause a substantial loss of cancer cells with altered functional abilities. These findings may enhance the healthcare industry and yield safer and effective treatments for prostate cancer.

1:45 THE EFFECTS OF SUSTAINED ADMINISTRATION OF GROWTH FACTORS ON TRAUMATIZED DISC USING THE ADULT MALE RAT AS A MODEL

Scott Wingerter*, James Woodall, Jr., Laura Franklin, Joel Davis, Michelle Tucci, Ashraf Ragab, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

The current modalities of treating symptomatic degenerative disc disease are either conservative non-surgical or surgical modalities. However, none of these modalities is a true cure for the degenerative process. Ideally, the best treatment would be preventing the progression of degeneration. The goal of our research is to identify factors that may slow or stop the degenerative process. A rat degenerative disc model induced by piercing the center of the disc was implemented. In this phase of the study, it was hypothesized that continuous sustained release of transforming growth factor (TGF) would reverse the loss of cellularity associated with degenerating discs. A total of twelve rats were divided into three equal groups. Group I served as control and groups II and III were subjected to a surgery where a 21-gauge needle was used to pierce the L4/L5 disc posteriorly. Animals in group III received TGF over a four week period via a tricalcium phosphate sustained delivery device. After 4 weeks the animals were sacrificed and the traumatized discs were removed. Sections of 10mM were taken and stained with hematoxylin and eosin and evaluated using light microscopy techniques. Using Image Pro software the area of the transition zone was calculated and the number of chondrocyte nuclei per area was determined. The results show that after four weeks, animals in group II (trauma only) showed evidence of disc degeneration with the largest decrease in cell number anterior to the site of trauma. Treatment with TGF resulted in chondrocyte numbers similar to control in posterolateral views of the disc, while lateral views and views of the site directly opposite the trauma (anterior) had approximately 45% less chondrocytes per area than the control; however, the chondrocyte numbers in the anterior views were twice as many as seen in the discs retrieved from trauma only animals.

2:15 COMPARATIVE EFFECTS OF CORTISOL ON KIDNEY TUBULE EPITHELIAL CELL USING CELL CULTURE AND ANIMAL STUDIES

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

Various studies have investigated the effects of kidney epithelial cells to various agents but there are few studies that compare an *in vitro* to an *in vivo* environment. The specific objectives of this study were to investigate the effects of cortisol (C) on the proliferation and viability kidney epithelial cells (KEC) and compare the finding with cortisol administered via drug delivery for 30 days using adult rats as a model. In phase I, a total of 30 tubes plated with KEC were divided into three equal groups. Cells were treated with either supraphysiological or physiological doses of cortisol and compared with untreated control cells. In phase II of the experiment, animals were divided into three equal groups and were given a TCPL drug delivery system containing supraphysiological levels of cortisol, SHAM or left untreated for 30 days. The animals were euthanized and their kidneys were compared using histological techniques. In Phase I: Epithelial damage was evident 24 after receiving a supraphysiological dose of cortisol, with increased hydrophic effects and alterations in cellular metabolism. In phase II, after four weeks of treatment, kidney tissues of animals exposed to sustained release of cortisol resulted in a significant reduction of glomerular area, with evidence of KEC damage. The overall histological and cytological data suggest that test compounds tested in tissue culture provide a correlation as to how they will perform *in vivo*. Testing in compounds *in vitro* will allow the investigator to establish the IC_{50}'s of the test compounds as well as calculate the number of animals needed to reach statistical power.

2:45 Break

Session V: Health Research

3:00 BLOOD PRESSURE IS NOT SALT SENSITIVE IN OBESE DOGS

Shardale McAfee and Jeff Henegar, Murrah High School, Jackson, MS, 39202 and University of Mississippi Medical Center, Jackson, MS, 39216

Blood pressure can change based on salt intake. This is referred to as salt sensitivity. Some rat models exhibit large increases in blood pressure when fed a high-salt (HS) diet. Obese Zucker rats have a significant increase in blood pressure when fed a high salt diet and thus are salt sensitive. However, it is unclear if the increase in blood pressure is due to obesity in these rats. Also, it is unclear if obesity salt sensitivity is specific for rats or is true for other species more similar to humans. Therefore, the present study tested the hypothesis that blood pressure in obese dogs is salt sensitive. The obese dog model mimics what happens in human obesity with regards to cardiovascular, endocrine, and metabolic parameters. To test our hypothesis, six obese dogs were given normal salt (NS, 85mEq/day), then low salt (LS, 7mEq/day), and then high salt (300mEq/day) for 7 days each, intravenously. Blood pressure and sodium excretion were measured. Neither LS diet nor HS levels significantly altered blood pressure in obese dogs (98 ± 4 LS and 104 ±5 HS versus 97 ± 4 NS, p=0.65 LS vs. NS, p=0.35 HS vs.NS). Sodium excretion was significantly less in LS (12.2 ±1.3 mEq/day) and significantly higher in HS (278 ± 6.8 mEq/day) compared to NS (86.2 ± 3.8 mEq/day). Thus, the kidneys were able to excrete enough sodium and fluid and prevent further increases in blood pressure. These data suggest that blood pressure is not salt sensitive in dogs.(Supported in part by the Howard Hughes Medical Institute)

3:15 TB DIAGNOSTIC USING EPITOPE PEPTIDE COUPLED WITH SPACER TECHNOLOGY IN AN ENHANCED ELISPAC DETECTON SYSTEM

A Rinaldy [1,3,4,*], K. N. Thimmaiah [1,2], H Simmons [1], L Sylvester [1], P Grisham [1], J Henry [3], K Gregorius [3], R Ilyas [4] and B Setiawan [4], [1] Northwest Mississippi Community College, Southaven, MS 38671, [2]St. Jude Children's Cancer Research Hospital, Memphis, TN 38105, [3]ImmunoCon Diagnostic, Cordova, TN 38016 and [4]Innogene Kalbiotech, Kalbe Farma, Singapore 139951

Rapid and sensitive diagnosis for infection by *Mycobacterium tuberculosis* is necessary in order to combat the spread of this ranking one infectious disease globally. To achieve this objective we focused on the membrane bound specific antigenic molecule isolated and purified from enriched membrane fractions of the virulent Erdman strain of *Mycobacterium tuberculosis*. Three epitope peptide domains with the highest hydophylicity were identified followed by its application in ELISA in combination with Tresyl-Activated-Dextran spacer molecule. The result is a minimal steric-hindrance configuration of these epitope peptides allowing the highly sensitive capturing of patient's specific IgG. Due to the nature of *Mycobacterium tuberculosis* as well as the mode of infection of this disease , the P3 prototype in this ELISPAC was assessed using 7 groups of serum samples. Specificity, Sensitivity, Positive and Negative Predictive Value were determined of the overlapping values primarily between group I (TB^+AFB^+) and group VI (TB^-/healthy). Sensitivity and positive predictive value was 88% whereas specificity and negative predictive value was 68%. (Supported by Kalbe Farma Research Foundation, Singapore, to AR).

3:30 THE EFFECT OF ELLAGIC ACID ADMINISTERED INTRAPERITONEALLY AND ORALLY IN *TRYPANOSOMA LEWISI* INFECTED RATS

Joan Dickerson*, Emily Fortenberry*, Carey Klotz*, Marlena Mattingly*, Zack Owens*, and Aubrey Voorbrood*, Belhaven College, Jackson, MS 39202

Trypanosoma lewisi, a non-pathogenic form of the protozoan parasite that causes African sleeping sickness, was used in an experiment to examine the effects of ellagic acid on parasitemia. Recent trypanosome research has focused on the use of anti-carcinogenic drugs to reduce parasitemia due to their anti-proliferative effects on cells. Ellagic acid, a phenolic compound used to treat malignancy and found in many fruits, was administered to rats both orally and intraperitoneally to examine its anti-proliferative and antioxidant effects. Rats were separated into four treatment groups: injection low dose, injection high dose, dietary low dose, and dietary high dose. Adult trypanosome counts in the injection high dose group were found to be significantly lower than adult counts in the control. It was also observed that in treatment groups immature forms of the parasite remained at a fairly constant level, while adult forms appeared to decrease in number. This indicates that ellagic acid may inhibit the maturation of immature forms. However, it was not clear if the treatment had apoptotic effects on the parasite. Further studies are required to indicate the specific pathway through which ellagic acid prevents maturation. Ellagic acid could prove to be a treatment for trypanosomiasis that is cost-effective and readily available in underdeveloped countries.

3:45 OZONE DEPLETION AND ITS POTENTIAL EFFECTS

Amin Haque, Alcorn State University, Lorman, MS 39096

The chlorofluorocarbon (CFC) gases released in the atmosphere might seriously damage the ozone layer in the stratosphere. The major CFCs are CFCl3 and CF2Cl2. The CFC molecules are broken apart by UV radiation, with the release of reactive chlorine radical atoms, which react with ozone molecules (O3) and convert O3 to O2 in a repeating cycle. It has been estimated that a single Cl radical may destroy as many as 100,000 ozone molecules. Other chemicals that damage the ozone layer include halons used in fire extinguishers, and chloroform used as a solvent in industrial processes. As methyl bromide and halons are broken apart, they release bromine atoms, which are 40 times more destructive to ozone molecules than chlorine atoms. Satellite images have revealed a "hole" in the ozone layer over the South Pole since 1985. The largest hole,

2.9 x107 km2, was recorded on September 10, 2000. The second largest ozone hole area, 2.7 x107 km2, was recorded on Sept. 11, 2003. Ozone levels over northern Europe, Russia, and Canada during the winter and spring of 1992 have been 12% below the seasonal average. The chlorine monoxide radical chain reaction is now thought to account for approximately 80 % of the ozone loss in the stratosphere. At present, relatively little is known or understood about the possible consequences of enhanced ultraviolet (UV) radiation levels in our environment. However, scientists anticipate and warn that depletion of ozone layer may have many significant effects on our health and the environment.

FRIDAY MORNING

Bost Auditorium North

8:30 Health Fair

10:30 Poster Session

TISSUE TRANSGLUTAMINASE DEPENDENT AND INDEPENDENT INTERACTION OF CALCIUM BINDING PROTEIN CALBINDIN D28K WITH ATAXIN-1

La'Mont Sutton*, Parminder J.S. Vig, Jinrong Wei, Michael D. Hebert, and S.H. Subramony, University of Mississippi Medical Center, Jackson, Ms 39216

Spinocerebellar ataxia-1 (SCA1) is caused by the expansion of a polyglutamine repeat within the disease protein, ataxin-1. In normal neuronal tissues, ataxin-1 localizes to the nucleus in a diffuse fashion. However, in the affected neurons ataxin-1 precipitates as large intranuclear aggregates. These aggregates may protect neurons from mutant protein and/or trigger neuronal degeneration by encouraging recruitment of other essential proteins. Our previous studies have shown that calcium binding proteins, especially calbindin D28k (CaB) and parvalbumin have a role in SCA1 pathogenesis. In addition, we demonstrated that CaB is recruited to ataxin-1 aggregates in Purkinje cells of SCA1 mice. Since our recent findings suggest that tissue transglutaminase 2 (TG2) may be involved in cross-linking and aggregation of ataxin-1, the present study was initiated to determine if TG2 has any role in CaB-ataxin-1 interaction. The guinea pig TG2 covalently cross-linked purified rat brain CaB. Time dependent progressive increase in aggregation produced large multimers, which stayed on top of the gel. To determine if CaB interacts with ataxin-1, we studied the effects of exogenous TG2 on HeLa cell lysates expressing GFP and GFP tagged ataxin-1 with normal and expanded polyglutamine repeats (Q2, Q30, and Q82) in the presence and absence of exogenously added CaB. The reaction products were analyzed by Western blots using anti-polyglutamine, CaB, or GFP antibodies. CaB crosslinked preferentially with Q82 ataxin-1. The present data indicate that CaB may be a TG2 substrate. Further, mutant ataxin-1 recruits CaB and TG2 stabilizes this complex by covalently cross-linking these interacting proteins, supporting the argument that ataxin-1 aggregates may be toxic to neurons.(Supported in part by the Howard Hughes Medical Institute)

METABOLIC EFFECTS OF FRUCTOSE 1,6-BISPHOSPHATE IN NORMOXIC AND HYPOXIC STATES OF MG63 OSTEOSARCOMA CELLS

Ameze Adah [1]*, Hamed Benghuzzi [2], Michelle Tucci [2], Derrick Huang [1], Laura Franklin [2], and Felix Adah [2], [1]University of Mississippi, University, MS 38677 and [2]University of Mississippi Medical Center, Jackson MS 39216

Glycolysis is a very important process which contains very intricate steps that play a role in cellular performance and viability. Fructose 1,6-bisphosphate (FBP) is a glycolytic intermediate that has proven to improve cellular conditions under hypoxic and ischemic conditions. Osteoblasts are key regulators of skeletal matrix synthesis and degradation. Thus, considering FBP's positive effects on ameliorating hypoxia-induced injuries, the objective of this study was to determine its effects and comparative effects on osteoblast cells under normoxic and hypoxic states. MG63 osteoblast-like cells were cultured in 24-well culture plates and treated with high, medium and low dosages of FBP at 24, 48, and 72 hours. At the end of each time period, cellular number, damage by a malondialdehyde assay (MDA), and glutathione levels were evaluated. There was a significant increase in cell number for the low level of FBP in normoxia at 48 hours ($p < 0.05$). For the cells in hypoxia, there was a significant decrease in cell number for the medium level at 48 hours ($p < 0.05$). At 48 hours there was a significant decrease in cell damage through MDA measurement for the cells in normoxia and hypoxia when compared to the control. Cellular damage was not evident in the supernatant in either oxygen condition for the duration of the study. A significant decrease in glutathione levels was also noted for the cells in hypoxia. Cellular morphology included multiple nucleoli, vacuolated cytoplasm, abnormal cells, and web-like cytoplasm. The results indicate that FBP does protect bone cells exposed to hypoxic injuries, and while doing so, ameliorating the states of the cells in shock.

ANALYSIS OF MULTIPLE MEDWATCH AND AdDEERS FORMS OF CLINICAL RESEARCH TRIALS AND ADVERSE EVENT OUTCOMES OF STUDY DRUGS AND DETERMINATION OF RELATIONSHIP TO STUDY DRUG

Rachelle Cooley [1]*, Andy Patel [1], Ednita Street [1], Maggie Clarkson[2], and Mitch Harrala[2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, [2]Gulf Coast Research Laboratory, Ocean Springs, MS 39566, and Singing River Hospital Cancer Research Center, Pascagoula, MS 39581

The purpose of this project was to analyze different MedWatch and AdDeers forms from clinical research trials and summarize them on an internal report form for the Singing River Hospital's (SRHS) Cancer Center Office of Clinical Research (OCR). The SRHS Cancer Center OCR is required to submit Adverse Event (AE) reports received from study sponsors to the local Internal Review Board (IRB) within a specified time frame in accordance with the Food and Drug Administration (FDA). Each study sponsor provides the OCR investigators with adverse events using the standard version of the MedWatch form. The AdDeers AE reports contain information on all grade three, four, and five toxicities experienced by patients receiving the sponsor's study drugs. The form requests specific information regarding the patient, study, drug regimen, incident/event and outcome. The investigator makes a determination of whether the event is related to the study drug or not. The study sponsor reviews the AdDeers form submitted by the investigator and also makes a determination as to relation of the event with study drug. The AE reporting process supports efforts by the FDA to notify individual investigators and the approving IRB's of expected as well as unexpected toxicities involved with use of the drug. The SRHS IRB's Standard Operating Procedures (SOP) require that all study sponsor generated AE reports be summarized on an internal report form. Once the report is reviewed by the local investigator for input and approval, the summary report is then submitted to the SRHS IRB for final review and approval. This notification to the local IRB insures patient safety on a local, national, and international level. The final disposition of all adverse events experienced by patients receiving a specific drug is included in the sponsor's application to the FDA for approval of the agent for commercial/retail use. The potential toxicities listed in drug inserts provided by the pharmaceutical company are a compilation of these adverse events.

COMPARISON OF TWO DIFFERENT FIXATION TECHNIQUES FOR A SEGMENTAL DEFECT IN A RAT FEMUR MODEL

Scott Wingerter*, Graham Calvert, Michelle Tucci, Audrey Tsao, George Russell, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS, 39216

Studies have attempted to identify the osteogenic effects of bone morphogenetic proteins using a rat femur model, which commonly involves the creation of a critical size defect followed by internal fixation of the femur. Among the most familiar fixation methods are either plating or intramedullary placement of a Kirschner wire (K-wire). There are advantages and disadvantages to each method; however, this study attempts to identify the best method by exploring the histological effects of each technique. The experiment involved two groups with no added treatment: Group P (plate fixation method) and Group K (K-wire fixation method). The animals were allowed a four week interval for the femurs to heal, and proximal, distal, and two midshaft cuts were examined under high-power microscopy after the fixation apparatus was removed. Group K exhibited a peculiar fibrotic healing pattern that followed the shaft of the then vacated K-wire and there was minimal new viable bone formation. Group P, however, exhibited a more natural ingrowth of newly formed bone that began at the proximal and distal cuts and proceeded centrally into the core of the defect. Due to the fibrotic tissue in Group K, this study shows that the model is insufficient due to the micromotion created and, therefore, supports plating of critical defects as the fixation method of choice due to the creation of a stable healing environment.

EXPERIMENTAL RESEARCH FOR DEVELOPING A NOVEL BANDAGE ADHESIVE THAT DEGENERATES UNDER WHITE LIGHT

Marshall Y. Bartlett* and Paige Phillips, University of Southern Mississippi, Hattiesburg, MS 39406

The loss of stickiness and tackiness in polymers Poly(Styrene- Butadiene-Styrene) (SBS) and Poly(Styrene-Isoprene-Styrene) (SIS) containing varying amounts ofC6o was observed after exposing the adhesive to an intense white light for varying time increments. After diluting the polymer in toluene, C60 was added to the solution to maximize cross-linking under white light. The more cross-linking occurs in a solution, the more stickiness and tackiness it loses. The gel fraction method was used to determine what percentage of C60 caused the most cross-linking in the solution. A dynamic mechanical analysis instrument was also used to measure the T 9 of the solution. As little .20 percent weight of C6o in SBS caused significant cross-linking and loss of stickiness/tackiness. The longer the system was exposed to white light, the more it cross-linked, but significant cross-linkage did occur within five minutes. Adding C60 also caused a great (30- 40° F) rise in the T g. With these results, it was determined that a novel bandage adhesive can be developed using photo-responsive polymers and fullerenes that crosslink and produce a non-sticky, non-tacky system.

FRIDAY AFTERNOON

Bost Auditorium North

1:15 Poster Session

HISTOPATHOPHYSIOLOGICAL COMPARISON OF MALE AND FEMALE HEART TISSUE FOLLOWING SUSTAINED RELEASE OF SUPRAPHYSIOLOGICAL LEVELS OF CORTICOSTEROID

Kenneth Powell*, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

Chronic stress may result in abnormal laboratory findings including urine free cortisol, and elevated late-night salivary cortisol levels. There is also data that supports the concept that stress-related increases in cortisol may be associated with known physiological abnormalities such as hypertension, insulin resistance, dyslipidemia, and higher incidence of cardiovascular alterations. The onset of adverse cardiovascular events

differs between males and females, and it generally reported that stress and hormone status are responsible for these differences. The aim of this study was to investigate the heart tissue of adult male and female animals following twenty-eight days of sustained supraphysiological corticosterone levels. Animals were divided into four equal groups containing four animals per group. Male animals in group I and female animals in group III served as control. Male animals in group II and female animals in group IV were surgically implanted with a TCP delivery device containing 50 mg corticosteroid. Twenty-eight days post surgery, the heart were collected and processed for histological evaluations. Histomorphometric measurements including total area, bundle lengths within the ventricles and the length of the apex were recorded. No differences in the wet weights were recorded in the male and female hearts when compared to the control. The length of the apex was increased following exposure to corticosterone in both male and female animals. The results also indicate an increase in the length of the bundles on the left side of the heart in the male animals exposed to corticosterone when compared to the male control heart tissues. No differences were seen in the female animals in the bundle lengths when compared with female control animals. The data overall suggest the possibility of structural differences in the heart that are gender related and suggest hyperatrophy.

IDENTIFICATION AND APPLICATION OF EFFECTIVE EARLY LITERACY PRACTICES FOR DEAF CHILDREN

Kimberly Barnes, University of Southern Mississippi, Hattiesburg, MS 39406

Literacy is the ability of an individual to write, speak, compute, and solve problems at levels of proficiency necessary to function in various roles. Historically the literacy levels of students who are deaf have been very low. Approximately 20 percent of deaf students graduate from high school at or below second grade reading levels. The written expression of these students is also very low when compared to their hearing peers. Promoting the literacy development of students who are deaf is a highly valued objective. The instructional practices, methods, and strategies should reflect the special needs of the hearing impaired. Thus this study identifies the best early literacy practices and assesses their implication with deaf children.

ARTERIAL STIFFNESS IN ADOLESCENTS EITH TYPE II DIABETES AT RISK FOR CARDIOVASCULAR DISEASE (CVD)

Ervin Coburn [1]*, Bruce Alpert [2], Rachel Beecham [1], [1]Mississippi Valley State University, Itta Bena, MS 38941 and [2]University of Tennessee Health Science Center, Memphis, TN 38163

In western societies, atherosclerotic cardiovascular disease is the leading cause death in adult population. One complication of obesity that is associated with cardiovascular disease (CVD) includes Type II diabetes. Most children with type II diabetes are overweight or obese. In fact, studies prove that 85 percent of type II diabetics are considered overweight or obese. This study wanted to prove that type 2 diabetic adolescents' pulse wave velocity (PWV) was faster than that of healthy adolescents. The PWV appears to be the strongest predictor of cardiovascular mortality by measuring arterial stiffness. The method of the study was to recruit blacks, whites, and hispanics that were type 2 diabetics. We gave questionnaires to screen for personal health and family health history, recorded BMI, and measured PWV with Colin Medical Instrument VP-1000 Vascular Profiling System by placing BP cuffs on all four extremities, ECG on both wrist, and a phonocardiographic microphone over the precordium. The results were inconclusive and the goal that was set was not reached by the end of the study. Full statistical analysis are yet forthcoming and we are hoping that the hypothesis stand true. The study should reveal whether data collected are significant. The study is hope to also prove that non-invasively measurements of PWV is an excellent screening tool for both diabetes and CVD and that it will help design investigations on whether reducing BMI in obese patients slows PWV.

EXAMINING TRAUMA-INDUCED CLINICAL COMPLICATIONS IN THE CONTEXT OF SOCIAL AND HEALTH DISPARITIES

Brandon Newsome [12]*, Xinchun Zhou [2], James Hamilton [2], Jake Olivier [2], and Olga McDaniel [2], [1]Murrah High School,Jackson, MS 39202 and [2]University of Mississippi Medical Center, Jackson, MS, 39216

Traumatic injuries often become a life altering and threatening event. The outcome however, depends on the strength of the individual's immune response to the injury. In posttraumatic injuries, the systemic inflammatory response syndrome (SIRS) often leads to clinical complications such as sepsis, multiple organ failure and death. An individual's genetic make up and social and health disparities are influential factors in the overall outcome. Our previous studies demonstrated the presence of multiple gene markers associated with sepsis at posttraumatic injuries. Here, we have tested the hypothesis that existing social and health disparities might have impact on post injury clinical outcome. Two hundred thirty African American (AFAM) and Caucasians (CAU) patients were studied. Health disparity data (HDD) including diabetes, hypertension, and social habits (smoking, drinking and drug abuse) as well as patient's education and the employment status were assessed. Overall, presence of sepsis and SIRS were inversely associated with age group in AFAM patients. There was a 2-fold increase in the presence of sepsis in AFAM patients >35 compared with <35. Frequency of sepsis was the same in both AFAM and CAU at age >35, but was increased 1.8-fold in CAU patients as compared with AFAM at age <35, $p<0.006$. Thus, factors beyond HDD influence posttraumatic clinical outcome.(Supported in part by the Howard Hughes Medical Institute and Project EXPORT-Jackson Heart Study

THE EFFECTS OF SYNTHETIC BONE GRAFTING MATERIALS ON THE VIABILITY AND MORPHOLOGY OF MG-63 OSTEOBLAST LIKE CELLS

Mark Barron*, James Woodall, Jr., Michelle Tucci, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Bone grafting has become a routine addition to fixation of many types of complex fracture patterns. Several synthetic bone grafting materials are currently used. The objective of this study was to evaluate the effect that these synthetic materials have on the body's capability to produce bone. The three synthetic grafting materials tested were tricalcium phosphate, zinc calcium phosphate, and pro-Osteon. The MG-63 cell line that was used is a human osteoblast like cell. The cells were tested for compatibility and resorbability. Measurements of calcium and alkaline phosphatase were taken at regular intervals over a 15 day period. Histological analysis was performed at the end of 15 days to evaluate cellular activity, osteocalcin level, and Collagen I. Our findings suggest that the cells show similar levels of osteogenic activity in all groups. However, the pro-Osteon treated cells resulted in bone cell formation only on the interior of the graft. The ceramic capsules resulted in formation of bone cell layers throughout the entire grafting material. All materials seem to be osteoconducive. However, the different patterns of bone formation within the materials will determine which is better suited as a bone grafting agent.

MONITORING FLEA CONTROL INSECTICIDE (CHLORPYRIFOS, TETRACHLORVINPHOS, AND PERMETHRIN) EXPOSURE LEVELS FROM THE FUR OF TREATED DOGS

Michael Davis*, Mississippi State University; Mark Russak, Mississippi State University, Mississippi State, MS 39762; John W. Tyler, Mississippi State University, Mississippi State, MS 39762; J. Scott Boone, Mississippi State University, Mississippi State, MS 39762; Matthew K. Ross, Mississippi State University, Mississippi State, MS 39762; Janice E. Chambers, Mississippi State University, Mississippi State, MS 39762

Pet owners have relied heavily upon both organophosphorus (OP) and pyrethroid insecticides for control of fleas and other pests of pets, thus leading to potential insecticide exposures in children. In the present study, pet dogs were treated with over-the-counter flea collars containing the OP insecticides chlorpyrifos (CP) or tetrachlorvinphos (TCVP), or a spot treatment with permethrin (PER), a pyrethroid insecticide. Transferable insecticide residues were quantified on cotton gloves used to pet the dogs, and on cotton t-shirts worn by a child. First morning urine samples were also obtained from adults and children for metabolite quantification. Transferable residues were highest near the neck of the dogs and were lowest in areas most distant from the neck for all of the insecticides. Three weeks after application, the average amounts of CP and TCVP transferred from fur of the neck (treated area) to a glove were 447 ± 57 and 15,788 ± 2194 µg/glove, respectively, and the average amounts of CP and TCVP transferred from the fur of the back to a glove were 8 ± 16 and 82 ± 32 µg/glove, respectively. The average amount of PER transferred to a glove from the fur of the neck (treated area) 4 hours post application was 24,521 ± 7,382 µg/glove while the average amount transferred at 20 days post application was 509 ± 274 µg/glove. T-shirts worn by the child on the day following application showed levels in ng/g shirt of 134 ± 41, 1692 ± 657, and 8297 ± 3421 for CP, TCVP, and PER, respectively. There were no significant differences between adults and children in the levels of urinary metabolites of CP; however, children typically had somewhat higher urinary levels of metabolites than adults. (Supported by EPA R828017)

SEASONAL VARIATION IN ANTI-CCV SERUM ACTIVITY IN CHANNEL CATFISH: IMPLICATION FOR BROODSTOCK SCREENING

Yonas Habte [1]*, and N. Chatakondi [2], Larry A. Hanson [1], [1]Mississippi State University, Mississippi 39762 and [2]Eagle Aquaculture, Pike Road, Alabama 36064

Channel catfish virus (CCV) is the etiological agent of channel catfish disease (CCVD), a fatal hemorrhagic viremia of *Ictalurus punctatus* fry. Using diagnostic real time PCR, we found up to 90% prevalence of latent CCV infection in sac-fry produced from carrier broodstocks; indicating high level of vertical transmission. Control of CCVD would therefore necessitate culling of carrier broodstocks. Serum neutralization index (SNI) assay and PCR have been suggested to be useful methods for broodstock screening. However, the effectiveness of these techniques have not been adequately evaluated. Screening of broodstocks by PCR and SNI assay in May 2004 and subsequent rearing of the fry lead to an outbreak of CCVD in 11.1% of CCV negative tanks. Re-evaluation of the broodstocks in October by SNI assay, and comparison to the May data demonstrated significantly higher titers. The results clearly indicate a better detection of CCV specific antibodies in October. In May, 4.2% of the broodstocks had SNI within the "CCV positive" range; compared to 40% in October. The same trend was observed in 2005. This suggests that virus expression is occurring in the summer in adult fish and implies that screening of broodstocks by CCV specific serology should be conducted in the fall.

BUTORPHANOL-INDUCED NEURONAL ACTIVATION WITHIN THE PARAVENTRICULAR NUCLEUS (PVN) OF THE HYPOTHALAMUS AND RESULTING ACTIVATION OF THE HYPOTHALAMIC-PITUITARY-ADRENAL (HPA) AXIS

George Howell [1]*, Melissa Parker [1], Ryan Veach [1], and Deandria Magee [2], Rob Rockhold [1], [1]University of Mississippi Medical Center, Jackson, MS 39216 and [2]Tougaloo College, Tougaloo, MS 39174

The present study seeks to determine the *in vivo* dose-response relationship between intravenous butorphanol administration and neuronal activation within the PVN and activation of the HPA axis. In addition to dose-response relationships, the role of the kappa opioid receptor (KOR) subtype in butorphanol-

induced neuronal activity within the PVN was explored. To determine the dose-effect relationship between butorphanol and PVN neuronal activity, butorphanol (0.1, 1.0, or 10.0 mg/kg) was administered and neuronal activity assessed by c-Fos immunoreactivity. Administration of butorphanol resulted in significant, dose-related increases in the number of c-Fos immunoreactive cells, percentage of c-Fos immunopositive cell area, and plasma corticosterone levels compared to vehicle. c-Fos expression within the PVN was positively correlated with increases in plasma corticosterone. The role of the KOR in butorphanol-induced PVN neuronal activation was explored by intracerebroventricular administration of nor-binaltorphimine (nor-BNI), prior to butorphanol (10 mg/kg) administration. Nor-BNI (20 μg) pretreatment did not reduce either butorphanol-induced c-Fos expression within the PVN or plasma corticosterone increases. However, nor-BNI (35 μg) pretreatment significantly reduced butorphanol-induced c-Fos expression within the PVN. Our results indicate acute administration of butorphanol elicits dose-related increases in neuronal activity within the PVN which is associated with activation of the HPA axis. Butorphanol-induced neuronal activity within the PVN is mediated by the KOR in the central nervous system.

SELECTIVE HUMAN MELANIN-CONCENTRATING HORMONE RECEPTOR 1 AND MELANIN-CONCENTRATING HORMONE RECEPTOR 2 ANTAGONISTS FOR THE TREATMENT OF METABOLIC DISEASES

Joshua Swan*, Alexander Quesenberry*, Mitchell Avery, and Ziaeddin Shariat-Madar, University of Mississippi, University, MS 38677

Melanin-concentrating hormone (MCH) is an appetite regulating neuropeptide highly expressed in the lateral hypothalamic area and the zona incerta. MCH regulates energy balance and feeding behavior as well as the modulation of cardiovascular and metabolic processes. These physiological functions are mediated by melanin-concentrating hormone receptor 1 (MCHR1) and melanin-concentrating hormone receptor 2 (MCHR2) in the G protein-coupled receptor family. Our goal here was to screen our in-house synthesized compounds to discover potent and selective inhibitors of human MCHR1 and MCHR2 receptors. Chinese hamster ovary (CHO) cells transfected with MCHR1 or MCHR2 receptor will be incubated with ^{125}I-MCH or biotinylated MCH in the absence or presence of synthesized compounds to determine and evaluate for MCHR1 and MCHR2 antagonist properties. The binding of ^{125}I-MCH to CHO cells stably expressing MCHR1 or MCHR2 will be determined. The pharmacological and physiological effects of MCH at MCHR1 and MCHR2 will be assessed by intracellular signaling and radioligand binding assays. In sum, we anticipate that this information may lead to the development of improved medications for cardiovascular and metabolic disorders in which these receptors have been compromised.

DEVELOPMENT OF A MODEL FOR ALCOHOLIC LIVER DISEASE

Veronica Levison [1] Rodney C. Baker [2] Keila Brown [3], Stanley V. Smith [2], Christine A. Purser [2], Tina G. Smith [2], Stanley V. Smith [2], and Michelle Tucci [2], [1]Alcorn State University, Alcorn State, Mississippi, 39096, [2]The University of Mississippi Medical Center, Jackson, MS 39216, and [3]Tougaloo College, Tougaloo, MS 39174

Introduction: Development of alcoholic liver disease in animal models has proved to be difficult, primarily because most experimental animals do not readily drink alcohol (ethanol). Purpose: Establish conditions under which zebrafish could be treated with ethanol continuously, and find methods suitable for histological examination of zebrafish liver morphology. Procedure: Test fish were placed in a 50 mM ethanol solution, controls were placed in a similar environment 22 C or 26 C with exception of ethanol in the aquarium water. Water samples were taken daily for ethanol measurements. The behavior of the fish was monitored and water samples taken for ethanol determination.. Fish were sacrificed at various time points and used to develop histology methods. Results: Both treated and control fish held in water at 22ºC stopped eating. The swimming and schooling behavior of zebrafish was not significantly altered by one week of treatment at 22ºC. The fish held at 26ºC exhibited normal feeding and swimming behavior. The control and treatment groups were not significantly different for approximately the first 30 days of treatment. After 45 days of treatment the fish started swimming in a more random manner and did not display normal schooling behavior. Conclusion: This study demonstrated that zebrafish can be treated with 50 mM ethanol for up to 2 months without extensive morbidity. After extended treatment ethanol treated fish consumed food slower than controls, and the normal schooling behavior is disrupted. Methods normally used to prepare histological specimens must be modified to obtain good quality zebrafish histology specimens.

INTRAOPERATIVE EVALUTION OF FEMORAL HEAD VASCULARITY DURING OPEN REDUCTION AND INTERNAL FIXATION OF ACETABULAR FRACTURES

James Woodall, Jr. [1], Barnaby Dedmond [2], Scott Wingerter [1], Robert Reddix [2], Ben Jackson [2], Steven Flores [2], Brenda Kulp [2], and Lawrence X. Webb [2], [1]University of Mississippi Medical Center, Jackson, MS 39216 and [2]Wake Forest University Baptist Medical Center, Winston-Salem, NC 27157

This study was designed to investigate the link between the amount of bleeding observed intra-operatively when the femoral head was drilled and the subsequent progression to avascular necrosis. This technique could be used diagnostically to establish a protocol for patients that are at increased risk of progression to avascular necrosis. This would give the surgeon an opportunity to initiate a more vigilant post-operative follow up plan with serial MRI and physical exams, or even an early

intervention. Diagnosis of avascular necrosis at an early stage before collapse of the femoral head would give the surgeon a chance to perform core decompression or free fibular graft at that time. A retrospective review of all patients undergoing internal fixation of acetabular fracture from August 1996 to April 2005 was performed. The surgeon used a 3.5 mm Kirschner wire to drill a hole off of the weight bearing axis of the femoral head of each patient. The results were dictated in the operative note (did not bleed, bled poorly, bled freely). All patients who had greater than twelve months of follow up were included, resulting in seventy-one patients with an average follow up of 32.5 months. The results of this review showed that 2 of the 9 patients (22.2%) that "did not bleed" progressed to avascular necrosis. Three of the thirteen patients (23%) that "bled poorly" progressed to avascular necrosis, and 5 of the 49 patients (10%) that bled freely progressed to avascular necrosis. These results indicate that patients with femoral heads that "did not bleed" or "bled poorly" were more than twice as likely to progress to avascular necrosis as patients that "bled freely". These preliminary findings are impressive, and warrant a prospective randomized control trial to determine is intervention is beneficial at the time of primary surgery.

COMPARISON OF WATER SOLUBLE AND LIPID SOLUBLE ANTIOXIDANTS AS SCAVENGERS IN A HYPOXANTHINE-XANTHINE-OXIDASE AND LIPID RADICAL GENERATING SYSTEMS

Omonuwa Adah *[1], Michelle Tucci [2], and Hamed Benghuzzi [2], [1]Mississippi College, Clinton, MS 39058 and [2]The University of Mississippi Medical Center, Jackson, MS 39216

The aim of the study was to investigate the reactive oxygen species (ROS) production in the hypoxanthine-xanthine-oxidase (HX-XO) and lipid free radical (LOO-) systems by using various concentrations of ROS scavengers, such as vitamin E, vitamin C, green tea, thymoquinone, and Tannic Acid to determine the concentrations of radical scavengers that are effective against intracellular (HX-OX) and cellular membrane radical (LOO-) damage. Various doses of antioxidants were evaluated at 1, 4 and 24 hours two different radical generating systems. In the lipid radical generating system we hypothesized that vitamin E and thymoquinone would protect against radical formation in a dose dependent manner and for a longer period of time. In our assay system, vitamin E and thymoquinone were more effective in squelching radicals at 1 and 4 hours, but were not able to sustain the protection at 24 hours. The water soluble compounds, vitamin C, green tea, and tannic acid were more effective in squelching radical formation after 24 hours when compared with control and lipid soluble compounds. The HX-XO pathway has been implicated as an important route in the oxidative injury to tissues, and is a source of oxygen free radicals. In our HX-XO assay system we found that green tea was most efficient at squelching radicals followed by thymoquinone and vitamin E in both a dose and time dependent manner. Tannic acid was not effective in eliminating radical formation after 4 hours and vitamic C was only effective at the initial time point. This information is important for the development of antioxidant regimes for use in the clinical setting.

HISTOLOGICAL AND RADIOGRAPHIC COMPARISON OF ALLOGRAFT SUBSTITUTES USING A CONTINUOUS DELIVERY MODEL IN SEGMENTAL DEFECTS

Tyler Marks *, Scott Wingerter, James Woodall, Jr., Laura Franklin, Michelle Tucci, George Russell, Rameesh Patel, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS, 39216

Demineralized bone matrix (DBM) has been shown to possess osteoinductive capability and one of the specific bone morphogenetic proteins (BMPs) found within DBM that has been attributed with this osteoinductive ability is osteogenic protein-1 (OP-1). The specific aims of this study were (1) to compare the treatment of segmental bone defects with OP-1 and DBM in a rat femur model and (2) to determine the effects of the two treatments given at high and low doses via sustained release drug delivery. Animals in Group 1 acted as the control and Group 2 had a created segmental defect with plating and placement of a calcined tricalcium phosphate lysine (TCPL) capsule containing antibiotic (sham). Group 3 and 4 animals had a created segmental defect and received a TCPL carrier containing antibiotic along with DBM or OP-1, respectively. After 2 and 4 weeks post-implantation, 5 animals in each group were sacrificed before the retrieval of the bone. The femora were analyzed radiographically and histologically for bone growth. Analysis of the gross specimens showed considerable bone regeneration at low and high doses for both DBM and OP-1 when compared to the shams. At low levels bone regeneration between DBM and OP-1 was very similar. However, at high doses, OP-1 was shown to cause bone overgrowth with a greater curvature and an increased thickness of the distal and proximal ends of the femur. The stained slides showed the defects treated with DBM and OP-1 to be bridged with lamellar and woven bone that was continuous with the original bone. Histologically, the experimental femurs demonstrated natural remodeling processes with new osteons and angiogenesis.

COMPARISON BETWEEN THE EFFECTS OF MEVINOLIN, ALENDRONATE, AND PARATHYROID HORMONE ON MG63 OSTEOBLAST-LIKE CELLS

Laura Franklin*, Joyce Belcher, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

Increasing osteoblast activity in an anabolic fashion may offer an ideal therapeutic treatment for various orthopedic complications including osteoporosis. The purpose of this study was to evaluate the effect of mevinolin, a clinical statin drug, and alendronate, a bisphosphonate, on osteoblast function (MG63 Cell Line) and compare its mode of action with the conventionally utilized parathyroid hormone (PTH). MG63 cells were treated with different concentrations (control, low (100nM),

medium (1uM), and high (10uM)) of mevinolin, alendronate, or parathyroid hormone. The cells were incubated for 24, 48, and 72 hours at 37°C in a 95% air and 5% CO2 environmental chamber. Data obtained in this study revealed that: (I) there were significant decreases in cell number after 24 hours upon the exposure of medium and high doses of mevinolin, but cells rebounded back toward control after 48 hours and were similar in number at 72 hours, (II) there were increases in cell number upon the exposure of medium doses of alendronate for 24 and 48 hours, but a decrease in cell number occur during 72 hours for low, medium, and high dose levels of alendronate, (III) there were no significant changes in calcium activity observed for mevinolin and alendronate. However alkaline phosphatase activity for alendronate showed lower levels compared to mevinolin and the greatest increase in activity occurred during 24 and 48 hours with the low and medium doses. Mevinolin showed no significant changes in alkaline phosphatase activity throughout the study. The concentrations (100nM and 10uM) of mevinolin and alendronate used did not trigger the differentiation process of the cells throughout the experimental phases. This observation led us to suggest that the reason for such an outcome could be attributed to the lack of a response in calcium production or alkaline phosphatase activity.

ANALYSIS OF PESTICIDE EXPOSURE AND RISK OF BREAST CANCER MORTALITY IN MISSISSIPPI

Elgenaid Hamadain [1]*, Ibrahim O. Farah [2], and Mohamed H. Abdalla [2], [1]University of Mississippi Medical Center, Jackson, MS 39216 and [2]Jackson State University, Jackson, MS 39217

Breast Cancer is the most common form of cancer among women in the United States. Established risk factors include advancing age, early menarche, late menopause, positive first relative, late age at first birth and socioeconomic status. According to the American Cancer Society, breast cancer case estimates were at 2,480 with 460 deaths for the year 2004 in Mississippi State. Mississippi State has a combination of risk factors making it suitable for studying the pathways of breast cancer etiology. The purpose of this study was to analyze the role of pesticide exposure as a risk factor for breast cancer mortality in Mississippi women. Data for this study consisted of secondary analyses of the Mississippi age-adjusted breast cancer mortality aggregated by two periods (1970-1994 & 1996-1999) and total number of acres of planted crops (as a proxy for pesticide exposure) for 1997-2001. Descriptive statistics, Spearman and Pearson correlations and geospatial analysis (GIS) by State Economic Area (SEA) were used for the analysis. Significant correlation between pesticide exposure and breast cancer mortality was detected in several SEAs. The total number of acres planted was positively associated with female cancer mortality and this association differed by race. Significant linear associations were found between level of pesticide exposure (acres planted) and breast cancer mortality rate in Mississippi women per SEA for both periods of study (1970-1994 and 1996-1999). We conclude that there were moderate statistically significant correlations between number of acres planted, type of crops and mortality rate of breast cancer in Mississippi women. Our findings may well relate to the pesticide bioaccumulation hypothesis

ASSOCIATION OF MRI-DEFINED SUBCLINICAL CEREBROVASCULAR DISEASE AND TRANSIENT ISCHEMIC ATTACK-STROKE SYMPTOMS: THE ARIC STUDY

Kenneth Butler*, Thomas H. Mosley, Jr., and Alan D. Penman, University of Mississippi Medical Center, Jackson, MS 39216

The purpose of this study was to examine the association between prevalent subclinical cerebral abnormalities identified by MRI and self-reported stroke and transient ischemic attack (TIA) symptoms in a large population-based cohort. During the third ARIC clinic visit, 1,934 of 2,821 cohort members aged 55 years and older at the Forsyth County, NC and Jackson, MS field centers were eligible for cerebral MRI examination, in addition to regular clinic examinations. MR images were evaluated for the presence and location of infarcts > 3mm in size and white matter hyperintensities (WMHs), and ventricular and sulcal size. TIA/stroke symptoms were assessed using a standardized questionnaire, and an algorithm was used to classify TIA/stroke symptoms as positive or negative. After excluding those with missing data or prevalent stroke, data were available for analysis on 1,278 persons. Infarct-like lesions were found in 145 persons (11%), including 111 with subcortical (lacunar) infarcts and 34 with cortical infarcts. WMHs were found in 150 (12%) study participants. High ventricular size was found in 211 (17%) participants, and high sulcal size was observed in 374 (29%). A history of TIA/stroke symptoms was reported by 112 (9%) persons. The adjusted prevalence odds ratio (OR) of having TIA/stroke symptoms was 1.9 (95%CI, 1.2-3.2) for persons with any infarct, increasing to 4.7 (95%CI, 1.3-16.4) in those with 3 or more infarcts. The adjusted prevalence ORs for persons with WMHs, high ventricular size, and high sulcal size were 1.7 (95%CI, 1.0-2.9), 1.3 (95%CI, 0.8-2.2), and 0.9 (95%CI, 0.6-1.5), respectively. Persons with both infarct and WMHs had an adjusted prevalence OR of 3.0 (95%CI, 1.3-6.5) for having TIA/stroke symptoms. In this population based middle-aged and young elderly cohort free of prevalent stroke at baseline, subclinical infarcts and WMHs detected by MRI are not always asymptomatic. These common changes in brain morphology are not necessarily benign.

THE EFFECTS OF SUSTAINED DELIVERY OF CORTICOSTEROIDS ON THE ADRENAL GLAND OF FEMALE RATS

Tamika Taylor [1]*, Vanessa Price [1], Steven Farris [2], Hamed Benghuzzi [1], and Michelle Tucci [1], [1]University of Mississippi

Medical Center, Jackson, MS 39216 and [2]Belhaven College, Jackson, MS 39216

The role of stress hormones on the structural and functional capacity of multiple organs has not been well defined. The objective of this investigation was to morphometrically evaluate the effect of sustained delivery of corticosteroids for periods of 28 days to adult female rats. Twelve animals were divided equally into three groups. Animals in Group I were implanted with TCP delivery capsules containing supraphysiological levels of corticosterone (50 mg). Animals in group II were implanted with an empty TCP capsule and served as operated and drug delivery device control (SHAM). Animals in group III were not implanted with TCP devices and served as control. Surgical techniques were performed following standard lab protocols. Body weights were collected weekly, and at the end of 28 days the adrenal glands were harvested, fixed, embedded, sectioned and stained with hematoxylin and eosin. The 5mm sections were subjected to qualitative and quantitative evaluations using Image Pro Digital Analysis System. Data revealed no differences in body weights or vital and reproductive organ wet weights after 28 days of treatment when compared to sham and control animals. Histopathological evaluation of the tissue suggests atrophy in the zona glomerulosa in animals treated with corticosterone. The area most affected is responsible for the secretion of mineralocorticoids. The data suggests the interaction of corticosteroid with mineralcorticoid receptors with the adrenal gland as well as suggest adrenal suppression by cortisol.

DOES YOUR IMMUNE SYSTEM HAVE STIPES? INVESTIGATING THE SIMILARITIES AND DIFFERENCES BETWEEN THE IMMUNE SYSTEM OF MAN AND ZEBRAFISH

Claudia Hohn* and Lora Petrie-Hanson, Mississippi State University, Mississippi State, MS 39762

Zebrafish share many orthologous genes with mouse and man. Studies have identified several regions of the zebrafish and human genome that encode the same (or similar) genes. Definitive blood cell lineages in zebrafish show a high degree of morphological similarity to mammalian counterparts. Gene expression studies and functional studies have indicated the general mechanisms of hematopoietic development and effector cell functions are likewise conserved. The similarities of these features and developments in the cell biology and functional genomics of zebrafish are making this model increasingly more attractive for immunobiological investigations. But the differences may also further our understanding of immunology. Zebrafish possess at least one unusually large family of putative immune genes, novel immune-type receptor genes (NITRs), for which a corresponding mammalian ortholog is not evident. Although the precise functions of NITRs are not yet known, it is likely that their membrane disposition and signaling are equivalent to other activating/inhibitory leukocyte regulatory receptors, like the mammalian natural killer (NK) cell receptors. NITRs could be evolutionary precursors of NK cell receptors, enhancing our understanding of mammalian innate immunity. Specific pathogen free (SPF) zebrafish are propagated and reared in the Mississippi State University College of Veterinary Medicine's fish hatchery. Mutant zebrafish lines are utilized to study innate immunity and the pathogenesis of channel catfish diseases. Wild-type zebrafish are available to researchers upon request.

THE EFFECTS OF FRUCTOSE-1,6-BISPHOSPHATE ON CELLULAR ATP LEVEL AT REDUCED OXYGEN LEVELS

Derrick Huang *[1], Ameze Adah [1], Michelle Tucci [2], and Hamed Benghuzzi [2], [1]University of Mississippi, University, MS 38677 and [2]University of Mississippi Medical Center, Jackson, MS 39216

Background and significance: Fructose-1,6-bisphosphate (FDP) is a glycolytic intermediate that has been used to protect tissues in various hypoxic and ischemic conditions. Under ischemic conditions where ATP levels are much lower than normal, bypassing the initial steps of glycolysis offers protection by allowing the cell to produce ATP without expending energy. Hypothesis: Exogenously added fructose-1,6-bisphosphate to MRC-5 fibroblast cells under ischemic conditions will maintain cellular ATP levels and ultimately allow cells to proliferate in a similar manner to untreated cells maintained at ambient air. Objectives: (1) To provide increasing concentrations of fructose-1,6-bisphosphate for 24, 48, and 72 hours under ischemic and ambient conditions and compare growth characteristics of cells under the similar conditions, and (2) To evaluate the cellular ATP levels at each time period following ischemia. Results: Under ambient conditions, FDP increased cell umber in a dose dependent fashion at 24 hours. Cell number was similar at 48 and72 hours. Cellular glutathione levels were decreased in all treatment groups as early as 24 hours, and MDA was increased in the medium and high dose treatment group for the duration of the study. Under ischemic conditions, FDP reduced cell numbers by 50% in the medium and high dose group at 24 hours. Cell numbers were not different at 48 and 72 hours of treatment. Cellular glutathione levels were not significantly different from control. Cellular MDA levels were increased in the medium and high dose levels. Cellular ATP levels were maintained in the fructose 1,6-bisphoshate treated cells in a dose dependent manner. Conclusions: Overall FDP was able to protect cellular glutathione levels and ATP levels under ischemic conditions. Increasing concentrations of FDP regardless of oxygen concentration resulted in increased evidence of cellular damage.

THE EFFECT OF DAKIN'S SOLUTION ON COLLAGEN AND CELL MIGRATION

Roshada Bozeman [1], Ryan Claire Propst [2], and Annette B. Wysocki [2], [1]Tougaloo College, Tougaloo, MS 39174 and [2]University of Mississippi Medical Center, Jackson, MS 39216.

Open chronic skin wounds are colonized with bacteria that can lead to subsequent infection. The use of Dakin's

solution, a topical antiseptic, on chronic open skin wounds remains controversial in clinical care because of its reported damaging effects. However, the effect of Dakin's solution on collagen and cell migration remains open to further investigation. Here we tested four different formulations of Dakin's solution, 0.5% (full strength), 0.25%(half-strength), 0.125% (quarter strength) and 0.0125% (diluted strength), to determine if it degrades collagen or impairs cell migration that may lead to delayed wound healing. To do this we first added varying amounts of Dakin's solution to acid solubilized type I collagen, with and without serum, at two different time points that were then mixed. Subsequently we used 8% sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE) to determine the extent of degradation using colorimetric detection with Coomassie stain to visualize the collagen. Our results indicate that the 0.0125% Dakin's solution resulted in little or no collagen degradation compared to higher concentrations, where collagen was either completely or partially degraded. Likewise, cell migration was completely inhibited using the 0.5% Dakin's solution compared to the 0.0125% solution where cells were still able to migrate. Furthermore, we noted that serum had a protective effect for both collagen degradation and cell migration and that time exposure was a factor in our collagen degradation experiments. Thus, we conclude that there is a dilution, serum, and time effect that can be used to attenuate the effect of Dakin's solution on collagen degradation and cell migration. (Supported by a fellowship from the Mississippi Functional Genomics Network).

ANALYSIS OF THE 16S-23S INTERGENIC SPACER REGION OF FLAVOBACTERIUM COLUMNARE

Lorelei Ford [1]*, Brian Scheffler [2], Esteban Soto [1], Mark Lawrence [1], and Larry A. Hanson [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]United States Department of Agriculture, Stoneville, MS 38776

The 16S, 23S, and 5S ribosomal RNA (rRNA) genes are highly conserved sequences in bacteria. For this reason, rRNA genes are often used for phylogenetic classification. On the other hand, the regions between the structural sequences, known as intergenic spacer regions (ITS) are under less evolutionary pressure to be conserved. Because they are not as highly conserved, they can be used to differentiate strains of the same bacterial species. The purpose of this study was to evaluate the 16S-23S ITS of Flavobacterium columnare, an important pathogen of catfish, by comparing of the sequences from 70 isolates. We developed two PCR assays that amplify overlapping regions of one large previously identified ITS. The primers targeted the 16s sequence and isoleucine tRNA and the 23s sequence and alanine tRNA. The PCR products were cloned and sequenced. We also targeted pulse field gel electophertically-separated, I-CeuI restriction fragments from the ATCC type strain. We found that the genome of this species harbors at least 2 intergenic spacer regions that are very similar and contain the same tRNA encoding sequences. This suggests that earlier studies that used the ITS for distinguishing between strains of Flavobacterium columnare may be comparing sequences from different structural RNA operons and thus have misleading data.

THE EFFECTS OF DEFEROXAMINE ON THE SURVIVAL OF FREE FLAPS USING THE ADULT MALE RAT AS A MODEL

Nicholas Longstreet [1]*, Sheila Lindley [2], Hamed Benghuzzi [2], Michelle Tucci [2], Feng Zhang [2], Steven Longstreet [2], and Michael Angel [2], [1]College of William and Mary, Williamsburg, VA 23187 and [2]University of Mississippi Medical Center, Jackson, MS 39216

The ability to transfer tissue based on microvascular anastomoses has created a revolution in reconstructive surgery. Patients whose injuries and tissue defects had been considered unsalvageable can now be rescued by the appropriate free-tissue transfer. However, secondary ischemia is a serious problem for the survival of a free flap after transfer. In order to improve the flaps tolerance to secondary ischemia, deferoxamine, a powerful iron chelator and free radical scavenger was administered following three hours of secondary ischemia. Sprague Dawley rat were used as a model for the study. Epigastric island flap was isolated and raised in the right groin area. Primary ischemia was induced for one hour. Twenty four hours later, a secondary ischemia by venous occlusion was performed for three hours. The flaps were clinically evaluated at five days and tissues were collected after fourteen days, fixed, embedded, sectioned, and stained using rigorous staining methods to qualify the health of the flap. The flaps were stained with H&E to characterize the cells present within the tissue. Additional immunostains methods using antibodies against T-cells (to indicate immune response and rejection of transplant tissue), presence of fibrosis, and inflammatory cells were also evaluated. The findings showed administration of deferoxamine showed a trend in the both the reduction of CD 40 which indicates fibrosis and CD 28 which is indicates lack of flap rejection compared with the saline control. The levels of inflammatory cells were not different between the two groups. Overall, the findings of this study were intriguing and suggest that additional experiments on length of secondary ischemia need to be performed to further characterize the importance of reactive oxygen species on flap survival.

THE EFFECTS OF MULTIPLE RADIATION EXPOSURE TO MRC-5 FIBROBLAST CELLS IN CULTURE

Pamala Jones [2]*, LaToya Richards [1], Hamed Benghuzzi [1], and Michelle Tucci [1], University of Mississippi Medical Center, Jackson, MS 39216 and [2]University of Southern Mississippi, Hattiesburg, MS 39406

The primary mechanism of biological damage to macromolecules from ionizing radiation is an indirect interaction

that begins with the radiolysis of water. The event is a cascade of chemical transformations that result in the formation of free radicals. Free radicals are highly reactive particles that can indirectly harm DNA and cause cellular damage. The aim of this study was to assess cell proliferation and structural integrity of the fibroblast by evaluating the MRC-5 cells morphologically after multiple exposures to ionizing radiation. Following multiple exposures (2, 3, or 4 times) with a single dose of X-radiation (10Gy), the cells were harvested at 24, 48 and 72 hours. An interesting finding occurred with 3(X) and 4(X) exposure to a dose of 10 Gy. With 3(X) exposure, the cell number decreased after 24, 48 and 72 hours. However, after 4(X) exposure, the cell number increased after all durations. Data analysis revealed that there was a statistically significant difference in the mean values between the treatment groups and the control ($p=<0.001$) for all durations. The cells exposed to 2(X) the radiation dose, demonstrated swelling, pleomorphism, and the nucleoli which were not as prominent as the groups exposed 3(X) and 4(X) to a dose of 10Gy. After 72 hours the group receiving 2(X) radiation dose revealed a characteristic owl eye nucleoli, usually seen after radiation exposure. After 3(X) and 4(X) the cells showed hydropic swelling and pleomorphism with multiple nucleoli present; however, after 72 hours, the cells receiving 4(X) the radiation dose of 10 Gy showed more cells that were spindle shaped with significantly less damage than 24 and 48 hours. These findings showed significant effects caused by free radicals generated from X-radiation.

IMMUNIZATION WITH PSPA INCORPORATED INTO A POLY(ETHYLENE OXIDE) MATRIX ELICITS PROTECTIVE IMMUNITY AGAINST *STREPTOCOCCUS PNEUMONIAE*

Quincy Moore [1]*, Lashundra Johnson [1], Michael Repka [2], and Larry S. McDaniel [2], [1]University of Mississippi Medical Center, Jackson, MS 39216 and [2]University of Mississippi, University, MS 38677

Vaccine delivery is an important issue especially if the delivery system can augment the immune response and does not require an injection. Novel vaccine delivery systems will likely lead to broader acceptance of vaccines. We used our pneumococcal immunization/ challenge model to examine the ability of a poly(ethylene oxide) matrix incorporated with PspA to deliver the antigen and modulate a protective immune response. The matrix containing PspA was implanted subcutaneously in CBA/N mice for direct comparison to subcutaneous injection of the antigen. Mice were boosted with a second implant at two weeks. One week later, sera were collected from the mice, and the mice were challenged with a lethal dose of Streptococcus pneumoniae. All of the mice that receive PspA in the matrix survived pneumococcal challenge and had serum-specific anti-PspA antibody levels statistically higher than mice receiving PspA alone ($p<0.005$). We also demonstrated in western blot analysis that the immune serum was reactive to PspA of several pneumococcal strains. As a proof of concept, our data indicate that PspA can be incorporated into the matrix and the matrix has the potential to be a novel vaccine delivery system.

2:15 Divisional Business Meeting

HISTORY AND PHILOSOPHY OF SCIENCE

Chair: Maritza Abril, University of Southern Mississippi

Vice-chair: John D. Davis, Jackson, MS

FRIDAY MORNING

Hunter Henry Executive Room 8

8:30 DOES SCIENCE CONTRIBUTE TO PEACE?

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

A difficult question indeed! The answer could be both yes and no. Which one is closer to the truth? Only an extremely enormous research, both in terms of time and cost, can settle that. For our purpose, let's focus on the two pertaining questions. Is it moral to seek and sustain peace? Does science contribute toward this effort? My aim here is simply to alert the scientists to the fact that what they do to advance knowledge can be sinful if it contributes to the absence of peace, provided that sustenance of peace is considered moral. Take nuclear energy. Its use for peaceful purposes will hardly be objected by anyone. But the extension of the associated science for nuclear bombs is undoubtedly divisive to humanity. Scientists engaged in fundamental research may not be able to judge whether their work will contribute toward peace or violence. But those researching in applied areas for military purposes could not claim their ignorance. With the recent emphasis on earmarked researching, both within and without the institutions of higher learning, on what is useful in a short-time frame, scientists need to be aware of what they investigate and whether or not their work is compatible with their "hearts". The basic question is whether scientists can and should influence the fruits of their work or should they take the backseat and let the policy makers, the society, and the politicians take charge.

9:00 CAN MATHEMATICS, COMPUTER SCIENCE, AND STATISTICS HELP US UNDERSTAND WHETHER FAITH AND REASON CAN INTERACT

Andrew Harrell, Vicksburg, MS 39180

In this talk we will look at a part of the recent discussion of theologians about science and religion. This part concerns how mathematics, computer science, and statistics might be able to present arguments that explain how faith and reason interact. In the book by William Demski, "No Free Lunch (NFL)" some of the mathematics and computer science in the two earlier papers by Wolpert and Macready have been used to support the authors\' philosophical, statistical arguments for the necessity of what is called "The intelligent design of the Universe". The question then comes down to whether there is an intelligent designer of our genome? However, in a later paper by the same two authors, they have given a mathematical counterexample to the key statement in Chapter 4 of the NFL book that the mathematical arguments there can deal with "the coevolving fitness schemes of Dr. Kaufmann". Does this mathematical result then invalidate Dr. Demski's philosophical/statistical conclusions?

9:30 THE STRUCTURE OF PHYSICAL OBJECTS AND THE *DESCARTES-MINUS* ARGUMENT

Michael Fitzgerald, Independent Scholar, Hattiesburg, MS 39402

A current debate in the philosophy of Physics and Biology is whether time or temporality is a proper 'part' of physical objects, just as a heart is a proper part of a human being. Those who claim the structure of physical objects or organisms is basically four-dimensional argue that time is a proper part of physical objects. So, time or one's temporal history is just as much a part of a human organism as its heart and brain. In contrast, those who claim the structure of physical objects or organisms is basically three-dimensional argue that time is not a proper part of such physical objects. The defenders of a four dimensional structure maintain that their view better accounts for the persistence of such physical objects through changes in its parts than does the rival view. To support their view, defenders of the four dimensional view have developed an argument, The *Descartes-Minus* Argument, which is designed to show that defenders of the three dimensional view run afoul of the logical law of the Indiscernibility of Identicals, i.e. (x)(y)(F) {(x = y) e (Fx / Fy)}. What I will show in the presentation is: 1) the nature and structure of the *Descartes-Minus* argument; and 2) how the defender of the three dimensional structure of such physical objects is not committed to running afoul of the Indiscernibility of Identicals. I ultimately conclude the *Descartes-Minus* Argument itself is insufficient to decide the case between the four-dimensional and three-dimensional views.

10:00 Break

10:15 THE *DAUBERT* TEST AND THE EVOLUTION OF AMERICAN LAW: MELDING LEGAL PRECENDENT WITH SCIENTIFIC DEVELOPMENT

Michael Dodge, University of Mississippi, University, MS 38677

The modern legal establishment is ever increasingly interested in science. Throughout most of the history of Anglo-American law, science received little attention, and was considered of almost negligible import. The Common Law relied on procedures established via centuries of judicial morphing and legislative vagaries. Unfortunately, most of this process occurred prior to or concurrent with what some call the scientific age—i.e., the late eighteenth century to the present. As the scientific method gained general acceptance with the American people, a problem developed when American law needed to incorporate concepts foreign to jurisprudence. The result was confusion, especially regarding the rules of evidence. To solve the problem, the courts turned to the philosophy of science, and the writings of Hempel, Popper, and others were analyzed for applicability to law. Falsifiability became sine qua non, and evidentiary tests were shaped to handle unique challenges. Initially, courts had difficulty interpreting science within the strictures of a legal context. *Daubert v. Merell Dow Pharmaceuticals, Inc*. introduced the attempt by the Supreme Court of the United States to more amiably integrate scientific evidence into the justice system. The legal profession relies on this test to ensure evolving concepts of justice are served. However, the question remains whether the dynamism of scientific knowledge may soon force the judicial system to again adapt itself. Philosophers may soon be needed to maintain the fragile communalism established by *Daubert*, and this presentation is designed to illicit possibilities for the future of science in American jurisprudence.

10:45 CLEMENTS VS GLEASON REVISITED

Robert Hamilton, Mississippi College, Clinton, MS 39058

Frederic Clements has long been criticized for taking a non scientific view of communities with his well known reference to communities as "superorganisms".However, looking at the historical development of ecology during Clements career, much of the attack on Clements seems unwarranted. Clements began his career seeking to make Ecology a science. When Clements career began, "ecologists" simply noted variation in species distributed, associated them with environmental conditions, and made up stories as to why the correlations were so. Clements and others sought to make ecology an experimental science, with Clements publishing the first experimental methods textbook for ecology, "Research Methods in Ecology". Gleason was a taxonomist, well known as an author of "Manual of Vascular Plants". To simply note the environmental position of a species is all many taxonomists want to know about ecology. I thus present the thesis that Gleason vs. Clements is the essence of a conflict between ecologists and taxonomists with respect to the significance of experimental ecological data, where ecologists insist on such data, while taxonomists insist that such associations are more or less random and/or meaningless. The science of Experimental Ecology that Clements helped found has

provided more than enough evidence that associations between species and their environment and between species are not random, and very meaningful. Clements basic paradigm of experimental ecology has triumphed completely; with the residual odd quirk of history being that Clements is considered unscientific by some.

11:15 WHAT IS AN 'ORGANISM'? ENTIFICATION AND DELINEATION IN BIOLOGY

Malachi Martin* and Michael Dodge*, University of Southern Mississippi, Hattiesburg, MS 39406 and University of Mississippi, Oxford, MS 38677

What is a biological organism? What necessary and sufficient criteria does biology and the philosophy of biology supply us with to delineate and demarcate the proper boundaries of an organism? Mahner and Bunge, in *Foundations of Biophilosophy* (1997), argue that the organism is the highest level of biological organization with the emergent property of *being alive*. They define an organism as a biosystem that is not a proper subsystem of another biosystem, that is to say, it may not be individuated as a component of another living thing. This is a useful tool when thinking about living things. However, some philosophers contend that biology lacks a central organism concept and argue that the great diversity of living forms appears to confound attempts at straightforward entification. Jack Wilson, in his paper "Organism Concepts and Biological Generalizations" (2000), maintains that our notion of an organism is derived from commonsense examples and ignores morphologically and physiologically quite disparate forms of life. When we consider, for example, the capacity of some organisms to split apart into separate organisms, fuse together as one organism, engage in lateral gene transfer and any other acts that violate our grasp of the notion of an organism, we are forced to concede that metazoans in general and vertebrates in particular offer little in the way of a central organism concept. We suggest that tenably addressing this biophilosophical issue may require abandoning any pretense to a uniform set of criteria for being an individual organism..

FRIDAY AFTERNOON

Hunter Henry Executive Room 8

1:15 Divisional Business Meeting

1:30 PHYLOCODE: A CONTROVERSIAL ALTERNATIVE TO THE LINNAEAN SYSTEM.

John Davis, Mississipi Museum of Natural Science, Jackson, MS 39202.

The PhyloCode is an evolving set of rules for biological nomenclature which abolishes all ranks above species! In the Linnaean system a named species must be assigned a rank of genus within a nested hierarchy of ranks, e.g. family, class, phylum. This is inadequate for branching relationships found by cladistic analysis. There are “more branches to the tree of life than Linnean ranks,”requiring a proliferation of new ranks such as “infracohort.” Changes in status of one group may also require a cascade of renaming and reshuffling ranks. Under PhyloCode, taxonomists can name any clade without renaming other clades. PhyloCode provides formal rules for defining clades. It also establishes a public registration database (RegNum) for clade definitions and names. Yale paleontologist Jacques Gauthier and Smithsonian reptile Curator Kevin de Queiroz launched the PhyloCode movement in 1983. A 1988 Harvard workshop led to a draft on the internet. The First International Phylogenetic Nomenclature (ISPN) meeting in Paris attracted taxonomists and evolutionary biologists from 11 nations. A second ISPN meeting was held at Yale in 2006. A finalized version of PhyloCode rules for naming species is due in 2007. Opponents of PhyloCode like entomologist James Carpenter fear chaotic breakdown of classification and loss of centuries of information from this effort to rename the two million or so species already “filed” under the Linnaean system. Others suggest that PhyloCode might exist in tandem with Linnaean classification.

zygo@jam.rr.com

2:00 PHILOSOPHICAL AND PRACTICAL IMPLICATIONS OF TRADITIONAL LINNAEAN NOMENCLATURE AND THE RECENTLY PROPOSED PHYLOCODE

Mac Alford, University of Southern Mississippi, Hattiesburg, MS 39406

With the radical improvements in inferring phylogenetic relationships due to methodological, computational, and genetic advances since the mid-1960s, traditional Linnaean nomenclature has been recently criticized as an inefficient and unstable system of communication and information storage and retrieval for systematics. Linnaean nomenclature is a versatile, theory-neutral hierarchical system, in use since the time of Aristotle, where classes are nested and mutually exclusive at a particular level (rank). Names have standard endings at each rank, and thus, names carry with them a certain amount of information about their contents. Unfortunately, this also means that as knowledge about relationships is modified (even for other units), names might need to be changed. The PhyloCode has been offered as an alternative system of nomenclature where groups of organisms are given stable, explicit, and unambiguous names tied to a definition. While this system makes names stable, the names themselves lack information content and the entities included in a name may change. Thus, the names are stable, but the contents are not. The two systems will be compared, philosophical considerations outlined, and an argument made for retention of the Linnaean system, albeit with some modification.

2:30 HIERARCHICAL APPROACHES TO SYSTEMATICS

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

We offer a critique of the paper by E.B. Knox (1998, The use of hierarchies as organizational models in systematics. Biol. J Linnaean Soc. 63:1–49) in which the Linnaean system of classification and attending nomenclature are compared with attempts to provide classifications from cladistic analyses. Systematists analyze phylogenetic relationships among groups of organisms at increasingly fine levels of detail, thus increasing the tension between cladistic analysis and classificatory systems. Contemporary fine-grained analyses are incompatible with the Linnaean system of classification and nomenclature, so a new system, the phylocode, has been proposed to offer guidance in matters nomenclatoral. We present Knox's argument that the Linnaean hierarchical system of classification and its attendant nomenclatoral codes are designed to be coarse-grained and in that design lies their practicality of application. Several nested and non-nested hierarchical models are presented, contrasted, and discussed for their suitability in cladistic analyses and their applicability in classificatory schemes.

3:00 BIOLOGICAL SPECIES CONCEPTS: PHILOSOPHICAL AND BIOLOGICAL APPROACHES

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

Biological species concepts through the mid-twentieth century usually included one or more criteria of speciation mechanism. The "biological species concept," for example, gave primacy to isolating mechanisms among sexually reproducing organisms to delimit membership to a particular species. These concepts rested on the premise that species were the units of evolution. Our current understanding of species has led to the suggestion that they are the products of evolution. Both biological systematists and philosophers of biology have proposed concepts that help us model and understand biological species independent of mechanisms of speciation. Here we compare philosophical approaches to concepts of species with recent biological approaches to concepts of species. On the philosophical side we consider the "species as an individual" (species explained as time-extended concrete systems) and the "homeostatic property cluster kind" (species explained conceptually as sets of organisms with similar properties held together by cohesive forces [homeostasis] and participating in a common history, (i.e., lineage). On the biological side we consider the "phylogenetic species concept" (species are the working units of cladistic analysis) and the "monophyletic species concept" (populations are the working units of cladistic analysis and species are monophyletic groups of populations). These approaches assume that the species is the end product of evolution and that the history of the species as embodied in lineage is an important component of the concept. Philosophical approaches enhance our understanding of species; biological approaches seek groups of organisms suitable for discovering phylogenetic relationships through cladistic analysis.

3:30 ESSENTIALISM RECAST: DELINEATING BIOLOGICAL SPECIES

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

Essentialists maintain that certain properties of organisms are both necessary and sufficient for biological species membership, such that "all and only" those members have those properties (i.e., "essences"). If a biologist knows the essence of a kind, an individual organism of that kind can then be properly identified as a member of the biological species. Essences, however, are hard to find. This a priori approach to biological species has rightly been rejected. In its place, various hypotheses about how to delineate biological species have been offered. We argue that the homeostatic property cluster kind (HPCK), advocated by Boyd (1999), when combined with lineage provides the spatial and temporal aspects required for delineating a biological species. These aspects are nomologically necessary for species classification and reidentification. Precisely because a particular organism X has the homeostatic property cluster it does, maintained through lineage, that we are able to identify it as a member of species Y. All members of a particular biological species have this homeostatic property cluster; however, not only those members have it, i.e., members of similar biological species would have similar HPC's. What only those members have is the same lineage. Thus, we have recast the notion of essentialism to accommodate the a posteriori reasoning of taxonomists.

4:00 BIOLOGICAL IDENTITY AND PERSISTENCE: THE THESIS OF SORTAL DEPENDENCY OF INDIVIDUATION

Malachi Martin, University of Southern Mississippi, Hattiesburg, MS 39406

The traditional ontological issue of identity and persistence is in no way impoverished with respect to diversity of opinion. Similarly, biological organisms come in a startling array of diversity as represented by the wide range of taxa found in biological systematics. How to apply a tenable account of identity and persistence to biological organisms? What does it mean to identify an organism at one time t_1 and later re-identify it, again, at another time t_2? Some answers have been offered by a few metaphysicians and biophilosophers, but in this presentation I will explore the applications of one. Following the lead of David Wiggins in his book, *Sameness and Substance Renewed*, I will argue that individuation in biology rests upon the empiri-

cal, a posteriori identification and understanding of natural kinds and that substantial sortals (such as *man* or *horse* and their refinements), as opposed to phased sortals (such as *boy* or *colt*) provide the covering concept for resolution of problems, particularly the "What is it?" question. I will further refine and apply the sortal dependency thesis of Wiggins to disparate forms of life that so often confound and confuse issues of identity and persistence, while working within a naturalized epistemological schema and ontologically endurantist framework.

MARINE AND ATMOSPHERIC SCIENCES
Chair: Stephen Howden, University of Southern Mississippi
Vice-chair: Zikri Arslan, Jackson State University

FRIDAY MORNING

Bost Auditorium North

10:30 Poster Session

MEASUREMENTS OF SOLAR IRRADIANCE WITH A MULTIFILTER ROTATING SHADOWBAND RADIOMETER (MFRSR)

R.Suseela Reddy, Sridhar Kota*, Umesh Remata, Rush Lockhart, Harene Natarajan, and R.Karim, Jackson State University, Jackson, MS 39217

The Jackson State University Meteorology Program (JSUMP) recently installed a Multifilter Rotating Shadowband Radiometer (MFRSR) through a collaborative effort with the NOAA Center for Atmospheric Sciences (NCAS) at Howard University. The MFRSR is currently in operation and measures global, diffuse and direct normal components of Spectral Solar Irradiance, in six narrow bands approximately 10 nm wide. The data resulted from the measurements were used in the computations of aerosol, water vapor, and ozone optical depths. The data for Solar Irradiance were considered for clear day (Oct. 9th, 2006) as well as cloudy day (Oct. 2nd, 2006) skies to study the effect of clouds on Radiation. The results indicated that no atmospheric effects were observed in the variation of total solar irradiance during clear skies. During cloudy skies the atmospheric effects were observed due to clouds. Validation of data with satellite measurements will be discussed. JSU will continue measurements of solar and atmospheric radiation and aerosols for climate studies and for long-range monitoring of Aerosol Radiation Network (AERADNET).

CHRONIC ACCUMULATION PROFILE OF CADMIUM, LEAD, AND MERCURY IN GOLDFISH

Cristina Nica [1]*1, Zikri Arslan [1], Anthony J. Bednar [2], [1]Jackson State University, Jackson MS 39217 and [2]US Army Engineer Research and Development Center (ERDC), Vicksburg, MS 39180

Mercury, lead and cadmium are among the most toxic heavy metals. Under chronic exposure, fish accumulate these metals to higher levels in the internal organs. The magnitude of stress induced by each individual metal is not only dependent on the relative toxicity of the metal ion, but also the target organ impacted. In this study, the uptake profile and relative toxicity of Cd, Pb and Hg were studied using goldfish. Goldfish were exposed to individual metals for ten days in glass tanks. Two different concentrations of the metals were administered individually: low level (20 µg/L for Hg and 100 µg/L for Cd and Pb) and high level (50 µg/L for Hg and 250 µg/L for Cd and Pb). Lethal effects were observed for fish exposed to Cd and Hg within the first two days. Toxicity of Pb was less pronounced compared to that of Cd and Hg. Internal organs, including the liver, gill, kidney, and muscle tissue were removed from exposed fish and digested in teflon vessels by nitric acid. Two different Certified Reference Materials, dog fish liver (DOLT-1) and lobster hepatopancreas (TORT-2) were digested using the same procedure for quality control. Samples were analyzed by inductively coupled plasma mass spectrometry (ICP-MS). The magnitude of accumulation was higher in fish exposed low levels of metals. Levels of Cd were consistently high in the kidney, while mercury accumulated in the gills, and lead in gills and muscles to higher levels.

FALL POST-LARVAL PENAEID SHRIMP IMMIGRATION INTO A MISSISSIPPI ESTUARY

Ryan Knobf [1]*, Ricky Greer [1], John Anderson [2], and Harriet Perry [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39553, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC), and Center for Fisheries Research and Development, Ocean Springs, MS 39564

The purpose of this project is to monitor the migration of postlarval penaeid shrimp into a Mississippi estuary during the fall season. Samples were taken with a beam plankton trawl at a single station along the marsh edge in Davis Bayou, Jackson County. Weekly sampling was conducted from mid-October through January. Water temperature, dissolved oxygen, salinity, depth, and weather conditions were recorded at the time of each sample. Penaeid shrimp were sorted, identified to species, and the length, weight, total number, and total biomass of each shrimp species recorded. While extensive research has been conducted on the spring immigration of brown postlarval shrimp into estuaries, little research has been done on postlarval recruitment into estuaries during the fall. Brown postlarval shrimp migration into estuaries peaks in the spring, but the postlarvae continue to recruit to the estuary until winter. White postlarval shrimp usually peak in the summer, but also continue to immigrate until winter. Pink postlarval shrimp recruit to the

estuary in fall until the winter. Abundance of postlarvae is sometimes used to estimate predictions of commercial landings.

THE POTENTIAL OF MISSISSIPPI MESONET DATA TO DETECT CERTAIN TYPES OF FOG BASED ON MULTI-PARAMETER PROXIES

Loren White* and Brandon DeShields, Jackson State University, Jackson, MS 39217

Synoptic reports of fog or mist are routinely reported primarily for FAA flight rules determination, by ASOS and AWOS stations sited at medium to large sized airports. The primary criterion for definition of fog or mist is according to the horizontal visibility range (0.5 statute mile or less for fog; 7 statute miles or less for mist). Since fog or mist is normally associated in Mississippi with relative humidity very near 100% and specific conditions of surface layer static stability and wind, it is hypothesized that sufficient relation to these ancillary parameters will enable the creation of a usefully robust proxy for fog/mist based on Mesonet-observed data. In order to develop such a proxy, we have identified events in which a sufficient number of ASOS/AWOS stations near a Mesonet station have reported fog/mist that a widespread fog event can be assumed (thus including the Mesonet site). By compositing and correlating Mesonet parameters for such cases at the five currently operating Mesonet stations, we can determine the feasibility and potential value of such a proxy fog product. For daytime cases, the probable existence of fog at the site can further be confirmed by visible satellite imagery.

MAPPING A NEW ENERGY SOURCE

Leigh Ann Eddins [1], Jason King [1], Hunter Lightsey [1]*, Jeff Rotman [1], Mississippi State University, Starkville, MS 39762

Over the past two decades, researchers have studied gas hydrates extensively because of the energy potential of the gases occluded. Gas hydrates are present everywhere in the world, and a large amount of gas hydrates are present in the Gulf of Mexico. The U.S.Geological Survey estimates that gas hydrates possess more carbon than oil reserves. If a safe and an economical process is developed to aquire the energy of gas hydrates, the United States could obtain more fossil fuels locally. Due to the Gulf of Mexico Energy Security Act of 2006 (S.3711), states such as Mississippi, Alabama, and Louisiana will receive royalties from any harvesting of natural gas or oil up to one hundred miles off their respective shores. This recently passed bill has hefty financial implications for these three southern states which depend especially on a method for finding and harvesting gas hydrates. However, locating gas hydrates is a difficult task, so this project explores a unique probability technique for locating gas hydrates. In this project, documented discovery of gas hydrates, documented bottom simulating reflections of gas hydrates, and documented oil reserves are combined with Google Earth © software in order to locate areas of gas hydrate concentration.

AGE AND GROWTH OF BOTTLENOSE DOLPHIN (TURSIOPS TRUNCATUS) IN MISSISSIPPI AND ADJACENT GULF OF MEXICO WATERS

Kenneth Brookins [1]*, Maria Begonia [1], Delphine Vanderpool [2], Keith Mullin [3] and Moby Solangi [2], [1]Jackson State University, Jackson, MS 39217, [2]Institute for Marine Mammal Studies,Gulfport, MS 39502, and [3]National Marine Fisheries Service, NOAA, Pascagoula, MS 39567

The bottlenose dolphin is one of the most well known cetaceans, because of its widespread use in marine parks and research facilities. However, there is still a strong need for information on growth rates of the species in order to better understand its ecology and population status. The objective of this study is to obtain biological data to elucidate the growth patterns of the bottlenose dolphin, *Tursiops truncatus*, in the Mississippi Sound and adjacent waters of the northern Gulf of Mexico. Teeth were collected from bottlenose dolphins stranded on the mainland coast of Mississippi and the adjacent barrier islands. The midsection of each tooth was cut into a 2-mm section using an isomer saw with a diamond-embedded blade. The section was then fixed in formalin overnight, rinsed with tap water and decalcified in a decalcifying acid mixture. Once decalcified, the sections were cut into thin, 25 um sections using a sliding microtome equipped with a freezing stage. These sections were then stained in Mayer's hematoxylin stain, rinsed in water before and after a weak ammonia rinse, and mounted on slides in glycerin. The number of growth layer groups (GLG) was read at least 3 times under a stereo microscope. Results revealed that the dolphins varied in ages based on the number of the GLG layers counted. The collection of information such as age and growth structure and other parameters are crucial to understanding the population dynamics and hence to successful management and conservation of the bottlenose dolphin.

COMPARISON OF SAMPLE DISSOLUTON METHODS FOR ANALYSIS OF SOIL AND SEDIMENTS FOR HEAVY METALS

Domingos D. Afonso [1]*, Zikri Arslan [1]*, and Anthony J. Bednar [2], [1]Jackson State University, Jackson MS 39217 and [2]US Army Engineer Research and Development Center (ERDC), Vicksburg, MS 39180

Accurate information of the heavy metals in soil and sediments is critical for better understanding the health issues of heavy metal contamination. Determination of the metals from soil and sediments is, however, a challenging task due to difficulties associated with sample dissolution and instrumental analysis. While complete dissolution of silicate may cause matrix interferences, incomplete dissolution and/or extraction of the metals may yield lower values. Volatility differences may also

cause inaccuracies if the elements of interest are lost during high-temperature digestion/extraction. It is therefore essential to develop an analytical procedure to achieve complete extraction of the trace metals into solution by minimizing the analyte loss and dissolution of matrix elements. In this study, we investigated the analytical performance of four different sample dissolution procedures for analysis of soil and sediment samples for As, Cd, Cr, Hg, and Pb. The methods were (a) open-vessel digestion by HNO_3+HF, (b) closed-vessel microwave-assisted digestion by HNO_3+HF, (c) closed-vessel microwave-assisted extraction by HNO_3, and (d) ultrasonic extraction in 5% HNO_3. The first two methods resulted in complete dissolution of the soil and sediment samples. However, Hg was completely lost in Method (a). Matrix interferences were highest in Method (b) due to the silicate matrix. The heavy metals were extracted by Method (c) without significant dissolution of the silicate matrix. Method (d) was also an effective means of extracting the metals to solution. This method also affords preparation of samples at room temperature rapidly that virtually eliminates analyte loss and minimizes contamination.

COMPARATIVE EVALUATION OF METAL CONCENTRATIONS IN VARIOUS PONDS IN MISSISSIPPI

Sunil Manohar Katta *[1], Zikri Arslan [1], Maria Begonia [1], Pao-Chiang Yuan [1], Anthony J. Bednar [2], [1]Jackson State University, Jackson, MS 39217 and [2]US Army Engineer Research and Development Center (ERDC), Vicksburg MS 39180

The metal concentrations in various ponds in Mississippi were measured to understand if the levels pose any health and environmental risks. The ponds studied include Lake Hico, Crossgates Lake, Stonegates Lake, Lake Catherine, Lakeland, Windsor Hill, Northlake Avenue, Belhaven Lake, Grand Tunica, Swan Lake, and Shadow Lake. These are ponds are actively used for fishing and watering crops, therefore, it is important that possible metal contamination by toxic metal is monitored regularly to avoid adverse health problems and for sustainability of aquatic life. For this purpose, water samples were collected in two sites of each individual pond. Samples were acidified to 0.1% nitric acid (pH~1.8) immediately, and filtered in the laboratory by 0.45-μm membrane filters. Determinations were made by ICP-MS. The accuracy of the elemental results from pond waters was validated by simultaneously running standard water reference sample (SRM 1643e). The results produced with YSI instrument showed pH was neutral between 7.5-8.5, temperature was moderate (30-32 ^{o}C), salinity was low (0.1-0.3%), and dissolved O_2 (DO) was at 7-8.5 mg/l. Results from elemental analysis of SRM by ICP-MS analysis showed agreement with the certified values. Most of theses ponds showed low levels of metal concentrations (compared to safe drinking water standards EPA) except with some metals (e.g., lead, chromium nickel, cadmium). Crossgates, Grand Tunica, Swan Lake, North Lake Avenue, Windsor Hill, Lake Catherine, Shadow Lake, Stonegates showed high concentrations of iron, manganese, and arsenic.

FRIDAY AFTERNOON

Hunter Henry Executive Room 12

1:00 TRACE ELEMENT BEHAVIOR IN THE MISSISSIPPI RIVER PLUME AFTER HURRICANES KATRINA AND RITA

MooJoon Shim [1]*, Lyndsie Gross [2], Peter Swarzenski [3], and Alan M. Shiller [2], [1]University of Southern Mississippi, Hattiesburg, MS 39406, [2]University of Southern Mississippi, Stennis Space Center, MS 39529, and [3]US Geological Survey, St. Petersburg, FL 33701

Hurricanes Katrina and Rita caused substantial mixing of waters along the Louisiana Shelf as well as remobilization of shelf sediments. These physical disturbances could have resulted in a significant change in trace element fluxes through this coastal mixing zone. Therefore, samples of Mississippi River delta outflow waters were collected during October 2006 and we report the results of trace element analyses of these samples here. River endmember concentrations for a suit of dissolved trace elements (Co, Cr, Cu, Fe, Mn, Ni, and V) were similar to previous reports for Mississippi River water. Dissolved Ni and Cu showed largely conservative mixing in the plume, also consistent with previous observations. Dissolved Co, Cr, and Mn all showed maximum concentrations at mid-salinities, though the salinity of maximum concentration varied among these elements. These distributions are indicative of input from reducing bottom sediments. There is little previous data for these elements in this region, however, this behavior is not out of line with other estuarine observations.

1:20 SUDDEN NOCTURNAL WARMING EVENTS AS OBSERVED BY THE MISSISSIPPI MESONET

Loren White*, Shari Dixon, and Brandon DeShields, Jackson State University, Jackson, MS 39217

A previously undocumented atmospheric phenomenon of "nocturnal warming events" has been discovered in data from the Mississippi Mesonet meteorological observing network. The phenomenon may be broadly defined as a sudden rise in air temperature during the nighttime hours, without any likely connection with frontal or convective activity. As Mesonet stations have been installed in various parts of Mississippi, variations in frequency and intensity of such events have been noted. A rough attempt has been made to classify the events according to: 1) intensity of temperature increase; 2) existence of a correlated decrease in dewpoint; 3) existence of a later sudden cooling that follows a period of quasi-isothermal temperature; and 4) existence of a significant increase in wind speed. In the most notable events: 1) temperature is strongly anticorrelated with dewpoint; 2) temperature levels off for an hour or two

before dropping fairly rapidly; 3) antecedent calm or very weak winds are replaced by wind speeds exceeding 2 m/s; and 4) the near-surface temperature inversion is reduced by 50%. Although nocturnal warming events could plausibly be explained by a variety of interacting mechanisms, most commonly it is believed that suddenly intensified winds mix down warm, dry air from a strong nocturnal radiation inversion. The trigger for reinvigorating the surface winds is unclear, though gravity waves from geostrophic adjustment or distant convection may play a role.

1:40 PERFORMANCE OF COLLISION CELL ICP-MS FOR DETERMINATION OF IRON FROM FISH OTOLITHS

Zikri Arslan* and Stephanie Daniels, Jackson State University, Jackson MS 39217

Iron is an important trace element in otolith microchemistry to gather information about the life histories of fish groups. However, iron occurs at very low concentrations in oceanic and estuarine waters. As a result, the iron concentration in the otoliths of fish is also very low that makes the determination of iron problematic by ICP-MS due to interferences of otolith matrix and spectral overlaps of polyatomic ions on isotopes of iron. Even in most cases the results for iron are not reliable to include in statistical evaluations. In this study, we have investigated the performance of collision cell ICP-MS in simulated otolith solutions. A method was developed to reduce the interferences of calcium on iron. The method is based on the coprecipitation of iron with sodium hydroxide to separate it from the interfering otolith calcium. Because otoliths are predominantly (e.g., 96% $CaCO_3$), optimization of the precipitation conditions were carried out with $CaCO_3$ (99.999%). Iron is quantitatively precipitated as hydroxides at pH above 11.8. The precipitation of the calcium was controlled by optimizing the volume of sodium hydroxide solution used. The procedure was validated by analysis of fish otolith reference material by ICP-MS.

2:00 DIEL CYCLING IN IRON SPECIATION IN THE PEARL RIVER, MISSISSIPPI

Peter van Erp* and Alan M. Shiller, University of Southern Mississippi, Hattiesburg, MS 39406 and University of Southern Mississippi, Stennis Space Center, MS 39522

Investigations in the cycling between oxidized and reduced forms of iron in freshwater has mainly been carried out in streams affected by acid mine drainage. This study looks at the existance of an iron diel cycle in the Pearl River, Mississippi. Speciation of iron plays a significant role in the transport of trace metals and/or organic matter. Using filtered (0.2 μm) surface water collected from the Pearl River near Stennis Space Center, Mississippi a series of incubation experiments has been conducted. Initial incubations showed that an iron diel cycle was not significant with [Fe(II)] between 30-80 nM. A subsequent incubation where samples were treated with the Fe(II) chelator bathophenanthrolinedisulphonate (BPDS) showed significant production of Fe(II) up to 2.6 μM. Apparently a diurnal peak of Fe(II) was being prevented due to rapid oxidation of the Fe(II). Further incubations will be conducted to ascertain the mechanism behind this rapid oxidation.

2:20 Break

2:40 DETECTION OF HYPOXIC CONDITIONS IN THE MISSISSIPPI BIGHT IN THE SUMMER OF 2006

Stephan Howden, University of Southern Mississippi, Hattiesburg, MS 39406

Monitoring of coastal waters for hypoxic conditions on the continental shelves of the U.S. has revealed that the development of hypoxia (dissolved oxygen concentrations < 2.0 mg/L) in the summer months is more common that once thought. In the Mississippi Bight, anecdotal evidence for the sporadic recurrence of hypoxia in Mississippi Bight had been recently augmented by summer time measurements conducted by the Mississippi Department of Marine Resources in 2004 at Fish Haven 2 (FH-2) south of Horn Island, and analysis of foraminifer assemblages in surface sediment samples taken in the 1950's near FH-2. Based upon a detection of near-hypoxic waters near FH-2 in late July 2006, two cruises on the R/V Tom McIlwain were conducted in August 2006 to sample a grid of 22 sites south of the barrier islands of Mississippi. The prime objectives were to map the extent of the hypoxic region along with the physical environment (temperature, salinity, and currents). With some exceptions, at each site profiles were measured of dissolved oxygen, temperature, pressure, conductivity, turbidity, and currents. Oxygen was measured using a YSI 6030 probe and a Sea-Bird SBE 43 probe. Salinity and dissolved oxygen values were compared and verified with analysis of discrete water samples using a Guildline Autosalinometer and Winkler analysis, respectively. A hypoxic bottom water region of 7 sites extending seaward to ~20 m water depth near FH-2 and extending along the 10 m isobath from Ship Island to Petit Bois Pass was detected. Winkler analyses confirmed four of these sites, with the other three having values <2.8 mg/L. Dissolved oxygen profiles exhibited large gradients near the seafloor making difficult the match-up between the profile data and the water samples. Eleven of the sites had values <3.0 mg/L. The water column was highly stratified throughout the region, in some cases with several pronounced pycnoclines, consistent with isolation of deep waters from atmospheric refreshment.

3:00 EFFECTS OF SITE, SEASON, AND DEPTH IN SEDIMENT ON THE ABUNDANCE OF LIVE FORAMINIFERA IN TWO NORTHERN GULF OF MEXICO MARSHES

Sondra Simpson, Charlotte Brunner*, and Patricia M. Biesiot,

University of Southern Mississippi, Stennis Space Center, MS 39529 and University of Southern Mississippi, Hattiesburg, MS 39406

The abundance of living foraminifera was documented over one year for two northern Gulf of Mexico salt marshes: one in a high-marsh setting of the Pearl River, and one in a low-marsh setting of the Jourdan River. This study tested the effects of site and season on the distribution of live foraminifera with depth in the sediment. Three sediment cores were taken and combined at each site in each of four seasons. The foraminifera were stained with rose Bengal, sieved at 45 μm, and counted. Statistical analysis consisted of two-way ANOVAs and a series of pair-wise comparisons. During the study, 14 taxa were recorded as living. Of these, 11 taxa were found in the low-salinity, high marsh, which was dominated by *Trochammina macrescens*, *Trochammina inflata* and *Tiphotrocha comprimata*, and 13 in the higher-salinity, low marsh, which was dominated by *Miliammina fusca*. Both site and depth in sediment had significant effects. However, the interaction effect was not significant. Surprisingly, season did not have a significant effect nor was there a significant interaction between site and season. The fauna had a statistically significant preference for depths <5 cm, and several species, including *Polysaccammina ipohalina* and *Trochammina macrescens*, had significant abundance peaks in the subsurface from 2.5-5 cm.

3:20 DEPTH-INDUCED VARIATION IN HYPERSPECTRAL REFLECTANCE SIGNALS OF AQUATIC VEGETATION

Melissa A. Larmer [1]*, Jonathan R. Jones [1]*, Christopher A. May [2], Hyun J. Cho [1], [1]Jackson State University, Jackson, MS 39217 and [2]Grand Bay National Estuarine Research Reserve, Moss Point, MS 39561

Remote sensing of submersed aquatic vegetation (SAV) is often limited due to the water absorption of near infrared radiation. We studied depth-induced variations in the reflectance patterns of common SAV using a GER spectroradiometer to provide a scientific understanding of the effects of depth and turbidity on remote sensing of SAV. Spectral measurements of upwelling energy were taken over *Ruppia maritima* beds at Grand Bay National Estuarine Research Reserve (NERR) and over outdoor tanks containing *Myriophyllum aquaticum*. Water level above the plant canopy was controlled by siphoning. Plants were scanned three times at a each depth at the intervals of 5-10 cm. The upwelling energy was converted to reflectance (%). Normalized Difference Vegetation Index (NDVI) values were then calculated for each set of measurements. Due to water absorption, the high plateau that appears in near-infrared regions of terrestrial plants became two individual peaks in submerged plants at approximately 719 and 810nm. NDVI values were approximately 0.3 for emergent SAV; these values decreased as water depth increased. Remote detection of SAV in shallow, coastal and inland waters will be improved if our results are integrated into the current vegetation index. We will apply our results to AISA images of Grand Bay NERR to assess the capability of this technique in identifying SAV beds. Acknowledgements: This research is supported by grants from NOAA-ECSC (No. NA17AE1626, Subcontract # 27-0629-017 to Jackson State University), National Science Foundation-UBM (No. DMS-0531927), MS-AL Sea Grant Consortium, and The Center for University Scholars of Jackson State University.

3:40 GUT MICROBIAL COMMUNITIES IN THE ESTUARINE BIVALVES *GEUKENSIA DEMISSA* AND *CRASSOSTREA VIRGINICA*

Dawn Loggans*, Patricia M. Biesiot, and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

The ribbed mussel *Geukensia demissa* is a dominant intertidal bivalve commonly found in salt marshes along the east coast of the United States and the Gulf of Mexico; the eastern oyster *Crassostrea virginica* is subtidal in the same regions. Previous studies have shown that detrital lignocellulose derived from *Spartina alterniflora* is utilized by *G. demissa* to meet 26-80% of its carbon requirements whereas *C. virginica* assimilates < 3%. We hypothesize that differences in the gut microflora of these two bivalves may contribute to the observed variation in digestion of refractory organic detritus. To characterize the gut microbial community in these bivalves, universal primers specific for bacteria were used to PCR amplify the 16S ribosomal RNA gene, which was then cloned. Sequence results from the clone libraries indicate that the two bivalve species do have different gut bacterial communities. *Mycoplasma* spp. dominate in the gut of *G. demissa*. Other gut bacteria included *Enterococcus faecium*, *Epulopiscium* sp., *Streptacidiphilus*, *Lactobacillus zeae* and *Synechococcus* sp. In contrast, *Mycoplasma* was not found in *C. virginica*, although *Massilia* sp., *Salmonella* sp., *Desemzia incerta*, *Gaetbulimicrobium brevivitae*, *Acinetobacter* sp., *Anaplasma* sp., and several uncultured proteobacteria were isolated. Current efforts are focused on determining whether the gut isolates are cellulolytic.

4:00 Divisional Business Meeting

MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Chair: Joseph Kolibal, University of Southern Mississippi

Vice-chair: Andrew Harrell, CEWES-GM

THURSDAY MORNING

Hunter Henry Executive Room 12

9:30 COMPILED ENGLISH

A. Louise Perkins [1]*, Tom Rishel [2], Farnaz Zand [1], and Sumanth Yenduri [1], University of Southern Mississippi, Hattiesburg, MS 39406 and Hancock Bank, Gulfport, MS 39501

Chomsky's hierarchical structure for spoken languages has served as the cornerstone of Computer Programming Language theory for decades. However, typical Programming Languages are still only Context Free because we are still unclear on how to disambiguate context sensitive grammars. In ongoing research we are using a suite of Context Free Grammars coupled to data mining algorithms that define text. These algorithms ares stochastic, so that errors can still occur. None-the-less the ambiguity problem is removed from the grammar context and promoted to a hyperlevel where context defining tools already exist.This shift in compiling paradigm allows us to build simple English language to programming compilers for narrowly defined contexts such as Banking.

10:00 SUITABILITY OF ENVIRONMENTS FOR NOVICE JAVA PROGRAMMERS

Edward Dillon* and Dawn Wilkins, University of Mississippi, University, MS 38677

For programmers who are new to the language of Java, it is traditional that they start writing programs on some simple text editor like Notepad and use a separate compiler invoked at the Command Prompt. Alternatively, an environment known as an Integrated Development Environment (IDE) is available to aid users in writing code and producing programs more efficiently. However, there are some problems concerning whether IDEs are too complex for novice users to understand. This research carefully examines Java IDEs to compare and contrast the IDE vs text editor approach, with the goal of recommending an appropriate software environment for novice programmers.

10:30 NETWORK ROUTING AND THE IMPLEMENTION OF UNIT/TASK SCHEDULING SOLUTIONS

Andrew Harrell, U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS 39180

For a long time discussion with the US Army combat engineer units and members of the US Army engineer community have resulted in the statement of a need for a rapid and accurate obstacle system and logistics haul effectiveness capability. The network analysis methodology to be presented in this talk was developed several years ago and has applications to both of these problems. It can also solve the problem of how to implement the an optimum solution (how to route it through an on and off-road network of tactical unit movement possibilities). Two different C-code versions of variations of the basic Edmonds-Karp-Dinic network maximum flow/min-cost algorithms exist. They, along with a Unix screen GUI, enable a user to solve routing and scheduling problems interactively. The programs that compute the optimum solution first compute best vehicle traverses across off and on-road digital map data. Then (after defining an overall network from a set of given tasks along with starting, intermediate, and end points) the user can compute the overall traffic throughput and display a list (ranked according to time and traffic flow rates) of possibilities to schedule units to move through the network to perform these tasks.

11:00 NETWORK FIREWALLS SECURITY

James Haywood, Jr., Mississippi Valley State University, Itta Bena, MS 38941

This project was based upon testing the security of the network firewall rule changes. There were three basic key points that was mandatory to investigate the security of the network firewall rule changes which were the collection of data, the network firewall rule change test, and the results.The collection of data consisted of four subunits of research. These subunits were the approver (process owner) of the change, the person who gained the access by the approver, reason for the firewall rule change and the recent status of the changed firewall rule. In gathering the data, a sample selection is acquired through the total amount of network firewall rule changes.

The testing part of the project consists of analyzing the verification of the necessary approvers, the person granted access to make the change, documentation for the reason of change and current status report are all acquired from samples picked. In order to test the firewalls a sample portion of the data was collected. The tool used to conduct the test was the Auditor-Type Toolkit which allows template of a testing sheet that compiles all necessary verification into a spreadsheet.

The results of the network security firewall test were base upon the finds of actual testing. If any data was missing from the acquired sample, the process owner of the firewalls intrusion detection was notified and had to find the missing data. If process owner couldn't find the missing data then the firewall rule change was reverted.

11:30 A CREDIBILITY-BASED SECURE SOURCE ROUTING PROTOCOL FOR WIRELESS AD HOC NETWORKS

Natarajan Meghanathan [1]* and Michael Williams [2], [1]Jackson State University, Jackson, MS 39217 and [2]University of North Texas, Denton, TX 76203

We propose a credibility-based secure source routing (CSSR) protocol for wireless ad hoc networks. We consider a realistic model of node behavior in which data and control packets are dropped arbitrarily. In order to increase chances of packet delivery, packets have to be sent through intermediate nodes that have a good history of forwarding packets for their

peers. Each node in the network maintains a credibility table that stores the credibility points (proportional to the number of packets forwarded) for each other node in the network. Credibility points for a node are incremented by a constant value upon successful packet forward, and halved when the node drops a packet. If the credibility points for a node are not updated for a certain time period, then the value is reset to 0. The credibility of a route is defined as the lowest of the credibility points of the constituent nodes (excluding the source and destination) of the route. CSSR chooses the route with the maximum credibility. Our approach achieves two purposes: relieves congestion in the network and bypasses around arbitrarily packet dropping nodes. We simulate CSSR and investigate the adaptation of the protocol to the actual node behavior by using different increment values for the credibility points. We study the performance of CSSR and Dynamic Source Routing (DSR) protocol for different values of the percentage of arbitrarily packet dropping nodes in the network. The performance metrics studied include the packet delivery ratio, delay per packet and the number of route transitions.

THURSDAY AFTERNOON

Hunter Henry Executive Room 12

1:00 THE USE OF LIMITERS IN STOCHASTIC INTERPOLATION

Joseph Kolibal*, University of Southern Mississippi, Hattiesburg, MS 39406

Stochastic interpolation primarily requires that the function generating the row space of the de-convolution and re-convolution matrices be non-negative. This means that a range of functions can be utilized, including those that limit the local growth of the generating function to pre-determined bounds, i.e., limiters. The application of limiters can substantially improve interpolation performance for extremely noisy and irregularly spaced data, and this study examines performance improvements that have successfully enhanced the robustness of the method.

1:30 EFFICIENT SUPPORT VECTOR MACHINES THROUGH PARALLEL COMPUTING

Arun Rajendran*, Peng Li, Chaoyang Zhang, and Youping Deng, University of Southern Mississippi, Hattiesburg, MS 39406

In this study the application of Support Vector Machines for classification of large datasets is investigated. Support Vector Machines is a machine learning algorithm with good generalization properties. But the time complexity of the algorithm depends on the number of examples on the dataset, which makes the problem highly inefficient for large datasets. In this study different methods to improve the time efficiency of Support Vector Machines are analyzed and a design to implement it in parallel is proposed. Also the parallel algorithm\'s performance in different architecture is analyzed and optimized for performance. Parallel implementation improves time efficiency of the learning process, while maintaining the accuracy.

2:00 THE SECOND DERIVATIVES OF THE CHEBYSHEV POLYNOMIALS, T_N, IN TERMS OF T_N

Joseph Kolibal*, University of Southern Mississippi, Hattiesburg, MS 39406

Expressing the second derivative of the Chebyshev polynomials in terms of the Chebyshev polynomials is required in the development of particular solutions associated with the solution of partial differential equations using radial basis functions. There are several approaches for evaluting this expansion, however its form is perhaps most elegant when expressing the expansion in matrix form obtained through the use of nearly orthogonal functions. This matrix is shown to be non-negative and thus the coefficients in the required sum are non-negative integers.

2:30 OBSERVING STATISTICS FROM A SCIENTIFIC DATA STANDPOINT

Richard W. Swinney, University of Mississippi, University, MS 38677

The purpose of this research is to express a scientific data environment implementing a particular study, such as Economics, using Statistics. A mapping process method has been designed that executes n-dimensions of data, implemented via a developed Java computer program. The mapped values indicate where an individual subject, such as a state, lies among its co-subjects based on combined factors, such as Education and Commerce. Using the fifty states in the U.S., the results shows where each state lies among other states, representing the combined actual statistics of subjects for each of the fifty states.

3:30 SOLUTION OF MAXWELL'S' EQUATIONS WITHIN A 3 DIMENSIONAL MULTI-BLOCKED CURVILINEAR DOMAIN

Terry Gerald [1]* and Atef Z. Elsherbeni [2], [1]SpecPro LLC, Vicksburg, MS 39180 and [2]University of Mississippi, University, MS 38677

We present a 3D solution technique for solving Maxwell's electromagnetic equations within a composite multi-blocked grid composed of sub-grids defined by curvilinear coordinate systems. The exterior of the composite grid is wrapped by an enclosing shell grid with an embedded convolutional perfectly matched layer which performs the role of an absorbing boundary condition. Sample results for practical applications will be presented showing the advantage of this gridding procedure over the traditional rectangular cells.

4:00 EXISTENCE THEOREM OF ELLIPTIC SYSTEMS WITH SINGULARITIES INVOLVING SOBOLEV

OR SOBOLEV-HARDY CRITICAL EXPONENTS

Xiaoqin Wu*, Mississippi Valley State University, Itta Bena, MS 38941

In this research, we study the existence of positive solutions of the system of nonlinear elliptic equations with sigularities involving Sobolev or Sobolev-Hardy critical exponents. This problem is interesting since the Sobolev and Sobolev-Hardy embeddings are not compact for critical exponents. The main tool to prove the existence theorem is Mountain Pass Theorem.

6:00 Poster Session
Location: Bost Auditorium North
Posters may be set up between 4:00p and 4:30p

GESTALT PRINCIPLES APPLIED TO SOFTWARE- ENGINEERING DIAGRAMS: AN INITIAL STUDY

Krystle Lemon*, Edward B. Allen, Jeffrey Carver, and Gary Bradshaw, Mississippi State University. Mississippi State, MS 39762

Discovering root-causes of comprehension errors in software design is important to prevent their presence in software systems. This research synthesizes software engineering and Gestalt principles of similarity, proximity, continuity for the purpose of discovering whether certain visual attributes of diagrams (dashed arrows, severe complexity, etc.) can affect the accuracy and efficiency of understanding correct relationships amongst the entities in the diagram. Twenty-seven subjects viewed diagrams of different types and answered questions about them. The experiment tested whether two dependent variables, accuracy and response time, were significantly affected by independent variables, diagram type (simple1, simple2, complex), Gestalt principles (good vs. bad), and forward/backward (question order). The results of this study indicated that the Gestalt principles did affect the comprehension in the complex diagrams. Further post hoc analysis was conducted on the data that revealed reaction time speed up occurred in all diagrams because of the type of questions presented to the subjects. Distance metrics such as line length, number of lines crossing, lines going into a box, lines coming out of a box, lines per diagram, boxes per diagram, and number of bends per line were measured and used as additional variables in the analysis. Interactions between number of lines per diagram, number of bends per line, and number of lines going into a box help to predict the average reaction time of the subjects.

ONTOLOGY ENGINEERING: METADATA MANAGEMIENT IN A RAPID PROTOTYPING CAPABILITY FOR NASA EARTH SCIENCES

Robert A. Elliott, Sr., Mississippi State University, Mississippi State, MS 39762

NASA, Mississippi State University, and other research organizations, are collaborating to develop a Rapid Prototyping Capability to advance Earth sciences. The Rapid Prototyping Capability will manipulate a wide variety of metadata and our research in Ontology Engineering will support more uniform handling of metadata. Ontology services and ontology engineering practices would facilitate experiments using NASA science results obtained from satellite and sensor data in the context of the Rapid Prototyping Capability. This poster defines ontology and introduces ontology engineering principles that describe the creation of ontologies, the tools used in ontology creation and the methodologies used in practice. Ontologies provide formal definitions of data and support sharing of knowledge bases. Ontology engineering will be applied to data sharing issues thereby enabling the merging of ontologies (knowledge bases) and creating new knowledge and data models. Ontology engineering practices are a basis of sound ontology creation and are rapidly growing as more user communities standardize this discipline. Our future work will apply ontology engineering to advance Earth science through the NASA Rapid Prototyping Capability.

AN ANALYSIS OF TEST COVERAGE FOR THE RULE BASED SYSTEM, LOCI

Stephen Medders*, Mississippi State University, Mississippi State, MS 39762

Rule based systems use a set of logical rules to decide which computations to do given the set of data. Loci is a rule based system that compiles a set of rules, automatically designs a parallel architecture for running the computations, and then returns results of the computations based on queries to Loci. CHEM code uses Loci to build models of partial differential equations (PDE) for use in computational fluid dynamics. These models are tested using a test suite called Quick Test. Quick Test runs a set of test data on the models used by CHEM code to verify that the PDE's in the models are in fact being computed by Loci. Currently, there is no method used to show the adequacy of the tests in terms of coverage. Traditional coverage tools measure lines of source code covered, logical paths covered, and logical conditions covered. However, these do not cover rule usage. Rule coverage of the test set should include data flow between rules and fault propagation from one rule to another. Fault injection, inserting a fault by altering a value or the code itself, is one method to check this. Future work will include performing this fault injection on the Quick Test suite, as well as identifying data flow paths and rule dependency graphs in order to evaluate rule coverage of the Quick Test suite.

FRIDAY MORNING

Hunter Henry Executive Room 12

9:00 USING ALICE TO DECREASE ATTRITION IN CS1

Constance Bland*, Timothy Holston, and Udar Kumar Kudikyala, Mississippi Valley State University, Itta Bena, MS 38941

A disturbing trend has resulted over the last decade as it relates to the number of students pursuing undergraduate computer science degrees. Specifically, the entering student population at Mississippi Valley State University (MVSU) has begun to mirror the national trend of showing a decline in the number of students declaring computer science as a major. The decline in the number of incoming students declaring computer science as a major coupled with the large attrition rate are the two factors most responsible for this alarming trend. In this paper, we discuss our strategy to affect the growing attrition rate of computer science majors. During the CS0 course, students are provided with an introduction to programming using Alice, a 3-D animation programming environment developed at Carnegie Mellon University. This introduction to Alice serves the dual purpose of molding students' work habits into ones which facilitate their success in the major as well as providing a mechanism for demonstrating abstract programming concepts in a concrete manner. Preliminary data indicates that students exposed to programming using Alice seamlessly develop traits and characteristics which are necessary to succeed in the discipline of computer science and subsequently are retained in the major at a higher rate than their counterparts.

9:30 E-SERVICING: THE USES AND IMPORTANCE OF THE NEW IEEE STANDARD

Sumanth Yenduri*, A. Louise Perkins, Smvanthi Munagala, and Famaz Zand, University of
Southern Mississippi, Long Beach, MS 39560

Everybody has to participate in protecting environment and that encompasses producers and consumers to recycle electronic tools and equipment. Organizations and governments all around the world are now pressurizing everybody into e-protection through various rules, protocols and directives. Recently, a new IEEE standard 1680 has been released with the aim to attract everybody. The standard will make recycling huge amounts of outdated equipment kept in waste storage facilities much easier. The standard was announced in May at the IEEE International Symposium on Electronics and Environment. The symposium was attended by academicians, industry personnel, manufacturers, consumers, environmentalists, and engineers. The "Standard for Environmental Assessment of Personal Computer Products" is the first IEEE standard and the first US standard on computer recycling. The Green Electronics Council (GEC) has listings for various products that comply with the standard proposed although the compliance is not mandatory .The standard covers only for computers and monitors as of now. As new computer technologies make many "not-so-old" computers obsolete although they are still functional accounts to the bulk of electronic waste produced (236.1 million tons only in US in 2003). Currently, less than l/5th of the e-waste is being recycled. The standard promotes extension of the life of the computers and also makes them easier to recycle. Modern day computers are difficult to recycle and may have hazardous material which cannot be recycled. There is no clear indication of what needs to be recycled and what not. In this paper, we outline the standard in more understandable terms by describing the guidelines, uses and the significance to adopt it. The need to understand the practices mentioned in the standard and to apply them is needed in today's world than every before.

10:00 A BLUEPRINT FOR AN RFID SMART FLOOR FOR EFFICIENT SHIPYARD ASSEMBLY YARD INVENTORY TRACKING

Andrew Strelzoff* and Tulio Sulbaren, University of Southern Mississippi, Hattiesburg, MS 39406

One of the major challenges for the industries serving the NAVY and the Air force is the tracking of current and future inventory of parts required for ship building. The tracking of parts is very important because it has a direct impact on the construction schedule and cost of the ships.

One of the possible technologies that could be used to track ship building parts is radio frequency identification (RFID) systems. Unfortunately, a blueprint to implement RFID technology with the shipyard conditions has not been developed. Shipyards poses special problems for RFID technology such as: 1-Scale of the operation stretched across thousands of feet, 2- Large number of parts in the tens of thousands, 3- Diversity of parts ranging from tiny wiring leads to entire engines weighing thousands of pounds, 4- Large metal objects such as hull assemblies or metal tubing which may reflect radio signals causing false or confused signals, 5- Sensor vulnerability to interference from shipyard manufacturing and test operations and 6- Sensitivity of shipyard instruments to interference from the tracking system.This paper presents the design parameters for an outdoor RFID "smart floor" to track thousands of parts through a shipyard. Based on the design parameters, this paper summarizes the currently available RFID technology and provides a blueprint for a durable, accurate, scalable, effective inventory tracking system based on RFID technology.

10:30 WIRELESS SENSOR-BASED LOCATION FOR MANUFACTURING

Shirong Du* and John N. Daigle, University of Mississippi, University, MS 38677

It is a difficult task to locate and track a large number of RFID-tagged metal containers by wireless sensor-based approaches inside a manufacturing plant due to the hostile and dynamically changing radio propagation environment. We present a top-container detection and location strategy to locate all the containers, including those from which the location sensors cannot receive any signal or any direct signal. Our strategy is based on the ad hoc information gathering and appropriate location methodologies. We also investigate the performance of various methodologies in locating containers

under the radio Rayleigh fading model on manufacturing plant premise. The methodologies can be divided into two categories: non-distance-based methodologies, which include position centroid and RSS pattern matching, and distance-based methodologies, which include triangulation and optimization. We examine the problems in triangulation location and use a least mean-square error optimization technique to locate containers. We find that when distance measurements from a small number of sensors are available and the measurement error is large, the optimization methodology can achieve lower location error than triangulation. When many distance measurements are available, triangulation has lower location error than optimization, but optimization performs much faster than triangulation.

11:00 Business Meeting

FRIDAY AFTERNOON

Bost Auditorium South

1:15 MISSISSIPPI CENTER FOR SUPERCOMPUTING RESEARCH (MCSR) USER ADVISORY GROUP MEETING, POSTER SESSION, AND SPECIAL SUBSESSION ON SUPERCOMPUTING

David Roach, University of Mississippi, University, MS 38677

The Mississippi Center for Supercomputing Research was established in 1987 by the Mississippi Legislature and the Institutions of Higher Learning (IHL) in order to provide high performance supercomputing (HPC) support for research and instruction at all state universities. The Mississippi Supercomputer User Advisory Committee (MSUAG) was established by the IHL Research Consortium to provide user input and advice to MCSR management and technical staff on policies and procedures for the Center's operations. It includes member representatives from all IHL institutions. The Advisory Group will meet at this MAS conference. Mr. David G. Roach, Director of the MCSR, will conduct the meeting. The agenda includes an update on MCSR HPC facilities and services, introduction of new MCSR staff members, and site reports and ongoing research updates by MSUAG representatives. A poster session, showcasing research projects that utilize MCSR facilities and services, will follow the Advisory Group Meeting. A Special HPC Subsession of the Mathematics, Computer Science, and Statistics Division, sponsored by the MCSR, will also be held to serve as a forum on supercomputing in which faculty and graduate student researchers will have the opportunity to describe their research projects that involve HPC, Internet2, Grid Computing, Visualization, Network Security, Computer Systems Administration, and the use of MCSR resources. IHL faculty and graduate students, with an interest in HPC and/or MCSR facilities and services, are also invited to attend and participate.

PHYSICS AND ENGINEERING

Chair: S. Kant Vajpayee, University of Southern Mississippi

Vice-chair: Erdem Topsakal, Mississippi State University

THURSDAY MORNING

Bost Theater

8:00 SURPRISED! SURPRISED! CT SCANS IN MANUFACTURING PLANTS

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

We associate the term CT scans usually with hospitals, physicians, and the like. Recently, CT scans have begun to enter manufacturing. They are evolving to help production engineers for the same reasons they help physicians. Like all technologies, manufacturing had to wait for CT scans until these became affordable. The CT scan technology is proving extremely useful since it fits in nicely with the modern philosophy of preventing defects, rather than inspecting it at the end of the production. The defects are identified and quantified; the associated data are used for taking timely corrective actions. X-ray computed tomography (CT) is one of the several non-destructive testing tools. However, it is the only one which can measure internal features non-destructively. It complements other inspection tools such as coordinate measuring machines (CMMs) and non-contact optical scanners that are suitable for external features. CT scans helps seeing inside a part to identify porosity, blockage, cracks, inclusions, voids, and mechanical fit. CT uses X-rays to produce cross-sectional views of the part under inspection. The CT data help create a 3-dimensional volumetric image of the part using X, Y, and Z coordinates. The CT slices yield a volume stereo lithography model (STL file) of both the internal and external features. The STL file is compared with the CAD data - the output the design process. Currently, CT technology is being used for first-part inspection and in medical-implant applications to benchmark processes. But its future lies in using the CT data as negative feedback to correct for the errors of production while the part is on the production machine. CT technology can achieve measurement accuracy as high as one-thousandth of an inch.

8:15 COMPARISON OF GENETIC ALGORITHM VERSUS PARTICLE SWARM OPTIMIZATION IN THE

ADAPTIVE NULLING OF PHASED ARRAY ANTENNAS

Andy Harrison*, deciBel Research, Inc., Huntsville, AL 35806

When operating a system in the presence of one or more strong interfering sources, low sidelobe levels may not be enough to ensure adequate reception of the desired signal. A method for overcoming this problem is adaptive nulling. In this method, the amplitude and phase coefficients of each element in the phased array are adjusted in such a fashion as to place a null in the antenna pattern in the direction of the interfering sources. Many adaptive nulling algorithms calculate the adaptive weighting coefficients for each antenna element by multiplying the original coefficients by the inverse of the covariance matrix. While this method is computationally fast, quantization of the phase will result in errors in null placement. Also, it is necessary to have receiver hardware at each element of the phased array as well as an elaborate calibration technique. Genetic algorithm and particle swarm techniques are global search methods that place very deep nulls in the desired directions, while maintaining the characteristics of the antenna main beam. Since the solution space is predefined by the quantized amplitude and phase coefficients of the particular antenna system, these global methods do not require continuous amplitude and phase shifts. Additionally, these methods deal with the coherent output power of the antenna array and therefore do not require receiver hardware at each element in the antenna array.

8:30 WHY WE NEED STRING THEORY FOR THE UNIVERSE?

Amin Haque, Alcorn State University, Lorman, MS 39096

The current unsolved mysteries in physics are the birth of the Universe, the beginning of time, the cause of the Universe inflation, dark matter, dark energy, and the black holes. According to Hubble's law and other evidence, the Universe was born with a Big Bang about 14.5 billion years ago. A fraction of microsecond later, it started expanding at an extremely high rate for a brief period of time. Within billion years the galaxies began to form with the aid of dark matter, which is believed to hold them together. A mysterious force, called dark energy, is believed to be responsible for the continuous expansion of the Universe at an accelerating rate. We want to go deeper to understand why things happened the way they did. Einstein's general theory of relativity describes only large objects ? the solar system, galaxies, and the Universe. Physicists discovered new building blocks of matter and laws that govern their behavior. The standard model of particle physics was developed, which is an expansion of quantum theory and describes the behavior of elementary particles very satisfactorily. Having two different theories for one Universe is not satisfactory. It should be possible to unify the standard model and general theory of relativity into one complete and comprehensive theory that should describe the behavior of atoms as well as stars. String theory promises new insights and offers hope that answers to at least some of these puzzles may be on the horizon.

8:45 SUPERSTRING THEORY AND THE UNIVERSE

Amin Haque, Alcorn State University, Lorman, MS 39096

String theory attempts to unify all four forces of the nature - gravity, electromagnetic, weak, and strong. According to string theory, all the particles of the Universe and all the force carriers are different modes of vibration of extremely tiny fibers or strings. The observed particle properties (mass, charge, spin) are determined by the strings' oscillatory patterns. Force carriers - graviton, photons, weak gauge bosons, and gluons - are yet other patters of vibration. The units of mass, quarks and electrons (leptons) that form protons and neutrons, are actually made of still more fundamental units - Strings. According to superstring theory, to describe the motion of a string we need eleven dimensions, plus antiparticles and a mirror image of particles, called superparticles. The hidden dark matter and dark energy also may shape our Universe from these dimensions. Superstring theory also predicts that for every known matter particle to have as-yet-undiscovered corresponding "super" force carrier particle and every known force carrier particle to have corresponding "super" matter particle. The superpartners (Squark, Selectron, Sneutrino etc) are thought to be more massive than their partners (quark, electron, neutrino etc). String theory can explore what happened at the instant of the big bang, and what was before the big bang. We now believe a multiverse of universes has existed since before the big bang. At this point no experiments are possible which could prove or disprove if string theory is real or just a mathematical concept.

9:00 EFFECTS OF NONPLANARITY ON SECONDARY FLOWS IN THE SMALL BRONCHIAL TUBES

Bela Soni*, Charla Lindley, and David Thompson, Mississippi State University, Mississippi State, MS 39762

Laminar flow in the small bronchial tubes, characterized by a Reynolds number range of approximately 100 to 1000, is quite complex due to the presence of vortex-dominated secondary flows that play a critical but poorly understood role in the filtration of entrained particles from inhaled air. Contributing to the complexity of the problem is the geometry of the bronchial network, which contains nonplanar, multi-generational branching. The out-of-plane branch angles are randomly distributed in a manner that allows the bronchial network to fill the space available in the chest cavity without intersections. In this paper, we present the results of computational fluid dynamics simulations for steady-state inhalation flow in four three-generation geometries. Since the branching angles are randomly distributed in, we limit this study to only cases for which the branching occurs in the plane perpendicular to the previous branch or the plane of the previous branch. Various fluid dynamical properties are employed to describe the differences between the flows.

9:15 PARTICIPATING IN DoD RESIDENTIAL PROTON EXCANGE MEMBRANE (PEM) FUEL CELL(FC) PROJECT BY ALCORN STATE UNIVERSITY AND THE PARAMETRIC STUDY OF PEM-FC OPERA-

TION

Sam Aceil*, Alcorn State University, Lorman, MS 39096

Distributed electric power generation is considered as a possible substitute for the current centralized power generation for certain usage. Starting 2001, the Department of Defense (DoD) funded a numbers of PEM fuel cells at various military sites with different climates. The Alcorn State University (ASU) Reserve Officers' Training Corps (ROTC) building was selected as one those sites during the 2004 Fiscal Year (FY04). The 5KW Plugpower GenSys PEM Fuel Cell arrived on campus on January of 2006 and the installation completed by March 2006 at ROTC building. The DoD contractor closely monitors the operation of the FC system remotely for one year as part of their contract with DoD. The data is also avail to ASU for their investigations. Parameters under investigation include electric and cogeneration power and efficiency, availability, unscheduled down-time, capacity factor, fuel consumption, total KWh, available KWh, electric efficiency. This paper discusses the results of the operation obtained so far.

9:30 MECHANISM OF DYNAMIC RECRYSTALLIZATION DURING THE FRICTION STIR WELD PROCESS

Lei Dong*, and Judy Schneider, Mississippi State University, Mississippi State, MS 39762

Friction Stir welding (FSW) is becoming an increasingly popular, solid state method for joining materials which are difficult to join by conventional fusion weld methods. Based on microstructural characterization of the FSW, three distinct zones can been identified: heat-affected zone (HAZ), thermo-mechanically affected zone (TMAZ), and refined zone (NZ). Many researchers attribute the formation of the ultrafine grains in the NZ to dynamic recrytallization (DRX). Although this mechanism is postulated, recovery rather than recrytallization is normally observed in alloys such aluminum with high stacking fault energy (SFE). Based on a review of the literature, there does not appear to be a consensus regarding the mechanism of grain refinement mechanism in the NZ. In our experiments, the use of metal cutting theory is being used to describe the thermo-mechanical processes the metal experiences during the FSW process. Using this analogy, a shear zone is expected to form around the weld tool. If the resulting microstructure found in machine chips can be correlated with the microstructure of the FSW in NZ, then this approach may help to quantify the thermo-mechanical conditions required for grain refinement.

9:45 Break

10:00 THE DIPOLE VORTEX

Henk Arnoldus*, Mississippi State University, Mississippi State, MS 39762

When light is observed by for instance the human eye, a camera or a photomultiplier in a laboratory, the distance between the detector and the source of the light is largely irrelevant. Light emanating from a source appears to travel in rays, e.g., it seems to propagate along straight lines from the source to the detector. This picture changes dramatically when we consider the spatial structure of the energy flow on a scale of an optical wavelength. We shall show that the light emitted by a point dipole, which is the most common source of electromagnetic radiation, emerges from the dipole in a peculiar way. The flow lines of the emitted energy form an optical vortex in the sense that the energy flow lines first swirls around the axis of the dipole before turning into an optical ray. We shall also consider the effect of such an optical vortex on the induced electrical current in a nearby interface with a conducting material. The current density, which is generated by the dipole, can have a very intricate structure, depending on the orientation of the dipole with respect to the boundary, and depending on whether it is an electric or a magnetic dipole.

10:15 SIMULATION AND PERFORMANCE EVALUATION OF BEST HOPPING SEQUENCE SELECTION PROTOCOL FOR INCREASING BATTERY LIFE OF UNMANNED AIRBONE VEHICLES

Amer Magableh*, Ibrahim Y. Abualhaol, Mustafa M. Matalgah, Atef Z. Elsherbeni, University of Mississippi, University, MS 38677

Frequency hopping (FH) is one of two basic spreading techniques used in spread spectrum communication to minimize the effectiveness of electronic warfare or jamming. The concept of FH is used in Unmanned Airborne Vehicle (UAV) transmission mainly to extend the battery life. We propose a new technique for FH, which is based on assigning multiple sub-channel hops to handle the transmission. The number of sub-channels and their selection are based on the required data rate and the signal-to-interference-plus-noise ratio (SINR) for each sub-channel. In our model, we assume the UAV uses adaptive modulation and coding techniques, and the transmission is carried over 16 sub-channels, each with 5 MHz bandwidth and span 80 MHz of bandwidth at the 2.4 GHz spectrum. The proposed new technique namely, Best Hopping Sequence Selection Protocol (BHSSP) is based on selecting a partial set of sub-channels based on a pre-defined minimum transmission data rate. The objective is to find a minimum number of sub-channels to be assigned to the link satisfying the minimum required data rate. Therefore, the sub-channels data rates should be determined, which are associated with the estimated SINRs. The BHSSP is implemented in simulink software package to simulate the system and evaluate its performance before going to real time implementation. The proposed simulink model for this new protocol contains a real-time estimator for the SINR of the 16 sub-channels. The BHSSP provides input to the communication system about which frequency hopping sequence to use in order

to minimize power consumption and therefore increase battery life.

10:30 CIRCUIT MODEL AND FULL WAVE ANALYSIS OF A COMPACT WIDEBAND QUARDARTUE HYBRID

Adarsh Jaiswal* and Ahmed A. Kishk, University of Mississippi, University, MS 38677

A printed, compact and wideband quadrature hybrid is designed by utilizing the multi-section technique for bandwidth enhancement and equivalent transmission line technique for size reduction. The compact quadrature hybrid has a size reduction of 50% as compared with the conventional quadrature hybrid. The compact hybrid achieves over 50% bandwidth at a centre frequency of 2 GHz. A circuit model and a full wave model are introduced and analyzed using Agilent Advanced Design System. Excellent agreement between the simulated and the fabricated hybrid is achieved which indicates that the circuit and full wave models are indeed good representation of the fabricated compact wideband quadrature hybrid.

10:45 LASER-INDUCED FLUORESCENCE SPECTROSCOPY INVESTIGATION OF URANYL COMPOUNDS

Guangjun Wang*, Yi Su, and David Monts*, Mississippi State University, Mississippi State, MS 39762

Uranyl (UO_2) compounds exhibit a characteristic fluorescence spectrum in the 450-600 nm spectral region when excited by wavelengths in the ultraviolet or in the short-wavelength portion of the visible spectrum. We report a parametric study of the effects of excitation wavelength (including 532 nm, 409 nm, 355 nm, and 266 nm), excitation laser power, and concentration on the laser-induced fluorescence (LIF) spectra of simple uranium compounds. The uranium compounds investigated include uranium dioxide, triuranium octaoxide, uranyl acetate, uranyl formate, uranyl nitrate , uranyl sulfate, and uranyl phosphate.

11:00 A PARTITIONED LOOP ANTENNA WITH OMNIDIRECTIONAL PERFORMANCE AT 5.8 GHZ

Roger Hasse*,Darko Kajfez, Veysel Demir, and Atef Z. Elsherbeni, University of Mississippi, University, MS 38677

When the dimensions of a loop antenna are on the order of the operational wavelength or larger, the current flowing in the loop exhibits phase changes that degrade the radiation efficiency. In this study a center-driven square loop antenna is designed at 5.8 GHz by partitioning the loop geometry with capacitive elements at strategic locations in order to maintain a nearly constant phase of current flow and enhance the radiation performance. A thin-wire loop antenna of radius 0.5 mm and side s = &lambda/4 mm is simulated using the AWAS software package, with an input impedance close to 50 &Omega and return loss of -35 dB at 5.8 GHz. Five capacitive elements ranging from 0.04-0.07 pF are used to achieve optimal current flow. The calculated radiation pattern in the plane of the loop is close to omnidirectional with directive gain of 1.5 dB. The simulated performance of the wire antenna and the equivalent printed structure is validated using a finite difference time domain (FDTD) package. Introduction of capacitive elements is investigated by using proximity coupling of conductor strips, and by alternating top- and bottom-layer conductors whose regions of overlap function as physical capacitors due to the intermediate dielectric medium. Such a partitioned antenna can serve as an alternative to the more complicated designs for producing omnidirectional pattern due to its simplicity of fabrication.

11:15 MODAL ANALYSIS OF METAMATERIAL SLAB WAVEGUIDES

Hafeez Olanigan* and Alexander B Yakovlev, University of Mississippi, University, MS 38677

Metamaterial slab waveguides obtained by homogenization of realistic metamaterial structures composed of periodic lattices of split-ring resonators are investigated in this work. These waveguides allow backward waves to propagate, such that phase and group velocities have opposite directions. Metamaterial slab waveguides represent isotropic magneto-dielectric slabs, wherein frequency-dependent permittivity and permeability are both negative within certain frequency band. In this work, we characterize the behavior of transverse electric (TE) and transverse magnetic (TM) electromagnetic surface waves on a metamaterial grounded slab and compare to the modal behavior of TE and TM surface waves on conventional dielectric slabs. In particular, it is shown that the modal spectrum consists of proper (bound) and improper (with fields growing in the cover region), propagating and evanescent, and real and complex modes. It is important to note that leaky modes do not exist on double-negative metamaterial slabs (they are classified as complex propagating surface wave modes). Dispersion behavior and field distribution of TE and TM surface waves are studied for metamaterial slabs of different thickness and compared to those for conventional dielectric slab waveguides.

11:30 POWER GENERATION WITH A LOW TEMPERATURE DIFFERENCE STIRLING ENGINE

Christopher Peters*, and Richard Raspet, University of Mississippi, University, MS 38677

Classroom demonstration Stirling engines will drive a rotating disc with temperature differences as low as the difference between body temperature and room temperature. This led us to wonder if the demonstration engine could be used to produce power from waste heat, and if so, what efficiency could be achieved. In this study, we converted the mechanical energy produced from a low ÄT Stirling engine into electrical energy using magnets mounted on the rotating disc and an induction coil. The study included the application of thermodynamic principles such as convection and conduction to evaluate the thermodynamic efficiency. We will present data on the electrical output of this engine and compare the efficiency to thermoelec-

tric devices that convert waste heat to electricity directly.

11:45 THE STATISTICS OF ACOUSTIC BACKSCATTER FROM THE SEAFLOOR

Jerald Caruthers, University of Southern Mississippi, Hattiesburg, MS 39406

Acoustic backscatter from the seafloor is a random process the statistical details of which provide information about the composition and geomorphology of the bottom interface and volume inhomogeneities below. Frequencies above about 50 kHz reveal information mostly about the seafloor at or just below its surface, while lower frequencies provide information from greater depths. Often with such data we seek to classify the seafloor into regimes such as sedimentary materials, e.g., sand or soft sediments, or forms such as sand ripples, shell-bit inclusions, subbottom layering, or other inhomogeneities. Generally, within some area of interest, the nature of the bottom changes from one region to another. So we are interested in developing algorithms for the most effective and expeditious means of "seafloor classification" and "change detection" based on data we collect at various frequencies. We will discuss the statistical character of seafloor backscatter data we have collected with a specially modified side-scan sonar operating at 150 and 300 kHz for the analyses of seafloor surface features and the design and planning for a new Multibeam SubBottom Profiler operating at 12 kHz that USM is presently building

THURSDAY AFTERNOON

Bost Theater

1:15 DESIGN OF SINGLE AND DUAL BAND CIRCULARLY POLARIZED MICROSTRIP PATCH ANTENNAS

Tejaswi Makineni*, Fan Yang, and Atef Z. Elsherbeni, The University of Mississippi, University, MS 38677

In this paper, different feeding mechanisms are considered to design circularly polarized microstrip patch antennas. The first is a single feed circularly polarized (CP) microstrip patch antenna. This design is achieved by embedding two tuning stubs on opposite sides of the patch antenna and placing a coaxial feed at the diagonal of the square patch. The second is a dual microstrip line feeding structure to create circularly polarized microstrip antenna. Since high impedance microstrip lines are difficult to fabricate, the antenna is feed through vias that are connected to 100 Ohm microstrip lines on the other side of the ground plane. The radiation performance of these two designs is compared with each other. Based on the above single band CP designs, a dual band CP microstrip patch antenna will be developed. Simulation and experimental study for sample designs are to be provided during the presentation.

1:30 PERMITTIVITY MEASUREMENT IN CUSTOM-SIZED WAVEGUIDE FIXTURES

Ravi K. Challa*, Veysel Demir, Darko Kajfez, Joseph R. Gladden, and Atef Z. Elsherbeni, University of Mississippi, University, MS 38677

The complex permittivity measurement is typically performed by utilizing the standard-sized waveguides, which come with associated coaxial to waveguide transitions, matched loads and possibly other specialized attachments like a moving short. We would like to present a novel procedure for extraction of complex permittivity using custom-sized square waveguide, without the need of a matched load. We propose to measure the two-port S- parameters using the TRL calibration method. With the measured S-parameters, the real part of the permittivity will be extracted from all four S-parameters using both forward and inverse techniques. The imaginary part is obtained by recomputing the value of the reflection coefficient for the short-circuited sample, and then determining the value of the unloaded Q factor by data fitting (software QZERO). The loss tangent is then equal to the inverse of the Q factor. It was found that, by using this procedure we can measure the imaginary part of permittivity accurately.

1:45 WIDEBAND DESIGNS OF ARTIFICIAL MAGNETIC CONDUCTORS USING FREQUENCY SELECTIVE SURFACES FOR LOW PROFILE ANTENNA APPLICATIONS

Gopinath Gampala* and Alexander B Yakovlev, University of Mississippi, University, MS 38677

Artificial Magnetic Conductor (AMC) ground planes have an in phase reflection property (AMC ground planes reflects the incident wave with a zero degree phase shift) applied to the design of low profile antennas. AMC is realized using periodic arrays of conducting elements called Frequency Selective Surface (FSS). In this work, new designs of wideband AMC ground planes realized by FSS structures printed on a metal backed grounded dielectric slab are presented. The bandwidth is defined between the frequencies for which the phase of the reflection coefficient at the surface of AMC ground plane lies between -90° to +90° for a plane wave of normal incidence. Three new designs of FSS structures are proposed. A nested L-loop structure, a new cross structure with unconnected arms and a near fractal structure combined with the new cross are proposed as the wideband elements for the design of AMC ground planes. Apart from the design of the periodic unit cell of the FSS structure, the bandwidth of the AMC ground planes

depends on the thickness and the permittivity of the dielectric substrate. The bandwidth increases with the thickness of the substrate while it decreases for high dielectric permittivity. The proposed designs yield bandwidths of 40% to 60% for an electrical thickness of 0.1λ to 0.14λ.

2:00 STUDY OF ARRAY CHARACTERISTICS OF A 2D PHASED ARRAY ANTENNA USING DIGITAL PHASE SHIFTERS

Suresh Kumar Yada* and Ahmed A. Kishk, University of Mississippi, University, MS 38677

Study of array factor of a two Dimensional (2D) array with rectangular lattice using different digital phase shifters is considered. Now-a-days digital phase shifters are widely used in phased array antennas as they are more immune to noise. Digital phase shifters provide discrete set of phase states depending on the number of bits used. The present work studies the effect of using specific digital phase shifters with certain number of bits on planar arrays. A study case of a planar array of a 32 by 32 element is considered with half wavelength element spacing. The numbers of bits considered are 1bit, 2 bit, 3bit, 4bit and 5bit. These results are compared to an analogue phase shifter. The array factor mainly depends on the element spacing and number of bits used along with other factors. The effect of element spacing is also considered. The factors like scan angle deviation, maximum side lobe level and directivity loss are calculated. A variation of array factors against frequency for phase shifters with different number of bits is presented. The types of phase shifters considered are true time delay lines, switched line phase shifters and constant-phase phase shifters. Different array geometries in 2D with different lattices and different number of elements are considered.

2:15 COMPETITIVE GROWTH PROCESSES AND ITS APPLICATIONS

Poonam Verma [1]* Mark A. Novotny [1], and Alice Kolokowska[2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Prudue University, Hammond, IN 46323

Our study is motivated by both applications to non-equilibrium materials growth and to algorithms for simulations on thousands of processors. We investigate some different growth processes and their corresponding universality classes and exponents. In particular, we simulate competitive two-component growth on a one dimensional substrate of L sites, which mixes Random Deposition (RD) which is uncorrelated in nature with a correlated growth process Ballistic Deposition (BD) which occurs with probability p. We find that the only effects of RD are that it stretches the time evolution of the surface roughness, but leaves the KPZ correlations intact. We identify that as p -->0 the initial phase becomes infinitely long as this is the limit of RD growth.

2:30 COMPACT ARTIFICIAL MAGNETIC CONDUCTOR DESIGN USING SPIRAL GEOMETRIES

Yanghyo Kim*, Fan Yang, and Atef. Z. Elsherbeni, University of Mississippi, University, MS, 38677

When plane waves illuminate on an electromagnetic band-gap (EBG) structure, the reflection phase continuously changes from 180° to -180°. Especially in a certain frequency where the reflection phase is 0°, the surface shows the same property as a perfect magnetic conductor (PMC). The PMC material does not exist in nature, but an artificial magnetic conductor (AMC) can be realized by properly designing the EBG structure. The objective of this research is to design compact AMC structures for wireless communication and RFID applications. Spiral geometry is investigated because it can increase the equivalent inductance, resulting in a lower resonant frequency. Single and double spiral structures are first introduced and examined by the finite difference time domain (FDTD) algorithm developed by the authors. It is observed that the reflection magnitude exhibits a large cross polarization over a high frequency range, 11 GHz to 30 GHz, which should be avoided in an AMC design. To eliminate the cross polarization, a four arm spiral element has been designed, which cancels the cross polarized fields in an opposite direction. The resonant frequency is 43.2 % lower than a traditional EBG structure. The proposed spiral AMC material is a good candidate for various antenna applications.

2:45 Break

3:00 TAGUCHI'S METHOD FOR OPTIMIZING MICROWAVE FILTERS

Wei-Chung Weng*, Fan Yang, and Atef Z. Elsherbeni, University of Mississippi, University, MS 38677

A new global optimization technique based on Taguchi's method is presented for microstrip filters designs. Taguchi's method effectively reduces the number of steps required in an optimization process due to the implementation of the orthogonal array thus a fast convergence speed can be obtained, which demonstrates a great potential for being a leading candidate for electromagnetic optimization tools. Microwave filters are widely used in telecommunication equipments. Filters suppress the noises coming from environment, prevent spurious signals interfering with other systems, and allow wanted signals to pass through within a specific frequency band. Although filters built with lumped elements can realize the desired frequency response, it is difficult to control the lumped elements' properties in the microwave band. Therefore passive planar printed types of filters are usually used for microwave applications. These planar filters are composed of several stubs of microstrip lines, and need to be accurately modeled due to the high frequency effects such as dispersion and dielectric/conduct loss. Therefore, an optimization technique and a full wave EM simulator are necessary tools for an optimum design of such filters. In this study, a full wave commercial simulator, IE3D along with our external Taguchi's based optimizer are used to optimize a microstrip band stop filter and a microstrip band pass filter. The desired frequency re-

sponses of the designed filters are successfully achieved with less number of iterations relative to other recently used optimizers for such applications. These application examples show the validity and efficiency of the proposed Taguchi's method for electromagnetic applications.

3:15 DETERMINATION OF WALKING HUMAN BACK FREQUENCY USING BAYESIAN PARAMETER ESTIAMTION

Asif Mehmood [1]*, Paul M. Goggans [1], James M. Sabatier [2], and Alexander E. Ekimov [2], [1]University of Mississippi, University, MS 38677 and [2]National Center for Physical Acoustics, University, MS 38677

To distinguish a walking human from other moving or stationary objects in near real-time is of great interset in military as well as civilian applications. We intend to solve this problem using Bayesian parameter estimation and data obtained from an ultrasonic Doppler vibrometer (UDV). Here we describe our initial experimental and analyticalwork to develop an automated non-invasive model-based approach for recognizing people based on their measured velocity signal while walking. Our experimental set up uses an ultrasonic Doppler vibrometer as a non-contact means for obtaining data related to the velocity of the moving body components. The main advantages of using an ultrasonic vibrational measurement system is high resolution, low cost, and ease of installation. In the UDV an ultrasonic transducer directs a 50 kHz acoustic wave to the moving body surface. The returned acoustic signal, frequency modulated by the velocity of the back vibration of walking human, is received by a co-located transducer whose output is sampled to produce the output data time series. Our experiment is laboratory based and intended to determine basic capabilities. The presence of a characteristic and approximately sinusoidal back motion component in the observed velocity of a walking human is used as a basis for distinguishing a walking human from other moving objects. . In this paper we present parameters estimation results for the walking human model and discuss our simulated and experimental results.

3:30 RADIATING CHARACTERISTICS OF DIPOLE ANTENNAS IN THE PRESENCE OF OBSTACLES USING THE ITERATIVE MULTRI-REGION TECHNIQUE

Mohamed Al Sharkawy*, Veysel Demir, and Atef Z. Elsherbeni, University of Mississippi, University, MS, 38677

This work presents an efficient algorithm to the solution of large scale electromagnetic radiation problems from dipole antennas and other local sources. The advantage of using the iterative multi-region technique in conjunction with some proposed enhancement procedures, involving the use of the incomplete LU preconditioning and the multiprocessors, is presented to provide a robust solution to selected antenna applications. As a starting point for further applications, the solution to the problem of a dipole antenna radiating in the presence of obstacles is investigated. Furthermore, the solution of a linear antenna arrays is evaluated with the least memory consumption and CPU time. This work is considered as a bench mark for providing a robust technique used in solving real life, large scale open boundary electromagnetic problems within significant time and memory savings.

3:45 SCATTERING OF OBLIQUELY INCIDENT PLANE WAVE FROM AN ARRAY OF CIRCULAR DIELECTRIC CYLINDERS

Bassem Henin*, Atef Z. Elsherbeni, and Mohamed Al Sharkawy, University of Mississippi, University, MS 38677

A rigorous semi-analytical solution is presented for electromagnetic scattering from an array of circular cylinders of arbitrary radii and positions due to an obliquely incident plane wave. The cylinders are illuminated by either TM_z or TE_z. incident plane wave. The analysis begins by representing each field component by an infinite series of cylindrical harmonic functions with unknown coefficients. Then equations based on the boundary conditions applied on the surface of each cylinder are used to deduce the values of the unknown coefficients. Two different methods are presented to check the validity of this technique. First, the principle of equal volume model is used to represent one cylinder by an array of circular cylinders and sample numerical results are given to compare the known echo width of the scattered field from one cylinder to that of an array of circular cylinders. Second, the near field is calculated to prove the validity of the boundary conditions on the surface of each cylinder. The results in both cases show excellent agreement between the calculated field and the known results from pervious work for special cases. The presented scattering technique can be extended for other types of cylinders.

4:00 THE QWEAK EXPERIMENT AND SEARCH FOR PHYSICS BEYOND THE STANDARD MODEL

Dipangkar Dutta, Mississippi State University, Mississippi State, MS 39762

Three of the four fundamental forces in nature (weak, strong and electromagnetic) have been combined (unified) into one mathematically consistent quantum field theory known as the Standard Model (SM). The SM predicts or is consistent with all known aspects of the elementary particles and their interactions over an impressive range of probes and scales. The Medium Energy Physics group at MSU is involved in several experiments that aims to challenge the predictions of the SM and look for physics beyond the SM. One of these experiments (The QWeak experiment) proposed for Jefferson Lab in Newport News, VA utilizes parity violating electron scattering from the proton to perform a precision measurement of the weak charge of the proton. This experiment will test the SM prediction at the

10&sigma level. Any deviation from the SM prediction would be a signal of "New physics", whereas agreement would place new and significant constraints on possible SM extensions. I will describe the QWeak experiment and talk about the diamond micro-strip detector which will be built at MSU for this experiment.

4:15 SPECTROSCOPIC METHODS FOR IDENTIFYING BACTERIA CELLS

Vidhu Tiwari*, Fang Y. Yueh, Lakshmi Pulakat, and Jagdish P. Singh, Mississippi State University, Mississippi State, MS 39762

The spectroscopic methods were used for studying Azotobacter vinelandii- a genus of free-living diazotrophic soil bacteria. These methods include Raman and Laser Induced Fluorescence (LIF) spectroscopy. Azotobacter has generated a great deal of interest owing to their unique mode of metabolism. It is a large, obligately aerobic soil bacterium, which has one of the highest respiratory rates known among living organisms and is able to grow on a wide variety of carbohydrates, alcohols and organic acids. The Raman Scattering of Azotobacter, incubated with gold nanoparticles, was examined with 532-nm and 785-nm as an excitation laser wavelength. The basic instrumentation for characterizing the bacteria by Raman spectroscopy employed laser and miniaturized fiber optic Raman Probe. The surface enhancement effects allowed the observation of Raman spectra of such bacterial cells, and were excited in the visible/NIR region of wavelength at low incident power for minimum sample degradation. LIF spectra of Azotobacter were collected with a 410-nm diode laser as an excitation source, and a reflection probe to deliver laser beam on the sample and collect the LIF signal from the sample. Spectral contrast observed in bacteria from nitrogen fixing and non-nitrogen fixing condition was analyzed for distinguishing the bacteria cells from their respective host media.

6:00 Poster Session
Location: Bost Auditorium North
Posters may be set up between 4:00p and 4:30p

INVESTIGATION OF RFID SYSTEM PERFORMANCE IN MULTIPLE-TAG ENVIRONMENTS

Atef Z. Elsherbeni, Fan Yang, Ahmed A. Kishk, and Chasidy West*, University of Mississippi, University, MS 38677

Many corporations are working to implement radio frequency identification (RFID) systems in order to improve the tracking of inventory, reduce items that are out-of-stock, and decrease shipment delays. There are different methods of implanting RFID tags. Some are adhesive and others are woven into fabric. The effective detection range of RFID tags is affected by the system setup as well as the interaction between the RFID tags. The objective of this research is to investigate the RFID system performance under different setups and multiple tags environment. The RFID system includes a reader unit, transmitter and receiver antennas, and RFID tags. In the first setup, two transceivers and two receiver antennas were placed on opposite sides of testing room at a distance of eleven feet. Each RFID tag has its own hexadecimal identification number and was placed on a cardboard medium. Two packaging tests were performed: a single box and a multiple box scan. For the multiple-box test, subject testing includes an outer “Relay” box that contains four smaller boxes labeled A-D. Each box was assigned six tags, one for each side. The IDs of the tags were scanned and analyzed to identify the successful reading zones and reveal the interaction effect between the tags. In the second system setup, only one transmitter antenna and one receiver antenna are implemented. The “Relay” box was then elevated above the ground to identify the effective reading zones of this simplified RFID setup. This research work provides a useful reference for future RFID applications.

DYNAMIC FOCUSING OF AWARENESS IN ADAPTIVE FUZZY CONTROL SYSTEMS

Ognjen Kuljaca, Alcorn State University, Lorman, MS 39096

Adaptive fuzzy logic (FL) control architecture is described in the paper. A detailed stability proof is given using Lyapunov-like stability criteria. It is shown that the fuzzy logic control system is focusing on a different region of the state-space depending on these varying factors. The proposed FL control algorithm does not require any assumptions on the initial parameters of FL controller for the system to be stable. The performance of the FL controller is studied in detail using simulation studies. Effects of changes in initial FL parameters, plant nonlinearity, and different reference trajectories on the final FL membership functions (MF) were investigated with the intention of drawing conclusions on how the learned MFs adapt to changing environments. It was observed that input layer MFs are changing in such a way that the whole state space in which plant states are contained is covered by MFs, but also that MFs are trying to put more weight on approximating plant states at their steady trajectories after the transient is finished if the excitation is persistently excited (PE). Simulations were also performed for the step reference input. It was noted that in the case of step reference although the fuzzy controller kept the system stable, the learning was very slow. Also, the final trajectories (only a point in this case), were just barely covered by the final MFs. The conclusion was that no meaningful learning process occurred due to lack of information in step reference signal.

SEARCH FOR WOBBLING AND TRIAXIAL STRONGLY DEFORMED(TSD) STRUCTURES IN ^{171}Hf AND ^{172}Hf

Yanci Zhang [1]*, W.C. Ma [1], D.G. Roux [1], J.A. Winger [1], R. Yadav [1], M.P. Carpenter [2], R.V.F. Janssens [2], T.L. Khoo [2], and G.B. Hagemann [3], [1]Mississippi State University,Mississippi State, MS 39762, [2]Argonne National Laboratory, Argonne, IL

60439 and [3]Neils Bohr Institute, Copenhagen, Denmark

Wobbling mode, characterized by a sequence of rotational bands with increasing number of wobbling quanta, is a low-lying collective excitation mode uniquely related to the excitation of nuclei with triaxial deformation. Theoretical calculations predicted potential energy minima with large quadrupole deformation ($\epsilon e_2 \sim 0.4$) and substantial triaxiality (γ? $\sim \pm 20°$) for nuclei near Z ~ 72 and N ~ 94. In the past several years wobbling bands have been established in 161,163,165,167Lu. A number of strongly deformed (SD) bands were also observed in neighboring nuclei 168,170,173,174,175Hf. However, the wobbling mode has not been observed in any Hf nuclei. We performed an experiment searching for wobbling mode and TSD structure in 171,172Hf at Argonne National Laboratory with Gammasphere detector array. Totally 2.1 x 109 events with multiplicity ≥= 3 were collected. Data was sorted into database, and further analyzed using 3-dimensional cube and 4-dimensional hypercube. Five candidates of SD bands in 172Hf and two in 171Hf were identified. Detailed results will be presented.

MULTISCALE ANALYSIS OF A MAGNESIUM CORVETTE ENGINE CRADLE

David Oglesby* and Mark Horstemeyer, Mississippi State University, Mississippi State, MS 39762

A multiscale analysis was performed to develop a monotonic microstructure-mechanical property model originally developed for a cast A356-T6 aluminum to include several types of microstructural inclusions found in popular magnesium alloys used in the automotive sector. These microstructure property material models can be used for finite element analyses in which the deformation history, temperature dependence, and strain rate dependence vary. Internal state variables are used in the monotonic material model to reflect void/crack nucleation, void growth and void coalescence from the casting microstructural features such as casting porosity, shrinkage, and intermetallics. In order to determine the pertinent effects of the microstructural features, several different length scale analyses were performed. Once the pertinent effects of the microstructural features were determined and included in the microstructural mechanical property model, load-to-failure analyses were performed on an AE44 magnesium Corvette engine cradle and a failure location was predicted. Monotonic, load-to-failure experiments were then performed on several cradles and the predictive capabilities of the model were verified through the accurate prediction of the failure location.

DESIGN AND FABRICATION OF A MICROSTRIP TRL CALIBRATION KIT FOR MEASUREMENT OF RF COMPONENTS

Dalia Elsherbeni*, Lisa Jordan, W. Elliott Hutchcraft, Richard K. Gordon, Darko Kajfez, University of Mississippi, University MS, 38677

In this paper, rather than the traditional short-open-load-thru (SOLT) method, a newer calibration technique called the thru-reflect-line (TRL) is studied for use in testing packaged transistors and passive surface mount components that are typically used on microstrip. TRL is a two-port calibration procedure that uses at least three standards to define the calibrated reference plane. For non-coaxial measurements it is difficult to fabricate and characterize standards such as an open circuit or a short circuit. In addition, the device under test must be physically connected to the network analyzer by some kind of transition. As a solution, we propose the development of a TRL calibration kit in which only microstrip TRL standards are used for S-parameter characterization of non-coaxial devices. Microstrip TRL standards for the thru, reflect, and line are designed, fabricated and tested for a frequency range from 200 MHz - 12 GHz. A split fixture design is built which contains microstrip to coaxial transitions to aid in measuring these devices. With this microstrip TRL calibration kit, accurate and repeatable calibrations over a broad frequency range will be verified and measurement results of several components such as transistors, inductors, capacitors, and other surface mount components will be verified.

DESIGN AND MEASUREMENT OF MICROWAVE CIRCUITS FOR A 2.45 GHZ RECEIVER

Maxwell Woolsey, John Ashmore*, Joshua Cassity*, Lorenzo Bennett, and W. Elliott Hutchcraft, University of Mississippi, University, MS 38677

Passive and active microwave receiver components were designed and measured. Microstrip technology was used at a design frequency of 2.45 GHz, which is commonly used by such technologies as wireless LAN and Bluetooth. The development of the devices, including power dividers/combiners, a directional coupler, amplifiers, and phase shifters, was examined in detail. The design phase began with initial hand calculations which were then modeled using Advanced Design System (ADS), a microwave circuit simulator. Parameter optimization was employed to fine tune the elements within the schematic analysis. Layouts were then generated from the schematic diagrams, and the device layouts were examined using full wave analysis of the ADS Momentum package. Further device tuning was often required due to the Momentum solution taking into account electromagnetic phenomena not modeled in the schematic analysis. The amplifier stages required a hybrid analysis technique, since the transistor was modeled using imported measured data. The technique involved interfacing elements in the ADS schematic utility with the microstrip circuit layout modeled in ADS Momentum in order to provide a more accurate simulation than the schematic analysis alone. When the device simulations produced acceptable results, the layouts were milled onto substrates. The devices were then measured using a network analyzer to ensure that the simulations accurately modeled the

actual devices.

THE USE OF GRAPHICS PROCESSING UNITS TO ACCELERATE LINEAR ALGEBRA OPERATIONS FOR ELECTROMGNETICS SIMULATION

Maxwell Woolsey*, W. Elliott Hutchcraft, and Richard K. Gordon, University of Mississippi, University, MS 38677

The use of graphics hardware for general purpose computation has recently gained interest due to the high processing speed and inherent data parallelization of current generation graphics processing units (GPU\'s). The difficulty of realizing GPU accelerated scientific programs is abstracting the graphics processes into a collection of liner algebra routines, providing a library of parallelized functions that could speed up matrix operations such as those used in electromagnetics simulation. Early attempts at general purpose GPU computations required extensive knowledge of the graphics processes and hardware assembly language. Higher level languages from nVidia, OpenGL, and Microsoft allow programmers to write graphics programs – shaders – without focusing on assembly language. General purpose computation, however, would still involve setting up 3D environments, passing data to the GPU as texture maps, loading the shader into the GPU, and rendering the 3D scene into a buffer to run the computation – iterating as necessary. Computation on graphics hardware has been abstracted further in two experimental languages: BrookGPU from Stanford, and Accelerator from Microsoft Research. These libraries attempt, with limited success, to provide completely abstracted GPU access. Both libraries were employed to solve electromagnetics problems using the finite element method. The resulting performance levels depended greatly on the computational size, demonstrating a huge data transfer bottleneck that could only be offset with the parallel-computation of large data sets.

PERMITTIVITY AND LOSS TANGENT EXTRACTION OF COMPOSITE MATERIALS USING OPTIMIZATION TECHNIQUES

Lorenzo Bennett*, W. Elliott Hutchcraft, Richard K. Gordon, Ellen Lackey, James G. Vaughn, and Reid Averill, University of Mississippi, University, MS 38677

There are many methods for reconstructing the electric properties of materials from the scattering parameters such as the Nicholas-Ross-Weir (NRW) or Stuchly-Matuszewsky equations. It is shown that optimizing the permittivity in Advanced Design System (ADS) is also a viable option for obtaining the permittivity or loss tangent of a certain type of material. Different types of composite materials were measured in this experiment. It was assumed that the materials did not have any magnetic properties. The composite materials were placed in a rectangular waveguide(X-Band), and the S-parameters were measured in the 7 to13 GHz range. ADS was then used to reconstruct the permittivity and loss tangent of the material from the measured data using several types of optimization techniques, such as the genetic, random, and gradient algorithms. In the results it was shown that the modeled S-parameters in ADS did converge to the measured S-parameters resulting in a unique permittivity. The permittivity results from ADS were compared to results using the NRW equations to show agreement. From the results, it is shown that this method can be a viable approach to use when measuring the electromagnetic properties of a material, and is comparable to other extraction methods.

DESIGN, FABRICATION AND TESTING OF AN RF POWER AMPLIFIER

Lisa Jordan*, Dalia Elsherbeni, W. Elliott Hutchcraft, Darko Kajfez, Richard K. Gordon, University of Mississippi, University, MS, 38677

An RF amplifier using a Silicon Carbide (SiC) transistor was designed for power gain. The SiC transistor can support a high power density and has high thermal conductivity, making it a good choice for a power amplifier. It is a small device with large power output capability. Agilent's Advanced Design System (ADS) was used for the majority of the simulations. This particular amplifier is optimized in the range of 1.9 – 2.6 GHz, as this is the optimal performance range of the transistor used. The transistor used in the design is a CREE device, CRF-24010, a 10 Watt RF power Metal-Semiconductor Field-Effect Transistor (MESFET). The design of the amplifier includes a stabilization network, matching networks at the input and output, and a DC biasing network. The stabilization network ensures that the transistor will not oscillate at any frequency under any passive load or source termination. Once the transistor was stabilized, matching networks were incorporated at the input and the output of the transistor. These networks minimized the reflection and therefore optimized the gain of the system. Lastly the DC biasing network was designed to hold the desired Q-point constant while not interrupting the RF signal path. Once the design was complete, it was fabricated and tested. Measured results were encouraging with slightly less gain than the simulated results.

CAN FLOW CONTROL DEVICES SIGNIFICANTLY REDUCE DRAG?

Sumontro Lal Sinha, Sinhatech, Oxford, MS 38655

This project's aim is to determine if aerodynamic drag of non- streamlined vans and trucks could be significantly reduced by sticking tape-Iike devices on them. These devices only marginally modify the flow next to the surface which they are mounted. They reduce skin- friction drag on streamlined objects, especially when the tape incorporates a flexible skin to interact with and attenuate boundary- layer turbulence. It was hypothesized that such a "Deturbulator tape" could attenuate turbulent mixing in the large separated wakes of vans and trucks. The Deturbulator transforms the wakes into stagnant air masses attached to the vehicles, providing a virtual streamlining extension. This streamlining reduces drag and improves highway fuel economy. Wind tunnel tests demonstrated 80% and 25% drag reductions on a van and truck with a 36% r eduction in wake

velocity fluctuations when the Deturbulator tapes were stuck at the right places on the model. Repeated measurements of highway mileage of a minivan and truck also showed 19% and 15% improvement respectively, when treated with deturbulator tape. Traditional methods for reducing vehicle drag rely on minimizing the size of the wake through promotion of turbulent mixing requiring major redesign to obtain a 5% increase in gas mileage. The present project can help reduce an estimated consumption of $33 billion in gasoline and diesel fuel costs per year, and a corresponding reduction in the emission of pollutants and carbon dioxide 225 million vehicles are treated with deturbulator tape.

THE ROLE OF MACROMOLECULES AND FIBRILS IN TENDON MECHANICS

Deborah Davis* and Lakiesha Williams, Mississippi State University, Mississippi State, MS 39762

This study examined various manuscripts investigating the contributions of macromolecules and fibrils to tendon mechanics with a goal of clarifying their roles in the tendon's overall behavior. Literature has shown the important roles that macromolecules and fibrils serve in assisting the tendon's structural integrity and function. One major role of collagen fibrils is providing stiffness and tensile strength to the tendon (Robinson et al., 2004). Redaelli et al. (2003) showed that as fibril length and diameter increase, elastic modulus, stiffness, and ultimate tensile strength increase. Redaelli et al. also observed that the macromolecules, glycosaminoglycan (GAGs), serve as bridges between contiguous fibrils, connecting adjacent fibrils. They concluded increasing fibril length increases interacting links and thus increases tendon mechanical properties. Robinson et al., 2004 indicated that the macromolecules, proteoglycans (PGs) and GAGs, transmit interfibrillar forces. Scott et al. (1981) examined the connections between collagen fibrils and PGs, showing that the connections provided fibril stabilization and organization (Kadler et al., 1996). A coupling of functions has been shown to occur between macromolecules and fibrils. This coupling has been demonstrated through microscopy and computational analysis, but not mechanically. This review will justify the need of mechanical studies that couple the roles of both macromolecules and fibrils. The future objective of this study is to determine the mechanical properties of both tendon fibrils and macromolecules and their overall impact on the mechanics of the tendon.

FRIDAY MORNING

Bost Theater

8:00 QUANTITATIVE DESCRIPTION AND PERFORMANCE ANALYSIS OF A RECTANGULAR LOOP NANOWIRE ANTENNA

Tanya Aranchuk* and Mustafa M. Matalgah, University of Mississippi, University, MS 38677

Recent advances in engineering made it possible to synthesize nanotubes with length comparable to the wavelength of microwaves (~ 1 cm). The possible use of these nanotubes as antennas has received wide attention among researchers, with applications in the areas of biochemistry, communications, engineering and many others. Attempts have been made to quantitatively analyze the performance of nanotube antennas. Thin-wire antenna geometry has been considered in the literature for this purpose. In this paper, we consider the performance analysis of a rectangular loop nanowire antenna. This type of antenna geometry enjoys a better signal-to-noise ratio (SNR) as compared to thin-wire antenna. We develop the circuit model of this type of nanotube antenna, in which quantum capacitance and kinetic inductance are incorporated, along with magnetic inductance and electrostatic capacitance. Hallen's-type integral equation is derived to examine and describe the performance of such an antenna. Performance parameters, such as antenna efficiency, radiation resistance, input resistance and reactance are calculated. The models for far-field and near-field antenna patterns are also developed.

8:15 NANO- BIO OPTICAL FIBER SENSORS FOR HUMAN BREAST CANCER CELLS AND DNA DETECTION BASED ON LASER INTUCED FLUORESCENCE

Chan Kyu Kim [1]*, Rajamohan R. Kalluru [1], Fang Y. Yueh [1], Jagdish P. Singh [1], Scott T. Willard [1], Alicia N. Musselwhite [1], and Paresh C. Ray [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Jackson State University, Jackson, MS 39217

Two different optical bio-sensors are being developed for human breast cancer cells and DNA detection. First bio-sensor employs laser induced fluorescence (LIF) technique to obtain standard Human breast cancer cell LIF spectrum. The LIF spectra of the cancer cell treated with 4-hydroxytamoxifen are also collected and compared with the standard LIF spectra of breast cancer cell lines to study the reaction of cell by chemical treatment. The bio-sensors have the capability to distinguish from the standard LIF spectra of human breast cancer cells to the LIF spectra of the cancer cell by treated 4-hydroxytamoxifen. Second bio-sensor used LIF quenching technique by gold nanoparticles for the detection of single-strand (ss) DNA hybridization. In this work, the fabrication of a miniaturized, inexpensive and battery operated ultra-sensitive LIF optical fiber sensor was developed. Fluorescence was induced by a battery operated laser pointer in the second case. Compact architecture of the designed sensor along with the carefully aligned optics, offers a cost effective solution to detect single base-mismatch DNA. A unique data processing technique has been developed to analyze the recorded data for identification and differentiation in both configurations.

8:30 SLURRY PRODUCT ANALYSIS WITH LASER INDUCED BREAKDOWN SPECTROSCOPY

Seong Yong Oh*, Fang Y. Yueh, and Jagdish P. Singh, Mississippi State University, Mississippi State, MS 39762

Laser-induced breakdown spectroscopy (LIBS) is an analytical tool that has the ability to provide simultaneous multi-elemental composition for solids, liquids and gases sample.LIBS technique exploits high-energy laser pluses to create the micro-plasma plume on the surface of material. Atomic emission spectra directly collected from micro-plasma plume is utilized for determining the elemental composition of the sample. Integration with the optical fiber, no sample preparation, and quick on-line elemental analysis are the main advantages of the LIBS probe, which make it practicable to apply in the inaccessible place. However, it is a challenging work to apply LIBS technique to slurry analysis due to its sedimentation, splashing by the laser induced shock on the slurry's sample surface and fluctuation in lens-to-sample distance (LSTD). To overcome those technical problems associated with LIBS measurement of the slurry sample, a slurry circulation system was newly designed. LIBS measurements of slurry samples were optimized by varying the experimental parameters such as the pulse repetition rates of laser and the detector gate time delay and width. The calibration curves for different elements were obtained and studied towards improving the LIBS analysis result. The configuration design of slurry circulation system for LIBS measurement and other results will be presented in the paper.

8:45 TEMPERATURE SENSING USING FIBER GRATING LOOP RINGDOWN TECHNIQUE

Armstrong Mbi* and Chuji Wang, Mississippi State University, Mississippi State, MS 39762

A new method to develop fiber optic temperature sensors with an off-the-shelf fiber grating, using Fiber Grating Loop Ringdown (FGLRD) technique is presented. The prototype sensor consists of a diode laser source, a photodetector, an electronic control portion, and a fiber grating written in a section of a single mode fused silica fiber loop. With this novel method, temperature measurements are converted to a characteristic measuring time constant called the ringdown time. Two types of sensors are developed; the Type I sensor using a bare fiber Bragg grating (FBG) as the sensing element demonstrates a measurement resolution of 0.18^{o}C (3-&sigma), and the Type II sensor using a long period grating (LPG) as the sensing element exhibits a thermal response up to 1000^{o}C and excellent operation in 21-450^{o}C. Additionally, a theoretical model of a Double Fiber Loop Ringdown (DFLRD) Temperature Sensor for simultaneous temperature sensing in separate locations is introduced. This work demonstrates a new generation of optical fiber sensors for remote sensing in harshest environments. This research is supported in part by US Department of Energy, National Energy Technology Laboratory, Grant # DE-RQ26-05NT500832 and National Science Foundation, Grant # ATM-0352926.

9:00 SOOT MEASUREMENT IN A HYDROCARBON ROCKET ENGINE WITH LASER INDUCED INCANDESCENCE

Kemal Eseller [1]*, Fang Y. Yueh [2], Rajamohan R. Kalluru [2], Jagdish P. Singh [2], Olin P. Norton [2], and Robert L. Cook [3], [1]Mississippi State University, Mississippi State, MS 39762, [2]Institute for Clean Energy Technology (ICET), Starkville, MS, and [3]Center for Advanced Energy Conversion (CAEC), Starkville, MS 39759

This research project is focused on a technique which can provide non-intrusive quantitative measurement of soot on a large-scale rocket engine plume and provides a unique diagnostic tool to characterize engine performance. Laser Induced Incandescence (LII) imaging is developed, and applied on soot particles to measure the particle size and density. LII sensor, as an analytical model, is useful for developing various rocket engines, understanding of soot formation and the oxidation process in the combustion. LII system has been set up to detect LII signals which are emitted by soot particles. LII signal was produced by a frequency-doubled pulsed Big Sky Model CFR 400, Nd:YAG laser (532 nm, 200 mJ, 9-mm diameter), and it was detected by a 0.5m spectrograph (Spex 500M, 2400 l/mm grating) through a UV grade optical fiber and photomultiplier tube. The effects of experimental parameters such as laser fluence, gate delay, gate width and the effect of the focusing laser beam on the LII signal were investigated to determine the optimum LII experimental condition.

9:15 ADAPTIVE POWER CONTROL PROTOCOL FOR MULTI¬CARRIER WIRELESS COMMUNICATION SYSTEMS

Ibrahim Y. Abualhaol*, Mustafa M. Matalgah, and Atef Z. Elsherbeni, University of Mississippi, University, MS 38677

The transmission power in any communication system is a valuable and limited resource. In many scenarios, the received instantaneous signal-to-interference-plus-noise ratio (SINR) might be less or more than a required value to achieve certain quality of service (QoS). In adaptive modulation and coding wireless communication systems, multi-rate transmission is supported depending on the received SINR. To achieve a certain transmission rate, SINR has to be within a predefined interval of service. Near-SINR-threshold based adaptive power control protocol (APCP) is suggested to be used in adaptive modulation and coding multi-carrier wireless communication system to maximize the system throughput and/or save the transmission power. The main idea of this protocol is to change the transmitted power over each sub-channel such that the received SINR lies near the lower threshold of the interval of service. When the SINR is near the upper threshold of the interval of service, it is obvious that we can save some power by decreasing the transmitted power down to just above the lower threshold. The excess power can be saved if the target is to increase the battery life. If the application needs higher transmission rate we increase the transmission power over some other

sub-channels in order to operate with a higher modulation/coding order.

9:30 PASSIVE MICROSTRIP RESONATOR FOR CHIP-LESS RFID TAGS

Chye Hwa Loo*, Atef Z. Elsherbeni, and Fan Yang, University of Mississippi, University, MS 38677

This work presents an implementation of a completely passive chipless radio frequency identification (RFID) tags as low-cost alternatives to chip-based RFID tags. In view of the fact that microstrip resonators exhibit electromagnetic resonance behavior, capturing a frequency response of a material structure with a microstrip resonator can be accomplished with very little transmitted energy. The proposed design uses microstrip planar structures with multiple variation resonant frequencies to accumulate digital information into the resonant structures. As an example, such resonant structures can be designed to handle the 96-bits electronic product code (EPC) which replaces the barcode on goods in supermarkets. The tag is interrogated by the tag reader, and the electromagnetic response of the tag is detected as voltages or currents induced in the tag reader antenna. The frequency response of the tag contains features that are relatively easy to extract and can be collected by a variety of simple electronic hardware. The information is observed and processed in the frequency-domain. Nevertheless, the primary potential benefit of the proposed chipless tag is that it can be printed directly on products and packaging cheaply. Novel approaches of design theory including a circuit model for a multiple-resonant structure will be presented.

9:45 Break

10:00 SUPERHEAVY NUCLEI: A SEARCH FOR ISLAND OF STABILITY

Anatoli Afanasjev, Mississippi State University, Mississippi State, MS 39762

Recent discovery of the element 118 (proton number 118) by the group of Russian and American scientists considerably increased the interest to the properties of superheavy nuclei (nuclei with proton number larger than 100). These nuclei are stabilized only by the quantum effects. In my presentation, I will consider these nuclei in the framework of the relativistic mean field theory. In this theory, the nucleus is described as a system of nucleons interacting by the exchange of different mesons. Special attention will be paid to self-consistency effects in these nuclei and to the differences in theoretical predictions.

10:15 SMALL WORLD CARBON NANOMATERIALS: DENSITY FUNCTIONAL THEORY SIMULATIONS

Jeremy Yancey*, Mark A. Novotny, and Steven R. Gwaltney, Mississippi State University, Mississippi State, MS 39762

The possible existence of small, pure carbon molecules based on physical small-world networks is addressed using density functional theory calculations. A ring of atoms with one or more small-world connections between pairs of non-nearest-neighbor sites was chosen for the network topology. The small-world connections are made with and without additional carbon atoms placed along the link. The energy per atom of these small-world carbon systems is compared with benchmark carbon clusters such as the C_{20} ring, bowl, and cage isomers, the C_{60} Buckyball, monocyclic pure carbon rings ranging from C_4 to C_{60}, bare linear carbon chains ranging from C_2 to C_{48}, fullerenes ranging from C_{20} to C_{60}, and various all-carbon graphitic fragments. The energy per atom results for these materials provide an indication that some of these pure-carbon small-world nanomaterials are reasonable for real world synthesis.

10:30 PROBABILITY OF ERROR BASED CHANNEL STATE DETECTION PROTOCOL FOR UPDATING CHANNEL STATE INFORMATION IN WIRELESS COMMUNICATION SYSTEMS

Ibrahim Y. Abualhaol* and Mustafa M. Matalgah, University of Mississippi, University, MS 38677

The signal-to-interference-plus-noise ratio (SINR) or the channel state information (CSI) is important for the transmitter and receiver to monitor the quality of the received signal and to determine the appropriate transmission power and modulation/coding order in adaptive wireless communication systems. The CSI is used to improve the performance of the system in terms of probability of error (PER) and probability of outage. In this work, we develop a protocol based on probability of error and called channel state detection protocol (CSDP), This CSDP uses a predefined trial sequence to estimate the CSI. The received trial sequence is compared with the same known sequence at the receiver end, then the instantaneous PER is calculated. The CSDP protocol maps the calculated PER for certain modulation into the corresponding SINR which represents the instantaneous CSI. The advantage of evaluating SINR using this technique is that it does not require any analog devices to measure the power of the received signal nor does it require specifying pilots to measure the received power. This protocol works for any wireless communication system over any fading environment.

10:45 THE SEARCH FOR A COSMOLOGICAL STANDARD CLOCK IN GAMMA-RAY BURST TIME PROFILES

John Patrick Lestrade*, Jane Harvill, Ionna Banicescu, and Ricolindo Carino, Mississippi State, MS 39762

Of the more than 3,000 gamma-ray bursts detected over the past 35 years by various experiments flown in space, redshifts have been measured for a little more than two dozen. These redshift data indicate that the sources of these explosions are spread out over distances of many billions of lightyears. At these

distances, we would expect the Hubble flow to impress a (1+z) stretching on the temporal properties of bursts. Unfortunately, due to the very large dynamic range of grb time profiles (durations range from 10's of milliseconds to 10's of minutes), it has been very difficult to detect any relativistic time dilations in the grb observations. Two of the early attempts were Lestrade et al. (1993, Astron. & Astrop Supp. Ser., 97, 79) and Norris et al. (1994, Astrop. J, 424, 540). In this paper we fit a nonparametric family of autoregressive models to the time profiles in the search for a more reliable standard clock.

11:00 SMALL-SIZE DOUBLE SIDED ROUNDED BOW-TIE ANTENNA ARRAYS FOR UWB APPLICATIONS

Tutku Karacolak* and ErdemTopsakal, Mississippi State University, Mississippi State, MS 39762

UWB systems require compact and extremely wide band antenna design covering the spectrum from 3.1 GHz to 10.6 GHz. High gain and phase linearity are also desired in such systems. Compared to a single antenna, antenna array systems significantly enhance the overall system performance, in terms of capacity and spectrum efficiency achieving high data rate service. Improved directivity and beam scanning are added advantages of array systems. In this study, double sided rounded bow-tie antenna arrays are considered. Each array element has two identical symmetric patches with one patch located on the front side of the substrate and the other on the back side. The antenna covers the UWB spectrum, and has also omni-directional radiation characteristics with reasonable gain values over the same frequency band. Different array configurations are presented in order to improve the pattern stability. The coupling effect between elements is investigated since coupling is a significant parameter in the array performance. Two, four, and six element linear arrays are designed with feeding networks for various steering angles. The maximum radiation is steered in different directions to form a scanning array by controlling the progressive phase difference between the elements. Measurements and simulations regarding antenna parameters such as S-parameters, radiation pattern, and gain will be presented. Results for different angles of phase shift between the elements will be also presented.

11:15 LASER RAMAN OPTICAL SENSOR FOR MONITORING QUALITY OF LIQUID OXYGEN

Appolinaire Luanje [1]*, Rajamohan R. Kalluru [2], Fang Y. Yueh [1], Jagdish P. Singh [1], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Mississippi Ethanol LLC, Winona, MS 38967

An integrated fiber optical Raman sensor is designed for real-time non-intrusive detection of liquid nitrogen in liquid oxygen (LOX) at high pressure and high flow to monitor the quality of LOX used during the testing of the rocket engine. This sensor can also be used to monitor the chemical composition in large chemical reactors to provide data to optimize the efficiency of the processing plant and to control the chemical process in the plant. The integrated sensor employed a hight power (3W) solid state pumped Nd:YAG frequency doubled 532nm laser, InPohotonics Raman probe inbulit Raman signal filter optics, high resolution miniature spectrometer, and Photomultipler tube with selected band pass filters to collect N2 and O2 Raman signals respectively. We report the improved performance of the sensor in estimating the ratios of nitrogen and oxygen in gas and liquid mixtures.

11:30 METALLIC PHASES IN ONE DIMENSIONAL MOLECULAR CONDUCTORS

Rahul Hardikar* and R. Torsten Clay, Mississippi State University, Mississippi State, MS 39762

In many organic conductors and superconductors internal vibrations (phonons) of the molecules making up the crystal are strongly coupled to the conduction electrons and have large effects on the electronic properties of the materials. The crystal structures of many of this class of materials are very anisotropic with conduction along essential a one-dimensional (1D) crystal axis. One great challenge in theoretical description of such materials is to describe why metallic or superconducting phases are often found close to insulating phases with unusual magnetic, electronic, or structural properties. We present a numerical study of the Hubbard-Holstein Model (HHM), one of the simplest models to incorporate the interaction of the vibrations with the conduction electrons. Previous theoretical studies of the HHM at half filling (one conduction electron per molecule in the crystal) predict that only insulating phases are possible. Our numerical results show that there exists an intermediate metallic phase whose size is dependent on the vibrational frequency of the phonons. This gives one possible mechanism that can explain why superconductivity is typically found adjacent to ordered insulating phases.

11:45 PERFORMANCE ANALYSIS OF WIDEBAND MULTI-STANDARD SOFTWARE DEFINED RADIO BASE STATION RECEIVERS WITH INTER MODULATION DISTORTION

AbdulKhaleq Mohammed* and Mustafa M. Matalgah, University of Mississippi, University, MS 38677

Software defined radio (SDR) base stations are designed to provide improved mobile communications with global roaming. In order to achieve this goal, SDR base station must be able to support multiple mobile communication systems standards. It is expected that the dynamic range of the signal received at the SDR base station is very high. This high dynamic range of the signal has huge impact on various performance metrics such as signal-to-noise ratio (SNR) and Spurious Free Dynamic Range (SFDR). Most recent work has focused either on improving the resolution of Analog to Digital Converter (ADC) or evaluating the performance metrics mentioned above to implement SDR base station practically. SDR receiver deals with a wideband signal with high dynamic range. One parameter that can influence

the performance of SDR base stations is Intermodulation Distortion (IMD) which arises due to the presence of large number of uncorrelated carriers in a wide band signal. The IMD is an In-Band Distortion to the system and is characterized by a parameter called Noise Power Ratio (NPR). Previous works have shown to relax the rigorous resolution requirements of SDR base station ADC by using methods such as the Adaptive Prediction and Digitization Cancellation (APCD) technique. These methods have overlooked the gravity of a wideband distortion like the IMD which can be very significant in SDR. In the present work we quantitatively analyze the performance of APCD-based receivers taking into account the IMD, and hence quantitatively measure the deterioration in performance.

FRIDAY AFTERNOON

Bost Theater

1:00 EFFECTS OF MECHANICAL STRAIN ON RAT BONE MARROW CELLS GROWN ON TITANIUM VERSUS THERMANOX

Marcia Lee* and Joel Bumgardner, Mississippi State University, Mississippi State, MS 39762

Metal alloys are widely used in orthopedic applications. Tissue culture models have been used with different material substrates to study the response of bone cells subjected to mechanical strains in order to gain insight into the cellular event sequence leading to osseointegration of an implant to the surrounding bone tissue. Our hypothesis was the response of osteoblast cells subjected to mechanical strain is affected by the culture substrate. For cells mechanically strained under the same conditions, we expected to find different rates of cell proliferation and extracellular matrix synthesis for cells cultured on titanium versus cells cultured on tissue culture plastic (Thermanox). To test this hypothesis, rat bone marrow derived osteoblast-like cells were grown on titanium or Thermanox and subjected to mechanical strains of 400 or 1000 microstrains of tension. The response of the cells on the different substrates to mechanical strain was determined by measuring alkaline phosphatase (ALP) expression, calcium deposition, DNA quantification and total protein synthesis over a twenty-day period. This study demonstrated no significant differences in the rate of cell proliferation and synthesis of extracellular matrix on cells strained under the same conditions and grown on titanium or tissue culture plastic (Thermanox). Furthermore, the two strain levels did not have a significant effect on cell proliferation and extracellular synthesis as compared to the controls. Over the twenty-day period, ALP, total protein and calcium levels increased in strained and unstrained cells. DNA did not increase significantly in any of the three groups during this same time period.

1:15 VERY SMALL ULTRA-WIDEBAND DOUBLE-SIDED EXPONENTIALLY TAPERED SLOT ANTENNA ARRAYS

Aaron Hood* and Erdem Topsakal, Mississippi State University, Mississippi State, MS 39762

The double-sided dual exponentially tapered slot antenna (DETSA), sometimes referred to as an antipodal Vivaldi antenna, has demonstrated a measured bandwidth of more than 40 GHz in past studies. While the antennas used to achieve these results are typically greater than 10 cm in length, our research has determined that antennas fabricated with dimensions less than 4cm x 4cm can easily exceed the range required for emerging ultra-wideband technologies (3.1-10.6 GHz). The antennas maintain approximately 4 dB of gain across the entire band with patterns directed along the main axis. By creating an array of these elements, the efficiency of the antenna is improved, and features such as beam scanning are possible with a two-element configuration improving the gain by a minimum of 2 dB. Coupling between the elements is an important consideration in array design as high coupling levels may result in unsatisfactory performance. A two-element DETSA array has been found to have an average coupling of –25 dB across the UWB spectrum. Various configurations of two and four elements are considered with feeding networks designed to provide different steering angles by controlling the phase difference between the elements. Simulated results are confirmed through careful measurements of the antenna parameters including S-parameters, radiation pattern, and gain.

1:30 SEAWULF: DESIGN OF A BEOWULF CLUSTER FOR THE PROCESSING OF SEISMIC DATA

Maxwell Woolsey* and Thomas M. McGee, University of Mississippi, University, MS 38677

A Beowulf cluster nicknamed “Seawulf” was designed for the processing of seismic data from an undersea gas-hydrates monitoring station. The project is funded by a grant from the Department of Interior, Minerals Management Service. Seismic data, by nature, can be processed in a data parallel manner. It consists of traces of acoustic data which may be divided among a number of processing nodes. The design of the Seawulf is typical of a Beowulf cluster in that it has a master node which generally controls operation of the cluster as well as external communication, and a number of nodes that each process a data subset. Common layouts for clusters include large racks of computers in tower cases as well as compact commercial units which enclose processing nodes in a small space. The former configuration produces a physically large cluster, in which each node has an enclosure and a power supply. The latter can provide an extremely dense unit, often taking advantage of proprietary hardware including shared power supplies and high-speed networking connectivity. This performance, however, comes at a high price. The Seawulf is a hybrid consisting of off-the-shelf

hardware in a custom designed enclosure with external recirculating air-cooling system and shared ATX power supplies. The Seawulf is expandable to 64 micro-ATX processing nodes combining the best of both standard topologies.

1:45 STUDY ON THE WALL INSULATION IN INVERTER-FED DRIVE

Pavel Trnka, University of West Bohemia, Czech Republic and Mississippi State University, Mississippi State, MS 39762

The voltage waveforms generated by power frequency converters affect significantly the reliability of drive wall insulation. A power inverter produces modulated voltage on its output which contains square-shaped voltage impulses with fast rise times. The problem is to predict the machine wall insulation lifetime, when it operates as a part of the power inverter fed drive. The main goal of the research project was to provide quantification of the wall insulation reliability decrease. Four the insulation systems were aged both by the AC 50 Hz voltage and high frequency pulse voltage. The life time curves have been evaluated and simple mathematical models have been employed to show the wall insulation reliability decrease. Two different shapes of the wall insulation samples were tested. The results obtained during measurement on flat samples and "dog-bone shape" samples were compared. The results of the test showed great difference between the two applied voltage shapes. Significant decreases in the times to breakdown of all four materials by the high frequency pulse voltage aging were observed. The tests proved that the resistance of the stress grading coatings has to be changed when used in power inverter fed drive. The comparison of the result obtained by the testing of different shaped samples proved the possibility to use flat samples. This shape of samples has the advantage during the measurements. The results from this research project are now used for the creation of the on-line monitoring system of the wall insulation in power inverter fed drive.

2:00 SIMULATION AND PERFORMANCE EVALUATION OF PATH LOSS RECOVERY PROTOCOL FOR UNMANNED AIRBONE VEHICLE

Omar Hammouri*, Ibrahim Y. Abualhaol, Mustafa M. Matalgah, and Atef Z. Elsherbeni, University of Mississippi, University, MS 38677

During the design of any transportation system, path planning is usually a recognized problem. It becomes significant when recovering the path of autonomous unmanned airborne vehicles (UAV). Path loss could be defined as the failure of a UAV to communicate with the ground control unit (GCU). In most cases, communication loss occurs due to the insufficiency in the UAV resources to satisfy the required minimum transmission rate. This could be the result of environmental and/or interference conditions, which decrease the received signal-to-interference-plus-noise ratio (SINR). The solution to these problems can be based on the path loss recovery protocol (PLRP) which is a mechanism to deviate the UAV from its current un-recognized trace in order to recover its communication with the GCU. The new subsequent trace-point is sought to experience better SINR, through either being on a line of sight or within less range from the GCU. In this research, the PLRP, applied to an adaptive modulation and coding system, is modeled and simulated using the Simulink software package. The performance of the PLRP is evaluated by assuming a certain mission path with scattering attenuation (simulated weather conditions), as well as instantaneous co-channel interference (neighboring UAVs). The out-of-service percentage, bandwidth, power consumption, and data rate are the main metrics used to assess the enhancement gained by the PLRP.

2:15 DEVELOPMENT AND TESTING OF MEAM POTENTIAL FOR AL-MG ALLOYS

Bohumir Jelinek [1]*, Jeffery Houze [1], Sungho Kim [1], Seong-Gon Kim [1], Mark Horstemeyer [1], and Michael Baskes [2], [1]Mississippi State University, Mississippi State, MS 39762 and [2]Los Alamos National Laboratory, Los Alamos, NM 87545

A MEAM potential for Al-Mg alloys was developed based on the elastic and structural properties determined from ab-initio calculations. Transferability of the new potential was tested by comparing various bulk, surface, and point defect properties with ab-initio simulations. Volume-energy dependence of Al and Mg in fcc, hcp, bcc and simple cubic crystal structures from MEAM and ab-initio simulations was determined. Heat of formation for Al-Mg crystals in C1, C3, C9, C15, $D0_3$, $D0_9$, A12, A15, $L1_2$, B1, B2, and B3 was calculated using both methods. Surface formation, stacking faults, and adsorption energies were compared. For point defects calculations, a close agreement of vacancy formation energies, interstitial and substitutional point defect energies was found.

2:30 LIGHT FROM A DOPPLER-BROADENED GAS OF ATOMS

John T. Foley, Mississippi State University, Mississippi State, MS 39762

In a gas of atoms at low pressure, the light emitted by each atom has its frequency shifted by the Doppler effect. In this talk computer simulations of the components of the total electric field vector from such a gas of atoms are presented. It is shown that at an observation point far from the atoms, each electric field component is a succession of wavepackets whose amplitudes and phases fluctuate on a time scale of the order of the reciprocal of the bandwidth of the light. It is also shown that the polarization of the light fluctuates on this same time scale.

2:45 MOLECULAR DYNAMICS SIMULATIONS OF CRACK NUCLEATION NEAR NANOPARTICLE INCLUSIONS

Jeffery Houze*, Bohumir Jelinek, and Seong-Gon Kim, Mississippi State University, Mississippi State, MS 39762

We studied nucleation of cracks near a nanoparticle embedded in a matrix under tension with molecular dynamic

simulations using Modified Embedded Atom Method (MEAM) potentials for Al and Mg. Uniaxial tension was applied to an Al(fcc) matrix containing an embedded Mg(hcp) nanoparticle. The same study was performed with an Al nanoparticle embedded in a Mg matrix. Animations showing the damage evolution in both alloying situations and the effect of the materials different tensile strengths on crack nucleation will be presented.

3:00 Break

3:15 GAMMA RAY BURST HARDNESS AS A FUNCTION OF TIME AND INTENSITY

Phillip Durst* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS, 39762

Gamma Ray Bursts (grb) are high-energy explosions happening at cosmological distances. While the cause of GRBs is still largely a mystery, numerous experiments have been undertaken to explore their intrinsic properties. In this study we present our analysis of the evolution of burst hardness. Here hardness in a burst is defined to be the number ratio of high energy (>100 kev) photons to total photons received. We divide each GRB time profile into variable size time bins based on the standard deviation (sigma) of the gamma-ray background. The width of each bin is the minimum width that contains an accumulated countrate of at least 100 sigma. This ensures good statistics as well as a finer time resolution when the burst is brightest. Zone hardness can then be presented as a function of intensity and time relative to burst trigger. Our preliminary results show that hardness decreases with time during a burst pulse and drops below that of the ambient gamma-ray background for a short interval. This latter effect is primarily due to the well-known time lag between hard and soft grb photons. In the case of hardness versus average zone intensity, our early results show a significant positive correlation. These latter results are in agreement with Borgonovo and Ryde (2001, Astrop. J, 548, 770).

3:30 HIGH-K BANDS AND GAMMA-RAY DIRECTIONAL ANGULAR CORRELATION MEASUREMENTS IN ^{168}Hf

Ram Yadav [1]*, Wenchao Ma [1], H. Amro [1], P.G. Varmette [1], G.B. Hagemann [2], B. Herskind [2], G. Sletten [2], R.V.F. Janssens [3], B. Million [4], and H. Hubel [5], [1]Mississippi State University, Mississippi State, MS 39762, [2]Niels Bohr Institute, Copenhagen, Denmark, [3]Argonne National Laboratory, Argonne, IL 60439, [4]Universita di Milano, Milan, Italy and [5]University of Bonn, Bonn, Germany

^{168}Hf is the first nucleus where triaxial superdeformed structures were found. We have now further observed three High-K bands in it employing the ^{96}Zr(^{76}Ge,4n) reaction. Two data sets were obtained from experiments at Argonne National Laboratory. The decay γ-rays were measured with the Gammasphere Compton-suppressed Ge spectrometer array. A self-supporting ^{96}Zr foil (thin target) was used in the first experiment, while in the second experiment the ^{96}Zr target material was evaporated onto a thick Au backing (backed target or thick target). Three- and four-dimensional histograms (cube and hypercube) were constructed for γ-ray coincidence analysis. Coincident spectra were studied using the software package RADWARE. Three previously unknown High-K bands were identified and placed in the level scheme. Spins and parities of levels in the High-K bands were proposed according to measured directional angular correlations of decay γ-rays. Based on our Cranked shell model calculations and a systematic comparison with neighboring nuclei, possible intrinsic configurations were suggested for the High-K bands and have been confirmed from gyromagnetic ratios measurement. The lifetime measurements for ^{168}Hf is in progress to establish the deformations. Work supported by U.S. DOE under grant DE-FG02-95ER40939.

3:45 IMPROVING THE VARABILITY-LUMINOSITY CORRELATION FOR GAMMA-RAY BURSTS

Shane Creel* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

Gamma-ray bursts (grb) are the most luminous explosions since the Big Bang. However, other than saying that they are extragalactic, it has been practically impossible to determine the distances to their sources. Recently, Li and Paczynski (2006, Astrop. J, 366, 219), using the data from the two dozen grb whose luminosities and distances are known, have shown that grb time-profile variability is correlated with burst luminosity, implying that grb might be standard candles. The hope is that if indeed burst luminosity can be deduced from the variability, that plus the apparent brightness yields the distance. The \"variability\" of a burst profile, its twinkling, can be defined in many ways. While the method they use works for two dozen bursts, perhaps there is a more robust definition that will work for the larger database. In this paper, we present new methods of calculating the variability of grbs in order to improve the tightness of the correlation.

4:00 MOLECULAR DYNAMICS SIMULATION OF SINTERING OF NANOPOWDERS

Amitava Moitra*, Sungho Kim, and Seong-Gon Kim, Mississippi State University, Mississippi State, MS 39762

Nanopowder metallurgy is an emerging technology that fabricates sophisticated metal parts by sintering of nano-scale metal powders. Consolidated nanopowders are known to have enhanced mechanical properties compared to conventional micron-size powders. Nanopowders also offer the promise of improving the sintering process since, due to their higher surface area to volume ratio; they can be densified more fully and much quicker resulting lower sintering temperature and higher fracture toughness. To understand the fundamental mechanisms of sintering of nanopowders, molecular dynamics simulations of

tungsten nano-particles were performed using the Modified Embedded Atom Method (MEAM). The effects of various heating cycles on sintering process as a function of size of the nanopowders will be presented.

4:15 DC PROTECTION FOR NAVAL SHIPBOARD POWER SYSTEMS

Hymiar Hamilton* and Noel Schulz, Mississippi State University, Mississippi State, MS, 39762

The need for DC power at continuous uninterrupted rates is a reality for ship survival during highly intense combat and regular travel. One newly proposed distribution system on the all electric ship is designed using a DC distribution method (zones) in which the use of transformers and frequency issues/manipulation can be eliminated with the use of power electronics. These power electronic devices can simplify the system providing more space, possible cost reduction, and variable control. Our main key objective is ensure that the DC buses/systems and converters/rectifiers are protected from faults, transients, and other malicious events that can cause unwanted interferences, shutdown, and possible damage or destruction. DC faults can have a detrimental impact on the ship performance. DC protection should allow for high speed and high sensitive detection of faults enhancing reliability in the supply of electric power. The simulations have shown our developed method of zero crossing can detect a DC fault and perform a shutdown on the line/bus without having to open a circuit breaker and return to normal operating conditions once the fault is removed. The use of power electronics and DC fault detection methods can be employed to solve how to protect the system's stability and longevity.

4:30 DEVELOPMENT OF AN ADAPTIVE PROTECTION SCHEME FOR NAVAL SHIPBOARD POWER SYSTEMS

Oluwaseun Amoda* and Noel Schulz, Mississippi State University, Mississippi State, MS 39762

Future naval ships will be all-electric, with an integrated power systems that combines the propulsion power system with the rest of the ship's electrical distribution system. Reconfigurations schemes are being developed for the Shipboard Power System to increase fight-through and survivability of these electric ships. An adaptive protection scheme named, X Adaptive Protection (XAP) is being developed for the DDX power system. XAP will use the status of breakers to determine the configuration of the system in real time. XAP will then perform fault analysis on the determined configuration. It will then use the result of the fault analysis and power flow levels to set the protection levels of the system.

4:45 INTELLIGENT PLACEMENT OF METERS FOR SHIPBOARD SYSTEM ANALYSIS

Sandhya Sankar* and Noel Schulz, Mississippi State University, Mississippi State, MS 39762

Real time monitoring of the shipboard power system is a complex task to address. Unlike the terrestrial power system, the shipboard power system is a comparatively smaller system but with more complexity in terms of its system operation. This requires the power system to be continuously monitored to detect any type of fluctuations or disturbances. Planning metering systems in the power system of a ship is a challenging task not only due to the dimensionality of the problem, but also due to the need for reducing redundancy while improving network observability and for efficient data collection for reliable state estimation purposes.

The research is geared towards the use of a genetic algorithm for intelligent placement of meters in a shipboard system for real time power system monitoring taking into account different system topologies and critical parameters to be measured from the system. The algorithm predicts the type and location of meters for identification and collection of critical measurements. The algorithm is tested with different system topologies. The results have shown that genetic algorithm is a useful tool for planning the metering system in an electric ship.

5:00 Divisional Business Meeting

PSYCHOLOGY AND SOCIAL SCIENCE

Chair: David Swanson, University of Mississippi
Vice-chair: Ronald Cossman, Mississippi State University

THURSDAY MORNING

Hunter Henry Brunson

Session 1: The Psychological and Social Impacts of Hurricane Katrina

8:30 HURRICANE KATRINA AS A NATURAL EXPERIMENT OF 'CREATIVE DISTRUCTION' : THE LONG- TERM SOCIOECONOMIC IMP ACTS TO THE GULF COAST

Ronald E. Cossman, Mississippi State University, Mississippi State, MS. 39762

Hurricane Katrina was both a natural disaster and a natural experiment of Joseph Schumpeter's 'creative destruction.' The water and winds destroyed existing geographically-anchored capitol in the form ofhomes, businesses, stock and human capital. It also reallocated that capitol, in the sense of radically changing property values through government and insurance payouts. The

result was a "clean slate" for development at new price levels. However, the forces that are shaping the new Gulf Coast are governmental regulations and insurance policies as articulated through grants, insurance payout, building restrictions and infrastructure commitment. The newly available shore line is now transforming into an economically higher and better use in the form of McMansions, high rise condominiums and casino-hotels. Meanwhile the working class, who provide the labor to the hotel, casinos and condos, are being forced to occupy the interior hinterlands due to the newly revised economic cost of living on the Gulf Coast. The outcome is a measurable economic gradient from the Gulf Coast inland. This socioeconomic gradient will have fundamental implications for the demographic composition of communities, voting patterns, school enrollment, community involvement and transportation for decades to come. Each of these processes are demonstrated via primary data collection on the Mississippi Gulf Coast as well as through secondary data analysis.

8:50 COLLEGE STUDENTS' EXPERIENCES WITH HURRICANE KATRINA: A COMPARISON BETWEEN STUDENTS FROM MISSISSIPPI STATE UNIVERSITY AND THREE NEW ORLEANS UNIVERSITIES

Duane A. Gill [1], Anthony E. Ladd [2], and John Marszalek [3], [1]Mississippi State University, Mississippi State, MS 39762, [2]Loyola University, New Orleans, LA 70118, and [3]Xavier University of Louisiana, New Orleans, LA 70125

This paper examines differences between students from Mississippi State University (MSU) and three New Orleans universities (Loyola, Xavier, and the University of New Orleans). Using data from a web-based survey of college students conducted shortly after Hurricane Katrina struck Mississippi and Louisiana, we compare students who were less affected (MSU) with students who were greatly affected. In particular, we focus on storm experiences, resource loss, psychological distress, educational impacts, satisfaction with response, and trust in institutions. As expected, students from the New Orleans universities were significantly more affected by the disaster than students from MSU. Our results suggest, however, that there are important steps all colleges and universities can take to become more resilient.

9:10 THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN THE RESILIENCE OF EDUCATIONAL INSTITUTIONS IN THE WAKE OF HURRICANE KATRINA

Arthur G. Cosby* and Bertta E. Sokura*, Mississippi State University, Mississippi State, MS 39762 and Helsinki School of Economics, Helsinki, Finland

This study has been done at SSRC/Mississippi State University and the target organizations are three educational institutions. The aims of our study are to measure how the target organizations had prepared for continuation of studying activities in case of disasters, how they have succeeded in doing so, and what lessons they have learned in the wake of Hurricane Katrina? This study is a multiple case study, which took place at three Louisiana educational institutions. The participants were three department chairs or teaching professionals from each organization, a representative of IT Administration and a representative of the registrar's office from two institutions. The method used was telephone interviews. The interviews were conducted during June and July of 2006. The questions were semi structured and open-ended. There were three different questions set, one for each group. The questionnaires were sent forward to the participants and the interviews were recorded and transcribed. The captured data introduced to the major themes; Increasing Workload, Chaos, Technological Infrastructure and Human Dimensions of Disaster, which are discussed. Also three different roles of information and communication technologies are identified. For deeper understanding of this phenomenon, follow up studies are needed.

9:30 Discussion

9:45 Break

Session 2: Factors Affecting Student Performance

10:00 HOW DOMESTIC VIOLENCE AFFECTS A STUDENT'S ABILITY TO MAINTAIN AN ACADEMIC PROGRAM

Ann Marie Kinnell, University of Southern Mississippi, Hattiesburg, MS 39406

In the spring of 2005, a large scale survey was carried out at The University of Southern Mississippi which examined 1) the extent to which students attending USM's Hattiesburg campus were affected by domestic violence, 2) the specific nature of this violence, and 3) the effect of this violence on their academic careers. In addition to the survey, interviews with students were collected to create a more detailed understanding of the student's experiences with domestic violence. An analysis of these interviews shows that domestic violence does affect a student's ability to maintain their academic program and that there is a lack of resources available to help students with this issue.

10:20 CORPORAL PUNISHMENT, PARENTAL ACCEPTANCE AND PSYCHOLOGICAL ADJUSTMENT OF YOUNG ADULTS

Shaila Khan [1]*, Ronald P. Rohner [2], and Abdul Khaleque [2], [1]Tougaloo College, Tougaloo, MS 39174 and [2]University of Connecticut, Storrs, CT 06269

Relationship among corporal punishment, perceptions

of parental acceptance-rejection, and psychological adjustment of young adults was investigated. Earlier studies reported that effects of punishment on youths' adjustment depended on levels of perceived parental acceptance, and are influenced by cultural norms of society. Adult versions of Physical Punishment Questionnaire (PPQ), Parental Acceptance-Rejection Questionnaire (PARQ), Personality Assessment Questionnaire (PAQ), and Personal Information Form (PIF) (Rohner, 2005) were administered to 250 college students from a private university in Bangladesh, and 200 students from a HBCU institution in Mississippi. For Bangladeshi adults, results suggested that psychological adjustment was associated with their perceptions of paternal acceptance (r=.203, p<.01), maternal acceptance (r=.338, p<.001), and harshness of paternal (but not maternal) punishment (r=.169, p<.05). Linear regression analysis indicated that only maternal acceptance (â=.146 t=1.62, p=.11) contributed significantly to youths' adjustment. Additionally, youths' adjustment was associated negatively with harshness of paternal punishment but positively with justness of paternal (but not maternal) punishment. Paternal punishment did not affect sons' psychological adjustment, but perceived paternal acceptance did. For daughters, harshness of paternal punishment and number of different types of punishment significantly affected their psychological adjustment. But perceived paternal acceptance did not. Maternal punishment had no significant effect on either sons' or daughters' adjustment. However, perceived maternal acceptance had a significant effect on both sons' and daughters' psychological adjustment. Different results were found for Asian and African American participants.

10:40 EFFECTS OF INTIMATE PARTNER ACCEPTANCE AND PARENTAL ACCEPTANCE ON PSYCHOLOGICAL ADJUSTMENTS OF COLLEGE STUDENTS

Shaila Khan [1]*, Ronald P. Rohner [2], Abdul Khaleque [2], [1]Tougaloo College, Tougaloo, MS 39174 and [2]University of Connecticut, Storrs, CT 06269

Effects of intimate partner acceptance and parental acceptance on psychological adjustments of college students were investigated in this study. Adult versions of Parental Acceptance-Rejection Questionnaire (PARQ), Intimate Partner Acceptance/Rejection Questionnaire (IPARQ), Personality Assessment Questionnaire (PAQ) and the Personal Information Form (PIF) (Rohner, 2005) were administered to 250 students from a private university in Bangladesh, and 200 African American students from a HBCU institution in Mississippi. For Bangladeshi students, results suggested that psychological adjustment is associated with paternal (r=.21, p<.05) and maternal acceptance (r=.42, p<.001), and with intimate partner acceptance (r=.50, p<.001). Analysis of variance showed significant difference between males and females in their psychological adjustment (F=5.31, p<.05); intimate partner acceptance (F=10.48, p<.01); and maternal acceptance (F=7.13, p<.01). Effect of intimate partner acceptance and both parental acceptance levels on psychological adjustment was tested by multiple regression analysis. Only intimate partner acceptance (â=.41, t=5.18, p<.001) and mothers' acceptance (â=.30, t=3.68, p<.001) were found to contribute significantly to psychological adjustment. Moderating influence of parental acceptance on this relationship was tested by comparing regression lines for two levels of parental acceptances (loving and rejecting). No interaction effect was found implying that the relation between psychological adjustment and their perceptions of partners' acceptance was not dependent on the level of perceived parental acceptance. These relations were found to be different for Asian and African American students.

11:00 ACADEMIC SUCCESS AND PERSONALITY TRAITS IN UNDERGRADUATES

Renita McMath*, Kristen Allen, Patricia E. Webster, Cassie Bradshaw, and Reid Jones, Delta State University, Cleveland, MS 38733

Three scales likely associated with academic success were drawn from the International Personality Item Pool (IPIP). These scales and a measure of the 'Big 5' personality traits were completed by samples of 59 and 44 students. Reliable results were obtained on all scales with the short IPIP scales having Chronbach's alphas ranging from .682 to.811. These three scales were also significantly (p< .05) inter-correlated including 'Self-Efficacy' with 'Achievement Striving' (r = .46); 'Self-Efficacy' with 'Intellect' (r = .52); and 'Achievement Striving with 'Intellect' (r = .29). Responses on these scales were aggregated into a single new scale called 'Academic Success'. The new scale was significantly correlated with 'Extraversion' (r = .40), 'Conscientiousness' (r = .65), 'Openness' (r = .49), and 'Neuroticism' (r = -.33). 'Agreeableness' was not significantly associated with 'Academic Success'.

11:20 Discussion

THURSDAY AFTERNOON

Hunter Henry Brunson

Session 3: Internal and External Factors Affecting Behavior

1:30 A SURVEY OF TOBACCO USAGE AND INFLUENCE PATTERNS IN A HIGH SCHOOL AND COMMUNITY COLLEGE

Sandesh V. Shettar, St. Andrew's Episcopal School, Ridgeland, MS 39157

Over the past two years, a demographic assessment of patients seeking smoking cessation was conducted. Data from 149 smokers were analyzed for: 1gender, 2race, 3age, 4marital status, 5education, 6employment, 7income, and 8recent cigarette

use. These data were compared with nationaVstate demographic data of current smokers. This year's research sought to study the initiation aspect of tobacco by analyzing the responses to an anonymous, voluntary questionnaire administered to an independent high school (HS) freshmen class and a local community college (CC) regarding their tobacco use and related information. The CC sample was largely Caucasian and female. Gender and Race of the CC sample against various demographic and other variables was done with Chi Square analysis. The CC sample w as largely Caucasian and female. 1/3 were current smokers with significantly more Caucasians trying tobacco and significantly less African Americans (AA) becoming regular smokers. While most wanted to quit, a few had been advised to quit (significantly less Caucasians) and most had made multiple failed attempts (only 5% succeeded). Withdrawal symptoms and craving were major deterrents in achieving abstinence. Most of the sample reported major media exposure to tobacco. Only 1/5 of the HS school sample reported current use with males having greater use. Very low medical professional enquiries about smoking and suggestions to quit were noted. Significantly more males saw media tobacco use and 2/5 recalled school education about the dangers of smoking. Therefore, prevention and cessation treatment efforts are needed to significantly impact the current high prevalence of tobacco use.

1:50 DEMOGRAPHICS AND LOCAL UNDERGRADUATE NORMS FOR THE 'BIG 5' PERSONALITY TRAITS AND IPIP SCALES

Patricia E. Webster*, Renita McMath, Cassie Bradshaw, Kristen Allen, and Reid Jones, Delta State University. Cleveland, MS 38733

Two samples of undergraduates (N=59 and N=44) completed personality self report measures. In the first sample, reliable results were obtained for the 'Big 5' personality traits with Chronbach's alphas ranging from .733 to .851. Nine additional scales were selected from the International Personality Item Pool (IPIP) which also yielded reliable results (alphas ranging from .679 to .889). Significant ($p<.05$) associations were obtained between 'Conscientiousness' and 'Agreeableness' (r = .35); 'Conscientiousness' and 'Openness' (r = .28); 'Neuroticism' and 'Extraversion' (r = - .27); and 'Neuroticism' and 'Conscientiousness' (r = - .29). Results on the second sample and overall regression models demonstrated significant relationships with age of subject and among the IPIP scales.

2:10 PERSONALITY TRAITS ASSOCIATED WITH POOR IMPULSE CONTROL IN UNDERGRADUATES

Cassie Bradshaw*, Patricia E. Webster, Kristen Allen, Renita McMath, and Reid Jones, Delta State University. Cleveland, MS 38733

Three scales likely associated with poor impulse control were selected from the International Personality Item Pool (IPIP). These scales and a measure of the 'Big 5' personality traits were completed by samples of 59 and 44 undergraduates. Reliable results were obtained on all scales with even the brief IPIP scales showing Chronbach's alphas ranging from .679 to .711. IPIP scales were significantly ($p < .05$) correlated for 'Recklessness' with 'Low Impulse Control', and 'Low Impulse Control' with 'Immoderation'. There was no significant relationship between 'Immoderation' and 'Recklessness'. The three IPIP scales were combined into an overall measure of Poor Impulse Control which was correlated with each of the 'Big 5' Personality Traits. The overall measure was significantly correlated with 'Neuroticism' (r = .43) and inversely with 'Conscientiousness' (r = -.52). The other three personality traits were not significantly associated with impulse control.

2:30 SOCIAL SKILLS AND PERSONALITY TRAITS IN UNDERGRADUATES

Kristen Allen*, Cassie Bradshaw, Renita McMath, Patricia E. Webster, and Reid Jones, Delta State University. Cleveland, MS 38733

Three scales likely to be associated with social skillfulness were taken from the International Personality Item Pool (IPIP). These scales and a self report form designed to determine the 'Big 5' personality traits were administered to two samples (N=59 and N=44) of undergraduate volunteers. Chronbach's alpha measures ranged from .719 to .889 were obtained on the IPIP scales. All three IPIP scales (Social Intelligence, Assertiveness, and Social Discomfort) were significantly ($p < .05$) associated with Pearson r's ranging from .44 to .53. The three scales were combined into a single measure of 'Social Skills' which was analyzed by Pearson r's and regression for their associations with the 'Big 5' Personality traits. The 'Social Skills' survey was significantly positively associated with Extraversion, Conscientiousness, Openness, and negatively associated with Neuroticism. Agreeableness was not associated with 'Social Skills'.

2:50 Discussion

3:00 Break

3:20 Poster Session (in room)

REVIEW OF CAREGIVER BURDEN INTERVENTIONS FOR CAREGIVERS OF PATIENTS WITH PTSD

Nolan McIntyre, University of Mississippi Medical Center, Jackson, MS 39216

This review examines important factors for treating caregivers of veterans with post-traumatic stress disorder (PTSD) for caregiver burden (CB) and contains suggestions for future treatment and research. These factors include caregiver interven-

tions, measures for burden and depression, and common confounding variables. Despite there being many studies examining CB, very few investigate the implications of CB specifically relating to PTSD. The vast majority of research done on CB specific to PTSD has occurred within the last decade. For this reason, CB of caregivers of patients with dementia was also examined. The majority of the literature suggests multicomponent interventions as being the most effective. However, local research points in the opposite direction (targeted interventions for selected subgroups of caregivers). Problem solving interventions were frequently mentioned in the literature, but contain their own areas of concern for implementation. Another area of controversy was found in the area of burden measurement. The majority of research uses the Zarit Burden Interview, but it is not without criticism. Measurements for depression are not nearly as controversial, with the Beck Depression Scale and the CES-D scales being the most commonly accepted. The last important factor that this review examined was confounding variables (e.g., patient PTSD severity, caregiver psychological adjustment, caregiver psychiatric history, and socioeconomic status).

SURVIVING "JUNGLE FEVER": AN EXPLORATION OF INTERRACIAL COUPLES' STRATEGIES FOR COMBATING RACISM

Reginald K. Riggins* and Kerry Ann Rockquemore, Jackson State University, Jackson, MS 39217 and University of Illinois at Chicago, Chicago, IL 60607

Despite the rapid growth of interracial marriages, family therapists have paid little attention to the unique stressors these families experience. Faced with racially based disapproval, hostility, and aggression that are absent in same-race unions, interracial families members must develop strategies to cope with racism. Hill and Volker (2000) found that women in Black-White relationships use blocking, transferring and generating strategies to battle racism. In this study, I analyze and coded thirty in-depth interviews of individuals in Black-White relationships to explore the validity of Hill and Volker's framework. The findings presented in this article support Hill and Volker's framework. The results show that the three strategies do exist but interracial couples use them selectively. Depending on the setting (family, friends, co-workers, and social settings), interracial couples choose specific strategies to fit specific settings. The research suggests that the patterns of why specific strategies are used in specific places are a result of interracial couples choosing what they think is the best course of action to preserve their relationship. In conclusion, a more comprehensive understanding of successful and unsuccessful strategies used by interracial families can help therapists working with such families in their clinical practice by making visible the invisible labor of facing racism in a "colorblind" Post-Civil Rights America. This research was supported by NIHM-COR Grant MH 16926.

RELEASE OF ENDOGENOUS CYTOKINES IN RESPONSE TO FOOD RESTRICTION

Chrissie Faust, Camille Herman, and Andrew Thaw*, Millsaps College, Jackson, MS 39210

Past research has identified an excessive amount of the cytokines inter-leukin 1-beta and tumor necrosis factor-alpha in patients seeking treatment for eating disorders. A return to normal levels of cytokines is seen once the patients return to a normal body weight. These cytokines are known to be potent appetite suppressants, thus the involvement of cytokines in the development of eating disorders is examined in this research project. Specifically, we demonstrate that cytokines are released in response to sudden weight loss and thus may contribute to the decreased appetite and further weight loss of patients with eating disorders. Juvenile Sprague-Dawley rats were allowed to eat ad libitum for 4 weeks. Following this initial acclimation period half of the subjects had their food reduced to 10 grams per day (a 50-60% reduction) for 3 – 4 weeks, or until they reached approximately 70% of the weight of the rats still on the ad libitum diet. This procedure mimics a sudden caloric restriction that might be imposed by someone beginning a strict diet. Once experimental weight was reached cytokine levels were examined in both groups using standard ELISA kits. Results demonstrate that cytokines are released in response to food restriction. This supports the hypothesis that such cytokines are present in excess amounts prior to cachexia and muscle wasting and may be a critical physiological factor in eating disorders.

3:50 Divisional Business Meeting

SCIENCE EDUCATION

Chair: Chris Snyder, USM Gulf Coast Research Laboratory

Vice-chair: Michael Carley, USM Gulf Coast Research Laboratory

THURSDAY MORNING

Hunter Henry Ballroom B

8:00 EMERGING INFECTIOUS CURIOSITY IN HIGH SCHOOL SCIENCE STUDENTS

Susan A. Bender, Jim Hill High School, Jackson, MS 38204

From the National Science Standards, teachers are asked to “Select Science content and adapt and design curricula to meet the knowledge, understanding, and abilities and experiences of students. Select teaching and assessment strategies that support the development of student understanding and nurture a community of science learners, and enable students to have significant responsibilities for the learning of all members of the community. Research and current population demographics suggest that the percentage of the United States population that

is comprised by members of a minority group is steadily increasing, and that female and minority students are choosing not to pursue careers or academic majors in the Sciences. One way to engage students in inner city high schools, is through the use of Emerging Infectious Disease Activities. These activities, allow students to assume the roles of physicians, patients, and public health experts to investigate a cluster of patients with similar symptoms reporting to different hospitals within the same area with a potentially life threatening emerging infectious disease and the increased likelihood of this infectious agent causing a widespread outbreak. The development of this teaching module is sponsored by a grant from the Howard Hughes Medical Institute presented to the Base Pair Program at the University of Mississippi Medical Center, Project Director, Dr. Rob Rockhold.

8:15 A REVIEW OF THE CENTRAL GULF COAST REGIONAL OCEAN SCIENCES BOWL KNOWN AS THE *HURRICANE BOWL*

Sam Clardy, Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC), Ocean Springs, MS 39564

The Central Gulf Coast Regional Ocean Sciences Bowl is one of 25 regional competitions held throughout the country. This bowl is an ocean science academic competition for high school students. Teams are comprised of four to five high school students and a coach. The winners of the 25 regional competitions are invited; at no expense to the team, to the national competition to be held April 28-30, 2007 in Stony Brook, New York. The focus of this presentation is to provide information about the regional competition, known as the *Hurricane Bowl,* and to encourage participation in this academic event that instills the *Essential Principals and Fundamental Concepts* of ocean literacy to all participants.

8:30 ESTABLISHMENT OF A VOLUNTARY COLLEGE EXERCISE PROGRAM

Johnny L. Mattox, Blue Mountian College, Blue Mountain, MS 38610

Mississippi ranks first in the number of obese citizens and physical exercise programs in some school systems have been discontinued due to inadequate funding. Therefore, it is important that students develop a regular exercise program voluntarily. The benefits of regular aerobic exercise are well-documented and numerous, including lowered blood pressure and heart rate, improved respiratory efficiency and lung function, increased bone density, improved mental well-being, and reduced stress levels, among many others. A program of walking/running has been established at Blue Mountian College. Members of the student body, faculty, and staff meet each week on Thursday at 4:00 p.m. to participate. Members of the program call themselves the BMC "Road Scholars". Students at the college are introduced to the program the first week of the school year during the Freshman Experience. The program is described and they are strongly encouraged to become a participant. Participants have indicated that the program is meeting a degree of success in improvement of their lifestyles. It is also possible that the program will benefit retention efforts by the college since student involvement in extracurricular activities seems to result in an enhanced feeling of belonging to the college community. Therefore, at present, the college plans to continue this program indefinitely.

8:45 RURAL BIOMEDICAL INITIATIVE (RBI): RURAL STUDENTS BECOMING CONFIDENT SCIENTIFIC THINKERS

Cindy Cook [1]*, Jeff Stokes [2], Susan A. Bender [3], Rob Rockhold [4],[1]Puckett Attendance Center, Puckett, MS 39151, [2]Murrah High School, Jackson, MS 39202, [3]Jim Hill High School, Jackson, MS 39204, and [4]University of Mississippi Medical Center, Jackson, MS 39216

The RBI incorporates aspects of the urban Jackson Public School District's science enhancement programs, Base Pair and SOAR, to acclimate rural students to opportunities offered in medical and scientific domains. Puckett Attendance Center in Rankin County is the first rural school in Mississippi to adopt the accredited Biomedical Research course, which combines rigorous, inquiry-based elements of Base Pair at Murrah High School and from SOAR at Jim Hill. In 2006-07, Puckett High School enrolled students into Biomedical Research, based on interest. When polled initially, 70% declared interest in a medical-related career, 20 % in a science-related career and 10% were undecided. The students engaged in lectures and laboratory studies, in areas of Forensics, Medicine and Health, Environmental and Molecular Sciences. Classes addressed academic and laboratory demands required by each discipline. Monitoring of student progress showed that 64% of students progressed at an above average rate (36% performed at an average rate). When students were polled again following exposure to the curriculum, 80% declared interest in a medical-related career and 20% in a science-related career. This initiative exposes rural students to career opportunities in biomedicine while challenging them with realistic career demands. (supported by Howard Hughes Medical Institute)

9:00 Break

9:15 IS IT A CRIME WHEN SCHOOL IS MAKING ME SICK

Timothy E. Fizer and Susan A. Bender*, Jim Hill High School, Jackson, MS 38204

From the National Science Standards, teachers are asked to "Select Science content and adapt and design curricula to meet the knowledge, understanding, and abilities and experiences of students. Select teaching and assessment strategies that support the development of student understanding and nurture a

community of science learners, and enable students to have significant responsibilities for the learning of all members of the community." From the Mississippi State Science Framework," students will communicate the results of their investigations in oral, written, and graphic form." These skills will be developed and enhanced from the sharing of knowledge among their peers and students will develop and appreciation for the sacrifices and scientific skills necessary to pursue careers in Epidemiology and Microbiology. Using basic Microbiological topics, I believe that I have achieved these goals. As a student in the Student Oriented Academic Research Program (SOAR), I have learned that even the simplest things in life can make one ill. I have acquired the skills and developed the techniques required to culture and grow the bacteria and fungi that lie dormant in my school. It is my hope that as I share my knowledge with other students in my building and other high school students around the state that they will be inspired to seek careers in advanced science fields. My research has been sponsored by my teacher, and by a grant from the Howard Hughes Medical Institute presented to the Base Pair program at the University of Mississippi Medical Center, Dr. Rob Rockhold, Project Director.

9:30 YES, VIRGINIA, THERE ARE NUMBERS THAT ARE NOT RATIONAL NUMBERS

Myron Henry, Sherry Herron*, Michelle Green, and Shauna Hedgepeth, University of Southern Mississippi, Hattiesburg, MS 39406

The 2006 Southern Miss Summer Mathematics Institute [$(SM)^2I$] consisted of 24 middle school teachers. One session featured the set of real numbers and was introduced though a Thanksgiving B.C. cartoon by Johnny Hart. The cartoon had a B.C. ant next to a pumpkin with $\pi p = (22/7)$ inscribed on the pumpkin. The B.C. ant concluded, "A Pumpkin Pi!" About half of the teachers thought the equation was correct. The session continued with an analysis of terminating and repeating decimals. The session on the next day was entitled "Yes, Virginia, there are numbers that are not rational numbers." Toward the end of the discussion on irrational numbers, one participant asked why "Yes, Virginia" to introduce the session. Fewer than half of the participants were aware of the 1897 editorial "Yes, Virginia, there is a Santa Claus" by Francis P. Church that responded to Virginia O' Hanlon's question, "Is there a Santa Claus?" The surprising (?) number of participants who thought $\pi p= (22/7)$ and who were unaware of the editorial prompted the lead project director to pen a "Yes Virginia" parody on irrational numbers. This presentation highlights the mathematics "path" to this parody and the use of technology to foster learning mathematics concepts. The Institute was funded by the U.S. Department of Education and administered through the Mississippi Department of Education.

9:45 DEVELOPING A GUIDE BOOK FOR DEER ISLAND, MISSISSIPPI

Michael Carley, Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC), Ocean Springs, MS 39564

The purpose of this project is to research and develop a guide book for Deer Island. Deer Island, a 674 acre landmass which lies just off the mainland coast of Biloxi, MS, is managed under the authority of the Mississippi Department of Marine Resources Coastal Preserves Program. The island is utilized by the public for numerous outdoor experiences including camping, beachcombing, and fishing. The guide book will serve to inform the public about the geological and archeological history of the island as well as document the common flora and fauna. This guide book is funded through the Mississippi Department of Resources Tidelands Trust Fund.

10:00 THE MEDICINE WHEEL GARDEN AS AN INTEGRATED PROJECT FOR CROSS CURRICULUM EDUCATION

Sherry Herron*, Candice Carter, Brandi Deroche, Leslie Jones, Marlissa Leavitt, Douglas Magomo, Jill D. Maroo, Betsy Sullivan, Tommy Sumrall, Anita Waltman, and Nina Ye, University of Southern Mississippi, Hattiesburg, MS 39406

The University of Southern Mississippi's Inter-tribal Society recently built a Medicine Wheel Garden which quickly evolved into a multi-disciplined educational tool that provides a hands-on, non-conventional arena for learning. A medicine wheel garden is circular in shape and divided along cardinal directions into quadrants which can have multiple meanings. The project idea has been introduced to area schools which have adapted the concept to fit their individual interests. The project provides an excellent opportunity to teach across the curriculum and to integrate disciplines, as well as lending itself to community involvement. Over fifteen groups at USM have been involved in the physical development of the Medicine Wheel Garden. Students in science and mathematics education are developing curriculum materials and activities applicable to lower, middle, and high school. Curriculum ideas related to core subject areas, vocational programs, technology programs and the arts - all of which apply to the tech-prep program in K-12 education - will be shared.

10:15 Break

10:30 MIDDLE SCHOOL MATHEMATICS AND SCIENCE FEATURING APPLICATIONS TO HURRICANES AND OTHER NATURAL DISASTERS

Sherry Herron*, Myron Henry, Lida McDowell, Shelia A. Brown, and Sharon Walker, University of Southern Mississippi, Hattiesburg, MS 39406

Forty-eight in-service teachers of science or mathematics from middle schools mostly located in South Mississippi participated in a full-day, two-week summer institute that featured concepts of mathematics and science motivated by applications emerging from natural disasters (especially hurricanes). Teachers participated in Maury Project activities that had been developed for a teacher enhancement program on oceanog-

raphy through funding from the American Meteorological Society. During a field trip to Deer Island, teachers collected debris and analyzed debris components. They also studied the path and impact of Hurricane Katrina using middle school mathematics and science concepts and through cell sheet and spreadsheet applications. Teachers utilized a SMART Board, tablet PC, projector, digital camera, and TI-84 graphing calculator during the institute to enhance science and mathematics understanding. Teams consisting of one mathematics teacher and one science teacher from the same school received this equipment package for classroom instruction in their schools. Funding for this Mathematics and Science Partnership (MSP) program (which continues through the school year) is from U.S. Department of Education. The MSP program is administered by the Mississippi Departments of Education. Presenters will describe instructional strategies and data and curriculum materials developed during and for the summer institute as well as ongoing interactions with teachers during the current school year.

10:45 CREATING AN EDUCATIONAL PODCAST FOR THE GULF COAST RESEARCH LABORATORY

Jessica Sherman [1], and Chris Snyder [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39553, National Aeronautics and Space Administration, Stennis Space Center, MS, 39522, and [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC), Ocean Springs, MS 39566

The Internet has become the most commonly used research tool in the world. Increased use has led to the need for methods of disseminating current information to interested parties. Video podcasts are emerging tools designed to meet this need. Video podcasts are short, informational segments formatted for easy distribution via the Internet and designed for playback on portable media players. This project involved the development of a template for the production of video podcasts for use in the J. L. Scott Marine Education Center's Sea TV program. The initial phase of the project involved researching existing podcasts, establishing a standard format for use in the Sea TV Program, and identifying an appropriate topic for the pilot broadcast. Once the topic was identified, production of the video segment began with an interview of Gulf Coast Research Laboratory (GCRL) personnel and gathering of necessary graphics and materials. After the production of the segment was completed, broadcast of the video podcast on the Internet was coordinated with both the GCRL Public Information Office and The University of Southern Mississippi Website Design Team. The result was a professionally constructed podcast, which is available to viewers worldwide.

11:00 RESTORATION OF FOSSIL COLLECTIONS FOR J.L. SCOTT MARINE EDUCATION CENTER (MEC) PROGRAMS

Jason Darden [1] and Sam Clardy [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, and [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center, Ocean Springs, MS 39566

This project was designed to restore the fossil collections that were damaged or lost at the J.L. Scott Marine Education Center (MEC) as a result of Hurricane Katrina. In addition to fossils previously owned by the MEC, the collection also contains specimens obtained by various donations and purchases. The internship included research to properly identify and label the fossils according to both their common and scientific names using Linnaean taxonomy. Once the fossil collection was completed, the collection was organized and displayed in an exhibit for the use in the MEC's Project Marine Discovery classrooms. The collection will be used as part of a hands-on experience in programs and workshops conducted on-site.

11:15 TECHNOLOGY AND SCIENCE EDUCATION ISSUES IN THE NEW MILLENIUM

Prince Showi [1]*, James Ejiwale [2], and Mudlagiri B. Goli [1], [1]Mississippi Valley State University, Itta Bena, MS 38941 and Jackson State University, Jackson, MS 39217

We have heard so much about integrating technology into our existing curriculum, but we are still struggling to adopt it. There are couples of issues to address in order for integration to be successful. First, you should determine what you want the technology to do for you. Technology can address the learning problems, because real influences of technology are too great to be ignored. Since the 21st Century, technology and science education have grown rapidly and made education relatively easy and unique and technological tools enable us to imagine ways of assessing the quality of an educational experience on a national or international level. Second, as we complete the 20th century and prepare for the 21st century, it is important to realize that our world is far different form one which existed a hundred years ago. In the 19th century, a largely agricultural workforce existed along side an emerging industrial economy powered by muscle, water and steam. In this short presentation, attempt will be made to look into the different aspects of technology issues and the way to incorporate it in to the university curriculum.

11:30 CENTRAL GULF OF MEXICO OCEAN OBSERVING SYSTEMS (CenGOOS) K-12 PROGRAM DEVELOPMENT

Kylie Williams [1*], Tami Wells [2], Stephen Howden [3], Conrad Johnson [4], Sharon Walker [2], 1 Mississippi Gulf Coast Community College, Gautier, MS 39553, [2]University of Southern Mississippi, GCRL, J.L. Scott Marine Education Center, Ocean Springs, MS 39564, [3]University of Southern Mississippi, Marine Science, Stennis Space Center, MS 39529, and [4]University of Southern Mississippi, Center of Higher Learning, Stennis, MS 39529

This project is a collaborative effort which "Bridges the Gap" between scientist and educators by developing ocean observation classroom activities for students (K-12). Real-time and near-real time ocean observing systems data was integrated into curricula that pursue the *National Science Standards, Mississippi Science Standards,* and the *Ocean Literacy Essential Concepts and Fundamentals.*This curricula development has significantly (p=0.01) expanded the knowledge of both formal (pre-service and in-service) and non-formal educators in observation system technology. The foci of the curricula includes; physical, chemical, geological and biological oceanography, remote sensing, acoustics and cartography.Physical and chemical data collected *in situ* from a research vessel platform coupled with data collected from ocean observing instruments provide data for virtual reality program activities in the classroom. The deliverables for this project are linked to the CenGoos, Gulf of Mexico Alliance (GOMA) and the Gulf Coast Ocean Observing System (GCOOS) networks and are utilized as teaching tools for classroom instruction and teacher workshops in Louisiana, Mississippi, and Alabama via a remote virtual reality classroom developed by the University of Southern Mississippi, Gulf Coast Research Laboratory, Marine Education Center.

11:45 Divisional Business Meeting

THURSDAY AFTERNOON

Hunter Henry Ballroom B

1:15 THE MISSISSIPPI STATE UNIVERSITY "CHALLENGE X" EXPERIENCE

Amanda McAlpin*, David Oglesby, and Marshall Molen, Mississippi State University, Mississippi State, MS 39762

Mississippi State University is currently one of 17 North American universities participating in Challenge X. Challenge X is a four year student design competition sponsored by the US Department of Energy and General Motors. Students are challenged to redesign a 2005 Chevrolet Equinox to decrease fuel consumption and harmful emissions while maintaining or exceeding stock vehicle performance. The first year of the competition focuses on modeling and simulation of the new vehicle powertrains. The selected powertrain is then built and implemented in the second year of the competition. The third and fourth years focus on refinement and consumer acceptability aspects of the vehicle. Throughout the project, students are required to follow a reduced version of the General Motors Vehicle Development Process. Besides the technical aspects of redesigning and implementing an automobile powertrain, the teams are also required to conduct media and community outreach and K-12 educational events. Challenge X provides invaluable hands-on and teamwork experience to all disciplines of engineering, business, education and communication students.

1:30 DESCRIPTION FOR 3-D LEARNING AND BEYOND: DIRECTION, DEVELOPMENT, DELIVERY

Rodney W. Beasley, Mississippi State University, Mississippi State, MS 39762

With a fast changing and challenging world facing our present students, education must keep up the pace to help them prepare for the 21st Century. Therefore, the changing business and professional communities are relying on teachers to prepare students for the workforce. Are professional educators meeting these expectations? With the need for better weather forecasts, environmental solutions, medicine, space programs, and disaster planning, science education at the secondary and post-secondary levels may be the only answer. Science education must merge with career-technical practices to help spark students' interest. In other words, science educators must combine the rigor/relevance framework with differentiated instruction to help recruit students into the scientific and engineering fields of study. Many studies have shown an increase in self-esteem among both male and female students by making the science curriculum relevant and by implementing differentiated instruction. The *3D Learning: Science and Beyond* workshop will give teachers activities to help apply rigor and relevance with differentiated instruction to provide students with a foundation in scientific and technical knowledge. Applied activities will be included to help teachers present science as a positive experience which in turn may increase test scores and self-esteem. Thus, these practices can help bring Mississippi to the forefront of science education, and prepare students to make significant contributions in the fields of science and engineering. To reduce teachers' anxiety about high-stakes testing, revisions and teaching strategies to the 2006-2007 subject area testing program will be presented. Materials and equipment will be distributed. Come join the fun!

1:45 TEACHING BIOINFORMATICS: STRATEGIES AND MATERIALS

Sherry Herron*, Jessica McNeil, and Tasha Thames, University of Southern Mississippi, Hattiesburg, MS 39406

Mississippi EPSCoR (NSF 05-589) funded the 3-day summer Bioinformatics Workshop for High School and College Instructors. Held at the Mississippi E Center, seventeen educators experienced curriculum materials developed through The Human Genome Project and units on human evolution from the DNA Dolan Learning Center at Cold Spring Harbor. Computer-based, wet-lab, and modeling activities experienced during the workshop will be described; pre and post test results and evaluations will be presented. Current work focusing on sickle cell curriculum materials will also be described.

2:00 MONTASTREA ANNULARIS AS A CORAL REEF HEALTH INDICATOR AT HALF MOON CAYE, BELIZE

Mallory Blakeslee* and Aimée T. Lee, University of Southern Mississippi, MS, 39406

This study utilizes Montastrea annularis in order to

determine the fitness of a coral reef ecosystem in Belize, Central America. M. annularis was chosen because it is the most abundant type of coral in the sample area. Therefore, its presence will directly relate to the health of the overall ecosystem. Sample sites were determined by using a random numbers chart, then the presence or absence of the coral at each site was recorded. Ten samples were taken at four sites on a barrier reef off the coast of Belize. Using a barrier reef allows researchers to compare between them and inland reef systems. This study indicates the overall health of the system sampled to be good; however, there are no previous data with which to compare. This study provides a base line for future studies.

2:15 BECOMING MORE ACQUAINTED WITH "HANDS-ON" OCEAN-RELATED LESSON PLANS AND OCEAN LITERACY STANDARDS

Sharon Walker, University of Southern Mississippi, Hattiesburg, MS 39406

This presentation will feature recently developed ocean and coastal processes lesson plans, aligned with State, National, and Ocean Literacy Standards. These lesson plans will focus on hurricanes and their subsequent environmental impacts on coastal and inland communities, specifically on marshes and wetlands, oceans and human health, and oyster reefs. Special emphases will be provided on the Essential Principles and Fundamental Concepts of Ocean Literacy. These Essential Principles include: 1) the Earth has one big ocean with many features; 2) the ocean and life in the ocean shape the features of the Earth; 3) the ocean is a major influence on weather and climate; 4) the ocean makes the Earth habitable; 5) the ocean supports a great diversity of life and ecosystems; 6) the ocean and humans are inextricably interconnected; and 7) the ocean is largely unexplored. Resource materials will be provided to attendees, as well as professional development opportunities for informal and formal educators.

2:30 Break

2:45 PROBLEM-SOLVING IN INTRODUCTORY PHYSICS COURSES: A COMPARISON BETWEEN ONLINE AND TRADITIONAL METHODS

Abu Khan, Jackson State University, Jackson, MS 39217

This study investigated the effectiveness of implementing online technology in problem-solving assignments. Instructors frequently encounter the questions whether online assignments serve the purpose of problem-solving, and whether traditional method of in-class problem-solving is better than online methods. Undergraduate students of introductory physics courses (N=239) at Jackson State University over past six years were assigned problem-solving tasks using both traditional classroom and online methods. In traditional method, each student took 11 quizzes over a semester. Students were given 4 problems in each 50-minute open book and open class-note quiz. Discussion with fellow students was prohibited. In online method, students were given 11 assignments (10 problems per assignment) that were picked up and submitted online within a week. Students had access to texts, class-notes, online resources including solution hints kept on WebCT platform. Problems assigned in-class and online were of similar degree of difficulty, and were worth 10% of students' final grade. When compared, no difference in student performances between the two methods was found. However, from separate analysis, algebra-based physics students (N=98) were found to perform better in traditional method compared to online method ($t=3.36$, $p<0.001$). Calculus-based physics students (N=141) were found to perform better in online method ($t=3.67$, $p<0.001$). More familiarity of these students with computer use may explain the observed difference. Results suggest that online methods can be effectively implemented in problem solving assignments.

3:00 A CRITICAL EVALUATION OF PUBLIC OPPORTUNITIES TO LEARN GEOBIOLOGY AT THE MISSISSIPPI PETRIFIED FOREST IN FLORA, MS

Renee Clary* and James H. Wandersee, Mississippi State University, Mississippi State, MS 39762 and Louisiana State University, Baton Rouge, LA 70803

Field trips to outdoor informal science education sites offer experiential opportunities for students that enhance or support classroom education as well as increase students' motivation to learn (Wandersee & Clary, 2006). In order to identify the onsite interpretive materials and features that comprise the best teaching opportunities for geobiological concepts at Mississippi Petrified Forest, a registered National Landmark and the only petrified wood site east of the Mississippi River, the authors performed a critical analysis of data they collected via site visits and an in-depth content analysis (Neuendorf, 2001) of the Flora trail guide brochure. They used the onsite interpretative materials from the comparable Petrified Forest of Calistoga, CA as a benchmark. The analyses determined (1) the design elements at Flora that are most effective for presenting integrated geology-biology concepts; (2) the opportunities to learn from the trail brochure that will aid science instructors in utilizing this informal educational site wisely; and (3) suggestions for teachers who wish to customize a brochure for a Flora site visit, and/or design activities that would support integrated science education within their biology and earth science/geology student populations.

3:30 THE ROLE OF OCEAN OBSERVING SYSTEMS IN K-12 EDUCATION: EXPLAINING THE CONCEPTS, DEVELOPING THE CURRICULA AND APPLYING THE TECHNOLOGY

Tami Wells [1]*, Sharon Walker [1], Stephen Howden [2], and Marcus Jarrett [3], [1]Gulf Coast Research Laboratory-J.L. Scott Marine Education Center, Ocean Springs, MS 39564, [2]University of

Southern Mississippi, Stennis Space Center, MS 39522, and [3]Department of the Navy, Stennis Space Center, MS 39522

The need for advanced ocean literacy in our society has never been more critical than it is today. Decades of science education research has well documented the need to improve the instruction and intellectual capacity of science and mathematics in K-12 students. Ocean Observing Systems, both atmospheric and from ocean platforms, have provided technological support to teachers delivering challenging curricula in meeting the standards of the Ocean Literacy Essential Principles and Fundamental Concepts. The Central Gulf Coast Ocean Observing System (CENCOOS), Gulf Coast Ocean Observing System (GCOOS), Gulf of Mexico Alliance (GOMA), and the Naval Oceanographic Office (NAVOCEANO) have established the ability to engage ocean monitoring systems and scientific research with educators (informal and formal) to enhance the ocean sciences education framework. The statistical impacts of professional development programs for precollege teachers document positive correlations between pre- and posttests. Technology resources, teacher workshops, curricular development and concepts of Ocean Literacy are recognized and discussed.

3:45 *MISSISSIPPI SCIENCE FRAMEWORK* AND *NATIONAL SCIENCE EDUCATION STANDARDS* BASED PROGRAMS AT J. L. SCOTT MARINE EDUCATION CENTER

Shelia A. Brown* Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC)*, Ocean Springs, MS 39566

The J.L. Scott Marine Education Center provides a variety of educational programs for public and private school groups K-12, teacher workshops and institutes, as well as the general public. Programs are structured to fulfill the *Mississippi Science Framework Standards, National Science Education Standards* and the *Ocean Literacy Essential Principles and Fundamental Concepts (2005)*. Programs may include mini-lectures, "hands-on" activities, arts and crafts, live animal encounters, and field trips to local habitats. The composition of these programs will be provided and evaluation data presented.

4:00 TECHNOLOGICAL ENHANCEMENTS TO J.L. SCOTT MARINE EDUCATION CENTER'S SEA TV PROGRAM

Chris Snyder, Gulf Coast Research Laboratory's J.L. Scott Marine Education Center, Ocean Springs, MS 39564

J.L. Scott Marine Education Center's (MEC) Sea TV program has been bringing an "eyes-on" educational experience to Mississippi classrooms for the past four years. Sea TV, a cooperative effort of the MEC and Mississippi Public Broadcasting, utilizes video conferencing technology, live animals and the Internet to bring coastal habitats and marine science into K-12 classrooms statewide. Post Katrina enhancements and advancements in Internet technology have been incorporated into the existing program to improve the educational and entertainment valve of the program. Enhancements and new programming techniques are fully detailed and demonstrated in a visual presentation highlighting the use of technology in the classroom.

6:00 Poster Session
Location: Bost Auditorium North
Posters may be set up between 4:00p and 4:30p

ENHANCING HANDS ON SCIENTIFIC EXPERIENCES OF SECOND GRADE STUDENTS VIA THE SCIENTIFIC METHOD

Mariel Fountain [1], and Kim M. Everett [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC), Ocean Springs, MS 39564, and Oak Park Elementary School, Ocean Springs, MS 39564

The purpose of this project was to enhance usage of the scientific method by second graders in the gifted program of Oak Park Elementary School in Ocean Springs, MS. One or two sub units from the following topics were selected: Density, Chemistry, Crime lab, Forensics, and Physics. Prior to each experiment, an informal discussion was used to determine prior knowledge by the students. After each experiment, informal questions and answers revealed increased knowledge on the subject. A lab report work sheet was compiled for each experiment including materials, hypothesis, procedures and results.

INTRODUCING ENGINEERING THROUGH A PROJECTS-BASED COURSE TO HIGH SCHOOL STUDENTS AND TEACHERS, AND PROVIDING COLLEGE STUDENTS INTERESTED IN ENGINEERING THE OPPORTUNITY TO MEET ENGINEERING PROFESSORS AND STUDY SIX DISCIPLINES OF ENGINEERING

Maxine Woolsey* and Marni Kendricks, University of Mississippi, University, MS 38677

Introduction to Engineering is a projects-based course developed to include basic mathematical engineering concepts, lectures by engineering professors, and hands-on projects where students, working in groups of three, follow the engineering process to construct prototypes representing six disciplines of engineering. The course provides opportunities for high school and college students to experience chemical, civil, electrical, geological, mechanical engineering, and computer science at the University of Mississippi, with engineering professors, during fall and summer semesters. Students participate in the teaching classroom, or via distance learning or interactive streaming video. Teachers facilitating or teaching Intro to Engineering participate in a two-week summer workshop to meet engineering professors and learn content and techniques for teaching engineering. The course, in its present format, was first taught to high school and college students during the fall of 2005. Eighty six high school students representing 26 high schools and 23 college students have completed the course. Results from post evaluation

surveys show 60 percent of students completing the surveys confirmed they want to continue studying engineering as a college major, 40 percent also included the discipline of engineering they want to study, and 40 percent indicated they do not want to major in engineering. Textbooks and project materials are available through Ole Miss Engineering.

EXCITING AND INCREDIBLE CRYPTOGRAPHY

Anil Sharma* and Dana Taylor, Mississippi Valley State University, Itta Bena, MS 38941

The field of cryptography is intriguing and continues to develop. It involves linguistic and mathematical techniques for securing information. Earlier forms of cryptography involved identifying patterns in language; however, modern forms utilize results in advanced mathematical fields such as number theory and discrete mathematics. Cryptography is concerned with encryption and decryption of information. Most recently, cryptography has such diverse applications as computer security authentication, electronic voting, and electronic money such as the Electronic Funds Transfer.

THE HISTORY OF STUDENT RESEARCH AT THE GULF COAST RESEARCH LABORATORY (GCRL)

Kim Dearman [1]* and Joyce M. Shaw [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522 and Gulf Coast Research Laboratory, Gunter Library[2], Ocean Springs, MS 39564

The Gulf Coast Research Laboratory (GCRL) has hosted numerous student scientists over its long history. From Spring Break research experiences to several years of post-doctoral study, both undergraduate and graduate students have used the laboratories, research vessels, and library materials of GCRL as they explored the coastal estuaries and marine waters of Mississippi. This project involves documenting the history of student research at GCRL. A comprehensive list of students, the work they published, and "where are they now" information will be compiled. Former students will be contacted and asked to provide personal stories about their most important memories of GCRL. This project continues nearly a decade of work devoted to documenting the history of the Gulf Coast Research Laboratory.

CREATING AN ARTIFICIAL BOG TO TEACH STUDENTS ABOUT CARNIVOROUS PLANTS

Samantha Mowrey [1] and Michael Carley [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, and [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center, Ocean Springs, MS 39564

In this project, information was collected to educate K-12 students about carnivorous plants found in coastal Mississippi. Research about the habitats and growth habits was initiated in order to create the most suitable environment for growth. After designing the appearance of the exhibit, the plants were located and, when necessary, permission obtained to transplant them to the prepared soil bed at the Marine Education Center. The plants are maintained as a live exhibit, in order to display and teach students about the carnivorous plants growing naturally in Southern Mississippi.

TEACHING SECOND GRADERS ABOUT SCIENTIFIC CONVENTIONS AND EXPERIMENTATION

Tiffany Nunnery [1] and Denise Wilson [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center and Aquarium (MEC&A), Ocean Springs, MS 39566-7000, Magnolia Park Elementary School, Ocean Springs, MS 39564

The purpose of this program was to teach second graders how a scientific convention progresses. This was achieved using a material called Oobleck. Oobleck is a mixture of cornstarch, water and food coloring. The unit was implemented on three days. The first day, the children were read Dr. Seuss's *Bartholomew* and were introduced to the properties of Oobleck. Through experimentation, students discovered that Oobleck is squishy and gooey; yet hard and firm when pressure is quickly applied. The students described their findings on the properties of Oobleck in writing. The second day, the students were instructed on the workings within a scientific convention and were required to develop written descriptions of their newly acquired knowledge. These descriptions were utilized to determine their comprehension of a scientific convention. The last day was a creative writing and comprehension day. The children completed worksheets to explain what they learned and wrote a story about landing on and taking off a planet covered in Oobleck. Using their newly acquired knowledge about the substance, the children designed a rocket ship that would not stick in Oobleck.

ADDRESSING THE NEED FOR APPROPRIATE SCIENCE COURSES FOR GRADUATE SECONDARY EDUCATION PROGRAMS

Larry Hanshaw, University of Mississippi, University, MS 38677

Appropriate graduate science courses are essential components of the curriculum needs of practicing science teachers and graduate science education students who are earning degrees at any institution. This report identifies and discusses key reasons related to problems with the availability of appropriate science courses here and proposes a potential solution to this dilemma that incorporates the following elements: (1) on-line science courses to address the appropriate content needs of practicing science teachers who are enrolled in our graduate

programs,(2) a high school-based laboratory option for practicing science teachers,(3)a discussion of cost issues and the use of on-line courses as a viable proxy to off-set needed evening-hours science courses and faculty, and (4) a discussion of university-school partnerships (and other stakeholder-partnerships) needed to facilitate the proposed solution. Education faculty concerned with graduate programs at other institutions may benefit from the discussion of the issues analyzed in this paper.

INTERGRATING POLYMER SCIENCE INTO MIDDLE/HIGH SCHOOL CURRICULUM

Toby Richey*, Tasha Thames*, Sarah E. Morgan, and Jeffrey S. Wiggins, University of Southern Mississippi, Hattiesburg, MS 39406

A new and innovative way to introduce students to the fascinating world of polymers was a topic of study through the National Science Foundation sponsored RET (Research Experience for Teachers) at the University of Southern Mississippi. This was designed to broaden students' limited knowledge of polymers beyond "plastics." A variety of activities were presented to expand students' perception of polymer science and instruct teachers on how to integrate this exciting field into any science curriculum. These activities were implemented by two Northeast Jones Middle/High School teachers: one a seventh grade science teacher and the other a ninth grade biology teacher. The students performed activities ranging from making nylon, slime, and shrinky dinks to evaluating super absorbent polymers in diapers. The benefit of these activities was to show students that polymers are a part of their every day life. As students' knowledge of polymers increased it enabled them to take conceptual knowledge to a real-world understanding. Impact of the activities was assessed through surveys and content examinations. This work was supported primarily by the RET program of the National Science Foundation under Award Number EEC-0602032.

EDUCATING ELEMENTARY SCHOOL STUDENTS ON CHEMICAL PROPERTIES

Jessica McCool [1] and M. Flowers [2], [1]Mississippi Gulf Coast Community College, Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS, 39522, [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center (MEC), Ocean Springs, MS 39564, and Oak Park Elementary School, Ocean Springs, MS 39564

The purpose of this project was to expose a group of elementary school students in the gifted program at Oak Park Elementary School in Ocean Springs, MS to a presentation on basic chemistry concepts. Through the presentation, students were introduced to the chemical and physical properties of five ordinary white powders: salt, sugar, plaster, cornstarch, and baking soda. Students tested reactions of each substance to water, heat, iodine, and vinegar. The students were taught to make careful observations, and determine the presence of a powder in a mixture through the use of indicators. The gifted students were able to identify the unknown substances by close personal observations and the chemical characteristics of each powder allowing them to develop experimental skills.

DEVELOPING A CROSS CURRICULUM SCIENCE REFERENCE GUIDE FOR ELEMENTARY LEVEL STUDENTS FOCUSING ON THE ASPECTS OF SCIENCE

Brittany Johnson [1], James Gladden [1], Adelle Register [2], [1]Mississippi Gulf Coast Community , Gautier, MS 39533, National Aeronautics and Space Administration, Stennis Space Center, MS 39522, [2]Gulf Coast Research Laboratory's J.L. Scott Marine Education Center, and Pecan Park Elementary School, Ocean Springs, MS 39564

This project was designed to introduce higher order thinking skills in elementary level students by analyzing and interpreting concepts of science. This was achieved by developing a cross curriculum science reference guide with hands-on activities and experiments focusing on the important aspects of physical sciences and life sciences. The students' knowledge and understanding of the topics before and after the lesson was measured using a pre and post assessment. This project helped the students develop a better appreciation of the science that surrounds them in their daily lives.

ZOOLOGY AND ENTOMOLOGY

Chair: Julius Ikenga, Mississippi Valley State University

Vice-chair: Alex D. W. Acholonu, Alcorn State University

THURSDAY MORNING

Hunter Henry Executive Room 8

9:00 PHYLOGENY OF LARGE WOLF SPIDERS FROM THE SOUTHEASTERN UNITED STATES.

Gail Stratton*, University of Mississippi, University, MS 38677

The large wolf spiders in the Southeastern United States include members of the current genera ,I>Gladicosa, Geolycosa, Hogna, Rabidosa and others. Although there have been taxonomic revisions of wolf spiders in the last 30 years of several of the genera, there has not yet been a comprehensive revision of lycosids since Chamberlin 1908. In addition there has not been a phylogenetic study to test ideas of generic placements and to present hypotheses of relationship. The present study investigated 36 species of wolf spiders by scoring 115 morphological characters including somatic characters, male palpal characters and female epigynal characters. Data were recorded in MacClade, and maximum parsimony analyses were conducted

using Paup (ver. 4.0b10) by using heuristic searches with 1000 random starting points and the Stepwise-addition option. Characters of interest were then mapped onto the resulting trees to investigate evolution of characters such as burrowing behavior. This study suggests that some genera are monophyletic but others are not.

9:15 WATER QUALITY STUDIES ON FRESHWATER BODIES IN NEW ORLEANS, LOUISIANA AFTER HURRICANE KATRINA

Alex D. W. Acholonu, Tiffari Jenkins*, Michelle Kinnard, Sherita White, Tandeka Phipps, and Tammy Williams, Alcorn State University, Lorman, MS 39096

After Hurricane Katrina occurred on August 28 – 29, 2005, on the Gulf Coast, much of New Orleans was flooded. Freshwater bodies and drinking water in the affected areas were polluted with high levels of coliform bacteria, fungi, pesticides and toxic chemicals. Lake Pontchartrain and Mississippi River were said to be dump sites for pollutants in addition to the flooding. Flood water fouled with human and animal remains, sewage, heavy metals, petrochemicals and other hazardous substances were pumped into Lake Pontchartrain. This makes periodic monitoring of these large water bodies necessary to assess the level of contamination still existing as well as smaller bodies like ponds. The purpose of this study was to find out the quality of these water bodies after one year of the hurricane occurrence as well as the Southern University, New Orleans (SUNO) Golf Course pond (especially as SUNO was one of the sites badly flooded because of the hurricane). Water samples were collected for two consecutive times from each of Lake Pontchartrain, Mississippi River and the Golf Course pond at SUNO and tested for contaminants using several chemical parameters. The results and analysis of the results show that the parameters tested met the MS/EPA Water Quality Criteria with the exception of a few.

9:30 PREVALENCE OF TUBERCULOSIS (TB) AND HIV INFECTION IN IMO STATE, NIGERIA

Alex D. W. Acholonu [1]*, A. Njoku [2], and Abram Dunbar [1], [1]Alcorn State University, Lorman, MS 39096 and [2]Imo State University, Owerri, Nigeria

There have been reported cases of association of tuberculosis (TB) caused by Mycobactetium tuberculosis, with Human Immunodeficiency Virus infection. The purpose of this study was to find out the prevalence of TB and HIV infection among people from Orlu in Imo State, Nigeria. During the period of August 2004 to September 2005, test samples were collected from both male and female respondents from Orlu aged one year to sixty years and examined for tuberculosis and HIV infection. Of 8197 specimens examined, 151 (1.84%) were positive for TB and 132 (1.61%) were positive for HIV infection. Analysis of the results will be presented.

9:45 WORKSHOP

ANIMAL TISSUE PREPARATION FOR MICRO- AND ULTRAMICRO-ANATOMY STUDIES

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

Tissue preparation is an important tool in advancing the microscopic studies of special association between animals. This association may exist at the level of mutualism, commensalisms, phoresis, or parasitism. Animal tissue preparation falls broadly into seven main steps: tissue acquisition, fixation and washing, extraction and infiltration, embedding, curing, sectioning, and staining. Carefully obtained and diced animal tissue is fixed in a solution of commercially available fixatives. The later range from formalaldehyde, gluteraldehyde, to osmium tetroxide solutions, depending on type of tissue and purpose. Extraction is normally accomplished using graded alcohol solutions, preferably, ethanol. Infiltration and embeddiing are achieved using a variety of commercially available epoxides. Samples are subsequently cured in an oven and then sectioned on a microtome. Sections are collected on commercially available grids for Electron microscopy and on glass slides for light microscopy and then stained. Samples collected on grids and glass slides are respectively examined on Electron microscope and light compound microscope.

Poster Session: 10:15a to 11:30a (in room)

10:15 A PHYLOGENY OF GENERA IN TRIBE TELEIODINI (LEPIDOPTERA: GELECHIIDAE) IN THE HOLARCTIC REGION

Sangmi Lee* and Richard L. Brown, Mississippi State University , Mississippi State, MS 39762

Teleiodini (Gelechiidae: Gelechiinae) includes 60 species in 18 genera in the Palearctic region and 113 species in 12 genera in the Nearctic region. This study provides the first phylogenetic analysis of generic relationships for Holarctic Teleiodini based on morphological data and provides a hypothesis to explain distributional patterns. This analysis includes all 23 genera of Teleiodini and four outgroup genera in the Holarctic Region. Character states were determined by examination of imagos, genitalia, and whole body mounts of specimens. A total of 61 morphological characters with 202 states were found to have informative value. The morphological matrix was made using MacClade and consisted of 27 terminals. The morphological data set was analyzed using PAUP version 4.0b10 for Macintosh. Bremer support values were calculated in Nona using the command bsupport 5. The heuristic search for the most parsimonious tree recovered 6 trees with equal lengths of 318 steps. These trees have a retention index of 0.4861, a rescaled consistency index of 0.2033, and a consistency index of 0.4182. This analysis supports the monophyly of Teleiodini with a high

Bremer support value of 4 for the tribe. The distribution pattern suggests five derivations of taxa in the Nearctic Region and five derivations of taxa in the Palearctic Region.

10:30 USE OF MICROCOSM STUDIES TO ASSESS THE RELATIONSHIP BETWEEN AQUATIC PLANTS AND SOIL MICROORGANISMS

Charles Rucker [1]*, Mark Weaver [2], Robert Zablotowicz [2], Rachel Beecham [1], [1]Mississippi Valley State University, Itta Bena, MS 38941 and [2]USDA-ARS, Stoneville, MS 38776

In this mini wetland study on the relationship between aquatic plants and soil microorganisms, I tried to show the difference in the soil microbial activity by performing a series of tests on the basic composition of the soil in each plot in the microcosm study. The plant species in this experiment were expected to promote the growth of different microbial communities in the soil and rhizosphere. We examined the soil for differences in the microbial communities, as represented by Fatty Acid Methyl Esters (FAME) and determined if they had different enzymatic properties. Through the process of natural selection these species of aquatic plants should flourish due to their invasive behavior. Each plant in this study had its own unique microbial population equipped with enzymatic properties that act as catalyst in the decomposition of nutrients and other organic pollutant. Due to years of ecology and environmental safety, nature should reduce the levels of deposits from unavoidable forces that must evolve such as erosion. This is positive feed back from the effort of the scientist at USDA-ARS Stoneville, Ms that serve as environmental protectors who find more eco-safe ways to carry out agricultural evolutions.

10:45 ANTS IN MISSISSIPPI STATE PARKS

Joe A. MacGown*, JoVonn G. Hill, and Rebekah J. Jones, Mississippi State University, Mississippi State, MS 39762

The objectives of this study were to survey Mississippi's state parks for ants to provide baseline data on the diversity and distributions of native and exotic species. The state parks provide ideal collecting localities because they are spread throughout Mississippi and offer an array of habitats. Collections were made from the spring of 2005 through late summer of 2006 in 17 of the 24 state parks. Ants were collected by a variety of methods for two to four hours at each park, identified, and stored in the Mississippi Entomological Museum. This survey resulted in the collection of 88 native species, including one that is undescribed, and ten exotic species (plus the hybrid fire ant). These included six new state records, three species only recently described, six species that were only recently reported, and 25 species that are rarely collected. Differences in the diversity and assemblages of ants have been observed with the greatest diversity found thus far from Wall Doxey State Park in Marshall County with a total of 56 species documented. Areas with high concentrations of exotic species, especially in the southern portion of the state, have been found to have lower diversity. A web site documenting ants found in Mississippi State Parks has been prepared that includes collecting trip logs, species lists, and photos of the parks and/or ant species (http://www .msstate.edu/or /mississippientmuseurn/Researchtaxa a es/Formicidae a es /MS.state.~k.ants.htm).

11:00 A PRELIMINARY LIST OF THE ORTHOPTEROID INSECTS OF THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Matt E. Dakin and JoVonn G. Hill*, Mississippi State University, Mississippi State, MS 39762

Due to recent concern over what appears to be rapidly declining levels of biodiversity, Discover Life in America initiated the All Taxa Biodiversity Inventory, whose main goal is to catalog all the living organisms in the Great Smoky Mountains National Park. Taxonomists from all over the world have been awarded grants and volunteered their time to this cause. This project will provide checklists, reports, databases, maps, and natural history information for future reference in monitoring biodiversity in the park. As part of this project the authors have been surveying the Orthoptera and associated orders of the Great Smoky Mountains National Park for several years. Thus far, we have documented approximately 100 species of Orthopteroid insects as occurring in the park, along with spatial and temporal information. This includes 45 species belonging to the Orthoptera sub-order Caelifera (grasshoppers, grouse locusts, and pygmy mole crickets), as well as 46 species belonging to the sub-order Ensifera (camel, cave, mole, true crickets, and katydids). Other orders under study include Phasmida (walking sticks), Mantodea (mantids), and Blattaria (roaches).

11:15 ACENTROPINAE (CRAMBIDAE) OF MISSISSIPPI AND ALABAMA

Edda L. Martínez* and Richard L. Brown, Mississippi State University, Mississippi State, MS 39762

The subfamily Acentropinae (Lepidoptera: Crambidae) includes 22 species in 11 genera of moths in Mississippi and Alabama. Larvae of these species are associated with aquatic habitats. Only five species in three genera previously have been reported to occur in Mississippi and Alabama. Eleven species are in genera restricted to lentic habitats, six species are in genera occurring in both lentic and lotic habitats, and five species are in genera with unknown habitat preferences. The purpose of this poster is to provide new distributional records for 17 species of Acentropinae from Mississippi and Alabama. Distribution maps and photographs of imagos are provided.

11:30 Divisional Business Meeting

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