

## ABSTRACTS OF PAPERS PRESENTED AT THE SPRING 1994 COLLEGIATE MEETINGS

## EASTERN REGION

THE UNIVERSITY OF TENNESSEE AT CHATTANOOGA  
CHATTANOOGA, TENNESSEE

**CYCLURA RILEYI RILEYI: AN OBSERVATIONAL POPULATION ASSESSMENT ON GUANA CAY, SAN SALVADOR, THE BAHAMAS.** *Isabella Angelini, Marie Colson, Melissa Dickinson, Debra Eaker, Carolyn Jones, Gayle Livingston, and Aimee McDaniel, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* An observational assessment of an isolated population of the endangered rock iguana, *Cyclura rileyi rileyi*, was conducted on "Guana Cay," an island located in the interior lakes of San Salvador, The Bahamas. The study indicates imminent extirpation of this population, based upon sightings of 10 extant individuals and six carcasses. The total population of the subspecies is estimated to be approximately 25 on this island. Further analysis will be conducted on water, sediment, and vegetational samples as well as samples of carcass tissue and fecal matter for the presence of toxicants.

**THE MODIFICATION OF THE LIQUID CRYSTAL 4-HYDROXY-4'-CYANOBIPHENYL BY ITS ATTACHMENT TO GLUCOSE PENTAACETATE.** *David Baker, Frank Tagliaferri, and Brenda Arrowood, The University of Tennessee, Knoxville, Tennessee.* Liquid crystals are described as organic compounds that, when heated, adopt a state between that of a true solid and a true liquid. Their uses are numerous and extend into the fields of medicine and electrooptics. The purpose of this research was to create the liquid crystal 4-hydroxy-4'-cyanobiphenyl and attach it to glucose pentaacetate. This carbohydrate liquid crystal would be analyzed for future uses.

**ORIGIN OF POROUS ZONES IN SUBSURFACE MISSISSIPPIAN MONTEAGLE LIMESTONE, RUGBY QUADRANGLE, MORGAN AND SCOTT COUNTIES, TENNESSEE.** *Mary Lynn Barnes and Richard E. Bergenback, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* Gamma ray, bulk density, and porosity geophysical logs from >700 producing oil and gas wells in the subsurface Mississippian Monteagle Limestone located in the Rugby quadrangle, Morgan and Scott counties, Tennessee, enable preparation of porous zone cross-sections (panes diagrams) and an isopach (formation thickness) map of the Monteagle. The isopach map indicates northeast-southwest-trending mounds interpreted as tidal bars. Porous zones within the Monteagle that are laterally discontinuous and occur at distinct stratigraphic levels are thought to have formed atop tidal bars through an interplay of eustatic and isostatic movements. Caves (porous zones) in Pleistocene bedrock developed on a modern platform carbonate island, San Salvador, The Bahamas, are offered as evidence to support the theory of formation of Monteagle porous zones.

**REEF STUDY IN RICE BAY OF SAN SALVADOR, THE BAHAMAS.** *Shannon Barrett, Bill Burley, Greg Cunningham, James Macrellis, Preston McAfee, and Helen McDearman, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* In conjunction with a separate mapping project, coordinates were taken of two reefs in

Rice Bay of San Salvador, The Bahamas. A biological observation noting certain coral types was conducted.

**LIQUEFACTION POTENTIAL IN HAMILTON COUNTY, TENNESSEE.** *Jerry A. Partrap and Jonathan W. Mies, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* Liquefaction, the process by which water-saturated cohesionless soil is transformed to a liquid state, can be induced by the cyclic shear stresses generated by earthquakes. Pore-water pressure in the soil becomes elevated with the passage of a seismic wave, such that the effective confining stress, which normally impeded frictional sliding of grains, is radically reduced. Under these conditions, the soil may behave as a liquid and may flow readily. This phenomenon can be very destructive in earthquake-prone areas that are underlain by soils with appropriate physical and dynamic properties. Although Hamilton Co., Tennessee, is not situated on a recognized seismic zone, a limited potential for seismically induced liquefaction exists. This area experienced ground motions (Modified Mercalli VII) associated with the 1811 New Madrid earthquake that were sufficient, by some estimates, to cause liquefaction. The sandy loam of the Staser Series is one of several local soils that may liquefy. Such soils are dominated by loosely packed, fine-grained, spherical (equant) particles and are commonly water-saturated at shallow depths due to their proximity to rivers and streams; these factors contribute to a soil's liquefaction potential. Some soils in Hamilton Co. are susceptible to seismically induced liquefaction. However, this is not a serious hazard, due to the limited occurrence of such soils and the likelihood of high-amplitude seismic disturbances.

**A SURVEY OF PARASITES OF SAN SALVADOR ISLAND'S FISH.** *Wm. D. Harris, M. K. Morgan, R. W. Norman, and K. L. Smedley, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* A general survey of the marine fish off the coast of San Salvador Island, The Bahamas, was conducted to determine the presence of parasites. This study began building a database of the parasites found in these subtropical waters. The parasites were identified using standard methods of preparation and identification. Those parasites found include two families of nematodes, two genera of copepods, and one genus of cestodes. The complete taxonomy of these parasites is listed in accordance with their hosts.

**SEDIMENTARY STRUCTURES IN A MEASURED SECTION ALONG TAFT HIGHWAY ON SIGNAL MOUNTAIN, TENNESSEE, WERE USED TO INTERPRET THE DEPOSITIONAL ENVIRONMENT OF THE PENNSYLVANIAN SEWANEE SANDSTONE, SIGNAL POINT SHALE, AND WARREN POINT SANDSTONE.** *Leah Cantrell and Richard E. Bergenback, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* A measured section of Pennsylvanian siliciclastic stratigraphic units on Signal Mountain, Tennessee, shows an architectural arrangement of sedimentary structures such as scours, trough crossbeds, in-channel bars, thin-bedded rippled sandstones, and small-scale sand lenses in shale. These reflect cyclic tectonic activity in an ancient Paleozoic Mountainous source area (now eroded), which is situated to the east of present-day Walden Ridge.

**PLAY BEHAVIOR IN PANDAS.** *Kim Hunter, Maryville College, Maryville, Tennessee.* Four red pandas at the Knoxville Zoo were observed for their play behavior with enrichments (toys) and conspecifics. A 3-year-old male and female and a 2-year-old male and female were observed. They were given various enrichments such as small boxes and red and white crates. Observations were taken of the pandas, play behavior without any enrichments and with each of the enrichments. I hypothesized that the pandas of both age groups would play with or without enrichments and would play more with added enrichments in the environment and that the two younger pandas would interact more and be more playful. I observed that the enrichments had no effect on the amount of play by the pandas but the younger pandas did play more with natural objects in the cage and with each other.

**LOCUS OF CONTROL, SELF-ESTEEM, AND CREATIVITY.** *Michael L. Hatcher, Maryville College, Maryville, Tennessee.* The relationship among locus of control, self-esteem, and creativity was examined in this study. The subjects consisted of 10 male and 22 female undergraduate students. Subjects were assessed by questionnaire for level of self-esteem and locus of control orientation. Creativity was measured by having the subjects perform a creative problem-solving sorting task. The results of the study showed a strong positive relationship between high self-esteem and high creativity and self-esteem and internality. Locus of control orientation did not affect creativity. Self-esteem was the only variable found to be a personality characteristic of creative individuals. These results as well as drawbacks to the experiment are discussed.

**STRAIN IN BUCKMINSTERFULLERENE: AN EXPERIMENT IN MOLECULAR MODELING.** *Keith Garrett, Maryville College, Maryville, Tennessee.* It has been proposed that the release of strain is the driving force behind the reactions of the recently discovered allotrope of carbon, buckminsterfullerene ( $C_{60}$ ). This molecule seems to favor such reactions, and it does not readily form compounds where strain energy is increased. In this study, strain in buckminsterfullerene is investigated with the use of the ALCHEMY III<sup>TM</sup> molecular modeling software. Three types of fullerene compounds were studied: fullerene metal complexes; fullerenoids; Main Group VIA substituted fullerenes. The ALCHEMY III<sup>TM</sup> minimization results were in close agreement with the literature values, and the software was found to be a useful tool in the analysis of relative strain energy and its role in fullerene chemistry.

**AN INVESTIGATION OF THE LEVELS OF PROTEOLYTIC ENZYME ACTIVITY IN MUCILAGE PRODUCED BY SEEDS OF *CAPSELLA BURSA-PASTORIS* (L.) MEDIC. BEFORE AND AFTER STRATIFICATION.** *Christopher Robert Landon Harris.* Prior research indicates that a protease in the seed exudate of *Capsella bursa-pastoris* is capable of digesting animal proteins. Presence of proteolytic activity in seeds of *C. bursa-pastoris* stored both wet and dry at two temperature regimes was examined. Proteolytic activity was assessed in four different treatments maintained for 7, 14, and 21 days: wet at 20°C; dry at 20°C; wet at 4°C; dry at 4°C. In all cases, seed mucilage was assayed. Proteolytic activity occurred in seeds in all four treatments in all four storage periods. At both temperatures, seeds in the dry regime showed higher levels of activity than those in the wet regime. Activity increased with the increased length of treatment. Neither temperature regime produced consistently higher levels of activity. Results show that these seeds can supplement stored food with animal protein after overwintering at low temperatures in moist soils.

**THE RELATIONSHIP OF AUTONOMY TO WELL-BEING IN WOMEN WITH MULTIPLE ROLES.** *Margaret Bell, Maryville College, Maryville, Tennessee.* This study explored the relationship of autonomy to well-being in women with multiple roles. Sixteen middle-class females from 30 to 49 years of age completed the California Psychological Inventory and a role-identification questionnaire. The number of roles held by participants ranged from one to five (paid worker, wife-partner, mother-parent, student, and volunteer). Respondents' scores on four subscales of the California Psychological Inventory were used to measure autonomy and a sense of well-being. Results suggest that women in their 40s are more likely to employ personal freedom and individual initiative (autonomy) to improve function than are women in their 30s. Also, a positive correlation occurred between number of roles and level of independence as reflected on the Independence scale of the California Psychological Inventory; however, findings regarding the relationship between autonomy and well-being in women with multiple roles were unclear.

**EFFECTS OF EXTERNAL REWARDS ON INTRINSIC MOTIVATION.** *Kathy L. Scott, Maryville College, Maryville, Tennessee.* This study examined the effects of an external reward on intrinsic motivation. Twenty-two subjects were divided into three groups of low, average, and high intrinsic motivation, based upon scores from the motivational analysis test. It was hypothesized that the introduction of an external reward (pizza) would affect the time to complete and accuracy of a nagram task. Results indicated that, when compared with the other groups, the high motivational group's performance of the task was lower, while the low motivational group's performance was enhanced with the introduction of the reward. These findings support previous research that external rewards can decrease performance for those who are highly motivated intrinsically and increase performance for those whose intrinsic motivation is inherently low.

## MIDDLE REGION

AUSTIN PEAY STATE UNIVERSITY  
CLARKSVILLE, TENNESSEE

**SYNTHESIS AND PRELIMINARY X-RAY DATA FOR 1,1-DIBROMO-2,2,3,3-TETRAMETHYLCYCLOPROPANE.** *W. Craig Brown, J. Ronald Boone, Kent Clinger, and Timothy P. Hanusa, David Lipscomb University, Nashville, Tennessee (WCB, JRB, KC), and Vanderbilt University, Nashville, Tennessee (TPH).* The molecule 1,1-dibromo-2,2,3,3-tetramethylcyclopropane was synthesized to determine its crystalline structure. The synthesis involved a well-known carbene-olefin-addition reaction in the presence of sodium tertiary butoxide. The crude product was recrystallized through trial of various solvents, and crystals suitable for determination of x-ray structure were produced. An incomplete dataset was collected due to sublimation of the crystal. The crystal was triclinic,  $P\bar{1}$ , and the lattice constants were  $a = 7.39(2)\text{\AA}$ ,  $b = 10.36(2)\text{\AA}$ ,  $c = 6.61(1)\text{\AA}$ ,  $\alpha = 105.4(2)^\circ$ ,  $\beta = 111.5(2)^\circ$ ,  $\gamma = 77.2(2)^\circ$ . Of the 403 unique reflections collected, 240 were considered observed ( $I \geq 3\sigma$ ). Application of the direct-methods technique yielded a preliminary structure which, upon least-squares refinement, led to a final  $R = 13.7\%$ .

**PRODUCT DISTRIBUTION OBTAINED FROM FRIEDEL-CRAFTS TERT-BUTYLATION OF HYDROQUINONE CATALYZED BY SILICA GEL.** *Paul R. Buckingham and Martin V. Stewart, Middle Tennessee State University, Murfreesboro, Tennessee.* Friedel-Crafts alkylation of hydroquinone with *tert*-butyl bromide affords a nearly quantitative yield of 2,5-di-*tert*-butylhydroquinone when its carbon

tetrachloride solution is stirred for 24 h at 70°C over a mixture of powdered sodium carbonate and silica gel. A series of *tert*-butyl substituted hydroquinones and 1,4-benzoquinones were prepared to serve as reference standards for the identification of the major products and minor by-products produced in this reaction using proton NMR spectroscopy. This included mono-*tert*-butyl-, 2,5-di-*tert*-butyl-, and 2,6-di-*tert*-butylhydroquinone and their corresponding 1,4-benzoquinones. Identification of these compounds in the NMR spectrum of the reaction mixture allows their production to be followed quantitatively for the purpose of acquiring kinetic data that will contribute to an understanding of the mechanistic role of silica gel in this mild and selective Friedel-Crafts reaction. The preparation and NMR spectra of this series of compounds will be discussed.

**SPECTROSCOPY OF ORGANIC RADICALS.** *Chris Landess, Mike Wallace, and Rudy Gostowski, Austin Peay State University, Clarksville, Tennessee.* Organic free radicals have been found to act as initiators or intermediates in fundamental chemical processes. These species are present in normal biological functions and are considered to be involved in various degenerative processes including aging. Attempts have been made to evaluate the thermodynamic stability and kinetic persistence of organic radicals. Some experiments have utilized electrochemical techniques to generate radicals by oxidation of the corresponding anion. However, these results have been questioned due to a lack of identification of the electrochemically-generated species and subsequent decay products. It is proposed that a spectroelectrochemical method would permit simultaneous generation, identification, and measurement of these transients. The purpose of this study was to establish the feasibility of differentiating between a radical and related molecules by means of ultraviolet-visible absorption spectrometry. Spectra have been taken of triphenyl-methane, the triphenylmethanide anion, and the triphenylmethanyl radical. The anion was produced by action of *n*-butyl lithium in tetrahydrofuran. Reaction of the chloride with silver amalgam in tetrahydrofuran yielded the radical and a precipitation of silver chloride. The location of wavelengths of peak absorbance for these species should permit their observation in a spectroelectrochemical experiment. The acids and chlorides of 9-(2-methylphenyl)fluorene and 9-phenylxanthene have been synthesized. However, preliminary studies indicate that the incipient radicals lack the kinetic persistence to permit spectroscopic study in the time-frame of the experiment. Our investigation of sterically-hindered radicals is continuing.

**RAINDROP SORTING-PHASE 1.** *Day Elam and Ron Robertson, Austin Peay State University, Clarksville, Tennessee.* Terminal velocity of raindrops is a function of size. Other properties such as pH also may be a function of size, but studies have been hampered by the difficulty in collecting size fractions of natural raindrop. A raindrop spectrometer based on terminal velocity was built. The device incorporates two rotating disks 0.5 m apart that rotate together at 150 rpm. The top disk has an opening of 20° to allow raindrops in; the bottom disk is divided into various sectors that collect the size fractions of raindrops. Preliminary results based on four different rain events indicate that the pH of raindrops around 1 mm in diameter is lower than that of larger and smaller raindrops. The collection fraction data is similar to previous work with the fraction of raindrops 0.5 mm and larger being about 0.70 for most rain events. This work has broad application to understanding the mechanism of acid rain formation as well as the design of environmental remediation techniques such as scrubbers at coal-fired industrial plants.

**MOBILE LEAD LEVELS IN SOIL.** *Brian Guyton, Scotty Blane, and Ron Robertson, Austin Peay State University, Clarksville, Tennessee.* Lead depositions in soil occur due to mining, smelting, and various

industrial operations as well as previous deposits from anti-knock auto fuels. The health hazards associated with lead are the result of direct ingestion, bioaccumulation, or movement into the water table. Our study was the conclusion of 2 years of testing soil samples in Montgomery Co. for mobile lead. Samples were taken at a depth of 10 cm from roadsides and the banks of the Red River. The mobile lead was extracted using a pH 4 acetic acid, sodium acetate buffer system and was analyzed by atomic absorption spectrometry. Soil lead levels varied widely with the highest levels at 14 ppm. Roadside studies gave a general exponential decrease with distance from the roadside. Most roadsides had <5 ppm. The Red River sites had levels from 1 to 14 ppm.

**LEAD CONCENTRATIONS OF CLARKSVILLE-MONTGOMERY COUNTY WATERWAYS.** *Richard Ribeiro, Jonathan Vinson, and Fred J. Matthews, Austin Peay State University, Clarksville, Tennessee.* Lead concentrations in the environment are of critical concern due to its negative effects on organic systems. The maximum acceptable level of lead in water, set by the Environmental Protection Agency, is 15 ppb. Analysis of selected storm drains and the adjacent downstream waterways in Clarksville, Tennessee, including the Red River in Montgomery Co., Tennessee, indicated lead levels normally ranging from 1 to 10 ppb, well below the maximum level allowed by the Environmental Protection Agency. The maximum concentration of lead observed, however, was 39 ppb, well above the maximum for lead allowed by the Environmental Protection Agency. Sampling was performed at several storm-drain sites and the adjacent downstream waterways on multiple occasions. Lead-concentration data were analyzed according to total rainfall during the sampling period, flow rates at each drain site, and distance downstream from the storm drain sampling site. Analyses were performed by atomic absorption spectrometry using the ammonium pyrrolidinedithiocarbamate chelation-methyl isobutyl ketone extraction method to concentrate the lead from the aqueous samples.

**IDENTIFYING THE POTENTIAL POPULATIONS AT RISK DUE TO GROUNDWATER CONTAMINATION IN MONTGOMERY COUNTY, TENNESSEE.** *Melody McElwee, Geoffrey Livingston, Tonya Walker, David Huffman, and James M. McCluskey, Austin Peay State University, Clarksville, Tennessee.* The potential populations at risk due to groundwater contamination in Montgomery Co., Tennessee, are modeled using the technology of geographic information systems. The analysis considers the location of major sources of groundwater contamination from high-potential landfills, high-potential oil and gas wells, low-potential oil and gas wells, high-potential underground storage tanks, and high-potential superfund sites in relation to local groundwater use, age structure of the population, income levels, and minority status of neighborhoods. Use of geographic information systems allows for the spatial analysis and inventory of the relationships in a highly flexible and visual context.

**THE PHOTOCHEMISTRY OF COPPER TRIPHENYLPHOSPHINE COMPLEXES.** *Jeff Tassin and Andrea Rieffel, The University of the South, Sewanee, Tennessee.* The photochemistry of  $\text{Cu}(\text{DMP})(\text{PPh}_3)_2^+$  was studied. Different photochemistry was observed when exciting into the MLCT band involving DMP at 400 nm than when exciting 337 nm in the presence of free  $\text{PPh}_3$ . The photochemistry of  $\text{Cu}(\text{PPh}_3)_4^+$  is similar to that of  $\text{Cu}(\text{DMP})(\text{PPh}_3)_2^+$  when excited at 337 nm in the presence of free  $\text{PPh}_3$ .  $\text{Cu}(\text{PPh}_3)_4^+$  and  $\text{PPh}_3$  do not absorb at 400 nm. Free  $\text{PPh}_3$  also is photochemically active when excited at 337 nm. Some or all the photochemistry observed in  $\text{Cu}(\text{DMP})(\text{PPh}_3)_4^+$  and  $\text{Cu}(\text{PPh}_3)_4^+$  when excited at 337 nm may be due to free  $\text{PPh}_3$ .

**A RE-INVESTIGATION OF THE OXIDATION OF 2-METHYLQUINOLINE BY SELENIUM DIOXIDE.** Mercedes H. McDaniel and Edward P. Kirven, *The University of the South, Sewanee, Tennessee.* New experimental methods have been developed which increase the yields and simplify the isolation and purification of quinoline-2-carboxaldehyde. The need for an efficient method of converting various 2-methyl nitrogen heterocycles to corresponding 2-carboxaldehydes led us to review the literature for precedents. The reported oxidation of 2-methylquinoline to quinoline-2-carboxaldehyde by  $\text{SeO}_2$  appeared to offer a means of accomplishing this. However, the reported yields were <50%, and we could not improve these yields using the published procedures in our laboratory. Isolation and purification also were difficult due to large amounts of by-products. Using dioxane that had been carefully purified to remove peroxides and running the reaction under argon substantially improved the yield of quinoline-2-carboxaldehyde. We also determined that the reaction is essentially complete in <5 min. A simplified workup procedure is described.

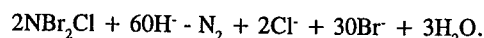
**PLASMID MULTIPLE CLONING SITE SEQUENCE VERIFICATION.** Eric Grogan, Rebecca Shattuck, Paul Matrisian, and Ann Richmond, *David Lipscomb University, Nashville, Tennessee (EG), and Vanderbilt University Medical School, Nashville, Tennessee (RS, PM, AR).* Two commercially available plasmids which had been stored at 4°C for long periods of time (pBluescript II SK+ and pBluescript SK-, Stratagene Company) were analyzed for gene competency and mutations in their multiple cloning sites. Only plasmids with functional ampicillin and lacZ genes were selected. The multiple cloning sites within the plasmids lacZ gene were sequenced by the dideoxy chain-termination method. Unanticipated results were confirmed by using restriction fragment analysis. pBluescript II SK+ had its multiple cloning site in the lacZ gene intact, but pBluescript SK- was found to have an unexpected BssHII restriction site within the lacZ gene.

**THE EFFECT OF ABSICISIC ACID ON REGENERATION EFFICIENCY IN SOYBEAN.** Haseena Rabi, S. M. Bhatti, and Prem S. Kahlon, *Tennessee State University, Nashville, Tennessee.* Interest in exploiting somatic cell techniques for improvement of soybean has resulted in increasing efforts to regenerate plants from somatic cells. Although various approaches have been used, reports of plant regeneration from soybean cultures remain limited. In recent years, investigators have reported somatic embryogenesis using high levels of hormones such as 2,4-D and NAA. Development of somatic embryos using another plant hormone, abscisic acid was examined in this experiment. The objective was to establish an efficient system for formation of somatic embryos. Two soybean cultivars, Weber and Forrest, were germinated, and leaves and cotyledons from these plants were used as sources of explants. The explants were plated on modified  $L_6$  medium containing 2 mg/l 2,4-D and varying levels of abscisic acid (0.00, 0.01, 0.05, 0.10, 0.50, and 1.00 mg/l). Average number of embryos was calculated following 3, 4, 5, and 6 weeks of culture exposure to abscisic acid. Results showed that there was a genotypic difference between the two cultivars in the numbers of embryos formed at all the concentrations of abscisic acid. The cotyledons did not show any embryogenic response from either cultivar. The leaves, however, had varying numbers of shiny, smooth embryos formed on their surface. There was an increased number of embryos with increased exposure to abscisic acid. In addition, there was an increase in embryo formation with increasing concentration of abscisic acid up to 0.1 mg/l. This was the optimum concentration for cultivars Weber and Forrest. This research was supported by USDA/CSRS grant no. TENX 9403-15-PS40.

**KINETICS OF THE DECOMPOSITION OF DIBROMOCHLORAMINE IN AQUEOUS SOLUTIONS.** Kimberly Womack and Dale Margerum, *Tennessee State University, Nashville, Tennessee (KW), and Purdue University, West Lafayette, Indiana (DM).* The formation of bromochloramines is postulated in the chlorination treatment of waste water that contains bromide ion. Little is known about dibromochloramine ( $\text{NBr}_2\text{Cl}$ ), which is a possible intermediate species. The products and kinetics of decomposition of  $\text{NBr}_2\text{Cl}$  are studied as a function of pH and buffer concentration. The experimental rate law is:

$$-\frac{d[\text{NBr}_2\text{Cl}]}{L} = (k_0 + k_{\text{OH}}[\text{OH}^-] + k_{\text{HPO}_4}[\text{HPO}_4^{2-}])[\text{NBr}_2\text{Cl}]^2$$

The values for the rate constants at 25.0°C are  $k_0 = 12.9 \pm 1.2 \text{ M}^{-1}\text{s}^{-1}$ ,  $k_{\text{OH}} = (3.38 \pm 0.42) \times 10^4 \text{ M}^{-1}\text{s}^{-1}$ ,  $k_{\text{HPO}_4} = 343 \pm 39 \text{ M}^{-1}\text{s}^{-1}$ . The following overall stoichiometry is proposed:



The average experimental ratio for  $[\text{OBr}^-]:[\text{NBr}_2\text{Cl}]$  is 1.23 or 82% of the predicted value of 1.5. It is proposed from ultraviolet-vis spectra that an unknown product consisting of the remaining nitrogen is formed.

**PROTEIN SYNTHESIS IN ULTRAVIOLET-IRRADIATED MOUSE FIBROBLAST CELLS.** E. D. Arrington, E. L. Myles, and C. Alexander-Caudle, *Tennessee State University, Nashville, Tennessee.* The role of electromagnetic field on the induction of human carcinomas is not clearly understood. There are many epidemiological studies that have found electromagnetic fields to be positively correlated with cancer. Experimental investigations using animal models or mammalian cultures have not conclusively linked the effects of electromagnetic fields (powerlines) and cancer. This study used ultraviolet radiation to determine its effect on protein synthesis in mouse fibroblast cultures. The result from this study will be compared with proteins synthesized during exposure to other forms of electromagnetic radiation such as magnetic fields (powerlines). This type of comparison will aid in discerning the possible mutagenic effects of electromagnetic fields. Mouse 3T3 fibroblast cells were seeded in 75-cm<sup>2</sup> flasks at equal densities. The cells were allowed to grow to confluency and then irradiated at 0, 15, and 30 s in the dark with UVC. Two-dimensional polyacrylamide-gel electrophoresis was performed with each sample, and a comparison analysis was completed using a computer-aided densitometer. There were seven proteins identified that were synthesized in the cells exposed for 15 and 30 s. These seven proteins synthesized were not observed in the control group. The seven proteins ranged from a molecular weight of 94,000 to 14,000-Kilodalton. The experimental group also synthesized a cluster of high molecular weight (160 to 200 Kilodalton) proteins that were not synthesized in the control group. These proteins will be compared with proteins synthesized in a magnetic field.

**THE EFFECT OF TEMPERATURE ON DIFFERENT SPECIES OF SALMONELLA.** Christy Fitzgerald, Zondra Peters, Carolyn A. Caudle, Yvonne Myles, and E. L. Myles, *Tennessee State University, Nashville, Tennessee.* *Salmonella* is an invasive microorganism that can cause food-borne illness. When infected with salmonellosis, a patient may suffer unrelenting diarrhea along with headaches, chills, fever, and vomiting. Sources of *Salmonella* include poultry, livestock, and animal products. *Salmonella* can survive in soil, water, and food and on surfaces and hands. In an effort to control the growth of *Salmonella*, our study examined the effect of temperature on the bacteria. Three species of *Salmonella* (*S. enteritidis*, *S. pullorum*, and *S. typhimurium*) were

exposed to 72°C for time periods ranging from 0 to 120 min. For all three species, the growth curve from the temperature exposure was inconsistent. We were able to reduce the growth and eradicate the bacteria at some time intervals but not with consistent results. A possible explanation for this is that exposure of the bacteria to heat may induce synthesis of protective proteins, possibly heat shock, which also may contribute to the survival of the organism. To investigate this possibility, protein fractions were prepared and examined by sodium dodecyl sulfate polyacrylamide gel electrophoresis. Proteins in the 18,500- and 30,000-rpm fractions of the cells demonstrated that there were differences in protein patterns between the two fractions. Results from this study indicate that the three species of *Salmonella* are able to activate some type of protein(s) when the organisms are placed in stressful conditions. We believe that stress protein(s) (possibly heat-shock) are being synthesized during prolonged exposure to heat, and these proteins may contribute the organism's virulence. Future investigations are needed to identify the protein(s) that has been observed.

**THE EFFECTS OF METHIONINE SULFOXIMINE ON WHOLE PLANTS.** *Tomika Walker, E. L. Myles, and C. Caudle, Tennessee State University, Nashville, Tennessee.* As the human population of the world increases and uses more land area for housing and industrial activities, agriculture is being forced into marginally productive areas. Drought, nutrient deficiencies and toxicity, salinity, temperature extremes, air pollution, and chemical interference are stresses often met. The present study involved disease resistance in soybean. Soybean plants were treated with 0, 4, 8, and 12  $\mu\text{M}$  of methionine sulfoximine for 2 weeks to determine the physiological effects of a bacterial infection (*Pseudomonas syringe*) on intact plants. After the exposure period, the total protein was extracted and analyzed by one-dimensional polyacrylamide-gel electrophoresis. The results showed no significant difference in protein synthesis or in growth rate. Future experiments will be conducted by applying methionine sulfoximine to the leaves.

**OBTAINING A HOMOGENEOUS DNA-SEQUENCING TEMPLATE BY SUBCLONING POLYMERASE-CHAIN-REACTION PRODUCTS IN *ESCHERICHIA COLI*.** *Amy M. Thompson and Henrietta B. Croom, The University of the South, Sewanee, Tennessee.* The purpose of this research is to develop a working protocol for the amplification of a portion of the mitochondrial gene which codes for the 16S rRNA of the large ribosomal subunit. Amplification of this gene from an individual *Tetragnatha pallescens* (Araneae, Tetragnathidae) from Oxford, Mississippi, was accomplished using a protocol for the subcloning of polymerase-chain-reaction products in *Escherichia coli*. The clarity of sequencing gel bands demonstrates the purity of the final amplification product. Based on the sequence for *T. pallescens*, we propose a structure for a portion of the 16S rRNA of the large ribosomal subunit. These results indicate that this protocol is ideal for amplifying portions of a genome that yield multiple polymerase-chain-reaction products. The resulting pure products can be used for sequencing, restriction analysis, expression, and site-specific mutagenesis.

**GENDER DIFFERENCES IN THE EXPRESSION OF TYPE-A CHARACTERISTICS WITH RESPECT TO STRATEGY BEHAVIOR.** *Jennifer M. Nicholas and R. L. Troelstrup, Tennessee Technological University, Cookeville, Tennessee.* Forty-eight undergraduate students (24 females, 24 males) were asked to complete two word-search puzzles, while EDR emotionality responses were recorded in order to test for type-A characteristics. The first puzzle consisted of eight words which involved a single search strategy and had no time limit. The second puzzle contained 16 words which required multiple strategies for solving and had a time restraint of double the time it took to find the words in the first puzzle or 10 min, whichever occurred first. Females

with fewer type-A characteristics displayed greater flexibility in finding words during the first section of the second puzzle, as predicted. However, the higher the type-A tendencies for males, the greater the ability for strategy shifts was on the first section of the second puzzle, contrary to prediction. While high type-A females had more difficulty with strategy shifts, they eventually found more words. In contrast, high type-A males made appropriate strategy shifts but found fewer words. There appeared to be no gender effect with emotionality when under a time restraint or not. The higher third of the type-A males displayed more emotionality than did the lower type-A males, but there was no difference among females. The higher type-A males seemed to be more emotional throughout the word-search puzzle, while females became less emotional as the puzzle continued. This possibly indicates that females display a different pattern of emotionality with time pressure than males. The female subjects reported more type-A characteristics than the male subjects over most type-A categories in a 20-item measure of type-A personality. Strategy-shift patterns were significantly correlated with the time-pressure component of the type-A scale. Type-A behaviors may be as prevalent in female as in male college students. With a different pattern in females, implying that adjustment strategies may differ between genders.

**JUDGEMENTS OF MANIPULATED SCHEMATIC FACES ON A NICE-MEAN DIMENSION BY FOUR DIFFERENT AGE GROUPS.** *Sharon Pryor, Anne Armstrong, James Wilber, and R. L. Troelstrup, Tennessee Technological University, Cookeville, Tennessee.* Judgements based upon real human faces result in an inability to determine the relevant features that affect ratings because of the complexity in specifying the features that can affect this appraisal. To simplify the face, single line drawings can be created to limit the number of variables. Most prior research has focused on reactions of college students to these schematic faces. In the present study, three facial factors were varied: head shape; length of forehead; distance between upper lip and nose. With three levels for each variable, 27 possible facial combinations were generated. Four age groups (elementary, junior high, college age, and senior citizens) were asked to rate the 27 schematic faces on an eight-point scale of niceness (low) to meanness (high), with each group balanced for gender. Statistically consistent findings across the age groups included: long faces, those with short distances between the nose and mouth were judged to be significantly meaner ( $P < 0.001$ ) than the other levels; average faces, those with intermediate values, were considered to be the nicest; long faces with short foreheads and close distance between the eyes were generally considered the meanest. The older two age groups rated long faces and long foreheads as meaner than did the two younger age groups; a similar pattern also was noted for close positioning of nose and mouth. As hypothesized, those faces exhibiting baby-like characteristics were judged less mean by younger groups than the older groups. The significant ( $P < 0.001$ ) interaction between the three manipulated variables indicated that very small physical manipulations of the faces resulted in substantial changes in judgements.

**HOW FEMALES RATE MALE ATTRACTIVENESS.** *Stacy Smith, Brian Brady, and Richard Troelstrup, Tennessee Technological University, Cookeville, Tennessee.* A male's body type seems to be important when judging attraction. Most individuals prefer one particular body type over another. This study was designed to see if any male body type dominates in female preference, when body types are presented by degree and buttock type viewed in pictures of front and back views. Sixteen female college students rated 36 pictures (half front view and half back view) of males for attractiveness. Subjects then completed an ideal-man questionnaire and rated male characteristics on a six-point scale. An one-between-and-three-within design was used. Order,

although not used, was the between variable, and body type, buttocks, and degree were the within variables. The hypothesis that ratings for backs versus fronts differed was supported. Also supported was the influence of buttocks on attractiveness and the preference of mesomorphic (hard and rectangular) body types over endomorphic (soft and spherical) and ectomorphic (linear and fragile) body types. The hypothesis that buttocks would be a more powerful predictor of attractiveness from the back was contradicted by a stronger interaction between fronts and buttocks. Significance was found for all interactions (both front and back analysis) and variables, except for the buttocks when analyzed from the back. The degree effect served to strengthen the significance of the preference for the mesomorphic body type. Preferences for attractiveness were found.

**THE INFLUENCE OF ELECTROMAGNETIC FIELDS ON PROTEIN SYNTHESIS IN MOUSE FIBROBLAST CELLS.** *Angela Watson, E. L. Myles, and Carolyn Caudle, Tennessee State University, Nashville, Tennessee.* Electric power occurs in all industrial societies. Many scientists feel that magnetic fields produced from electrical power (power lines) can cause cancer. In an attempt to determine the relationship that exists between magnetic fields and power lines, we performed experiments with mammalian cells growing in culture. The exposure of mouse fibroblast 3T3 cells was at a frequency of 60 Hz and a field strength of 9 gauss. Cultures of mammalian cells were in Dulbecco's modified Eagle medium and allowed to grow until they reached confluence. Exposures of the 3T3 cells to the magnetic fields were with a Helmholtz coil. The exposure length was 2 h. The proteins were extracted from cells by using a phenol extraction technique. Sodium dodecyl sulfate polyacrylamide gels were prepared and subjected to electric current in Hoeffer's mighty small gel unit. After separation of the proteins, they were analyzed using a Biorad densitometer. The results showed that exposure to the magnetic fields caused no detectable cell death or the synthesis of new proteins.

**GROWTH-RATE ANALYSIS OF CULTURED HELA CELLS.** *Tomar Johnson, E. L. Myles, and C. Caudle, Tennessee State University, Nashville, Tennessee.* This preliminary study was conducted to determine the optimum growth rate and viability of a human cervical carcinoma cell line known as HeLa Cells. To determine the effect of non-ionizing radiation on cultured cells, knowledge of the optimum conditions for cell growth and viability is necessary so that experimental error remains low. Viability and growth rate should be at its maximum. The HeLa cells were cultured in RPMI 1640 media. This medium contains L-glutamate, sodium bicarbonate, and fetal bovine serum. Optimum growth conditions are 37°C and 96% air relative humidity with an atmosphere of 93% and 7% carbon dioxide only conducted in a regulated incubator. The doubling time for the HeLa cells was 24 h. After the initial 24-h period, there was no significant increase in the cell population. The second 24-h period or 48 h after the initial seeding, the cell population increased and doubled. Proteins were extracted from the cells and analyzed to determine uniformity. DNA was quantitated initially and after the cells had grown to confluency to determine viability. There was no observable difference in the proteins synthesized. DNA quantitation was inconsistent due mainly to experimental error.

**OCCURRENCES OF CORAL BLEACHING AND BLACK BAND DISEASE ON THE CORAL REEFS OF SOUTH CAICOS, BRITISH WEST INDIES.** *Scott O. Guthrie, Harris O. Yates, and Edmund Green, David Lipscomb University, Nashville, Tennessee (SOG,HOY), The School for Field Studies Center for Marine Resource Studies, South Caicos, British West Indies (EG).* The coral reefs of South Caicos, British West Indies, were examined for the occurrence of coral

bleaching and black band disease. Twelve sites were selected, and sampling involved the use of randomly selected transects. Reefs in three different depths were examined: shallow, 2-4 m; mid, 12-19 m; deep, 24-26 m. Coral bleaching was observed at every site. However, black band disease was not observed on any corals within the randomly selected surveyed areas. Data suggest that with increased sedimentation a greater percentage of each coral colony is bleached. Coral also is more likely to be affected by bleaching at deeper depths than at the shallow or mid depths. Because coral bleaching and black band disease severely weaken and damage the coral-reef ecosystem by disrupting the delicate mechanisms that the coral uses to construct the reef, continued studies of this area will be necessary. This research has provided a framework for future monitoring and study of reefs.

**DEFICIENCY OF GLUCOSE-6-PHOSPHATE DEHYDROGENASE IN MOSLEM IRAQI KURDISH REFUGEES.** *Anita Cato, Maria del Pilar Aquinaga, and Chris Wright, Tennessee State University, Nashville, Tennessee (AC), and McHarry Medical College, Nashville, Tennessee (MPA,CW).* Glucose-6-phosphate dehydrogenase deficiency (G-6-PD) is an X-linked recessive inherited disorder that may cause abnormalities within the hemoglobin chain and cause hemoglobin to precipitate out of erythrocytes into small circular bodies known as Heinz bodies. Heinz bodies are formed when a sulfhydryl group at position 93 on the beta chain becomes oxidized. This oxidized sulfhydryl group becomes a disulfide bond, which causes a conformational change within the quaternary structure of hemoglobin, to form Heinz bodies. The present geographical niches, the mountainous areas of Iraq, Turkey, and Iran, have identified a high incidence of Heinz bodies in 82 refugees (54%). Of the 15 people tested for G-6-PD deficiency, 75% were G-6-PD deficient, and 25% were borderline. Those that did not have Heinz bodies were not G-6-PD deficient. However, one patient was borderline. Other hematological tests showed no unstable hemoglobin, when conducting an unstable hemoglobin assay; using reverse HPLC, there was no silent hemoglobin variant or iron deficiency in individuals with Heinz bodies. Once the refugees were identified G-6-PD deficient, it was critical to establish the variant of the deficiency these people possessed. G-6-PD Mediterranean was the possible variant. The molecular basis of G-6-PD Mediterranean is a point mutation-T transition at nucleotide position 563 causing a serine-to-phenylalanine replacement at amino-acid position 188. Most G-6-PD Mediterranean subjects also have a silent C-T transition without amino-acid replacement at nucleotide position 1311.

**ROLE OF POLYPYRIMIDINE-TRACT BINDING PROTEIN IN REGULATION OF ALTERNATIVE SPLICING IN THE RAT BETA-TROPOMYOSIN GENE.** *Nadine N. Bewry, Margaret Blackshear, and David Helfman, Tennessee State University, Nashville, Tennessee (NNB,MB), and Cold Spring Harbor Laboratory, Cold Spring Harbor, New York.* The cytoskeletal protein, tropomyosin, has multiple isoforms. The rat beta-tropomyosin gene can produce two mRNAs: skeletal muscle beta-tropomyosin; fibroblast tropomyosin through an alternative splicing pathway. Studies focused on the area of the gene located between exons 5 and 8 to better understand the regulation of exon-7 (skeletal muscle exon) splicing. Studies have shown that there are two regulatory elements within intron 6. The first element is a polypyrimidine tract; the second element is called the intron regulatory element. Previous studies have shown that the polypyrimidine-tract binding protein binds to these regulatory elements and, therefore, may play a role in regulating the alternative splicing pathway. We determined the role of this binding protein by using monoclonal antibodies that may inhibit its function. Results indicate that the binding protein enhances the splicing of exon 7 because antibodies were able to inhibit specifically this splice.

**BROWN RECLUSE LABORATORY MAINTENANCE.** *Lorrie L. Henson and Larry N. Latson, David Lipscomb University, Nashville, Tennessee.* Safety handling procedures were developed for maintenance of brown recluse (*Loxosceles reclusa* Gertsch and Mulaik) in the laboratory. Twenty specimens were collected from September 1993 through March 1994 in one house (222 m<sup>2</sup>) in rural Clay Co., Tennessee. One additional specimen was collected in a nearby building; the other specimen was collected in a residence in Davidson Co. Longevity of captured specimens ranged from 1 to 129 days. Only one of three spiders that molted during the 186-day period survived molting. Weights of specimens ranged from 0.8 to 63.2 mg. A transfer cage was designed using a modified petri dish with attachment bars to hold a laboratory vial for safe transfer of specimens into viewing chambers. A food source of fruit flies was safely injected into maintenance chambers using disposable pipettes. Data and bitmapped graphics of scanned photographs of specimens were imported into ToolBook 1.53 and W.P. Presentation 2.0 for development of biological software.

**ASSESSMENT OF THE BIOLOGICAL INTEGRITY OF TWO SECOND-ORDER STREAMS USING MACROINVERTEBRATE COMMUNITIES.** *Randall Barnes and Steven W. Hamilton, Austin Peay State University, Clarksville, Tennessee.* Severe erosion during the construction of a golf course near Pickwick Dam, Hardin Co., Tennessee, exposed two second-order streams to intense sedimentation. In order to formulate a rehabilitation plan, the biological integrity of each impacted site was assessed by qualitative, multiple, habitat sampling and compared with the assessed biotic integrity of two unimpacted reference streams. Macroinvertebrates were selected in rough proportion to their abundances in samples and assigned to abundance categories to calculate taxa richness, biotic index, EPT to Chironomid ratio, and functional-feeding-group analysis. Low taxa richness revealed fewer species in the impacted streams compared with the moderately high number of species taken from the reference streams. EPT to Chironomid ratios showed that the impacted streams were dominated by generally pollution-tolerant chironomids, while reference stream communities were composed mainly of generally pollution-intolerant Ephemeroptera, Plecoptera, and Trichoptera. High biotic-index ratings of the impacted sites further demonstrate the presence of a pollution-tolerant community. A functional-feeding-group analysis revealed a sediment-tolerant community dominated by collector-gatherers and shredders. In contrast, the reference streams had a nearly balanced representation of collector-gatherers, collector-filterers, shredders, and scrapers. This biological assessment of aquatic, macroinvertebrate communities demonstrates the degradation of the biological condition of the impacted streams that can be attributed to heavy sediment loading.

**AMBULANCE SIREN DETECTOR SENIOR PROJECT.** *Tammy Edwards, Austin Peay State University, Clarksville, Tennessee.* This project involved the research and development of an ambulance siren detector. The purpose of the detector is to respond to frequencies between 700 and 2,000 Hertz, which includes ambulance sirens, thus, alerting drivers of an acoustically-quiet, moving vehicle. Upon detection of a siren, light-emitting diodes will be activated. Additional light-emitting diodes will be activated as the distance between the siren and detector is reduced. Components or sections of the detector include two microphones, a filter, an amplifier, an analog-to-digital convertor, eight light-emitting diodes and a light-emitting diode driver. The purpose, design, and implementation of each section and the utility of the ambulance siren detector will be discussed.

## WESTERN REGION UNION UNIVERSITY JACKSON, TENNESSEE

**NADPH-DIAPHORASE IS INCREASED IN THE CILIARY GANGLION OF AGED PIGEONS.** *Bryan S. Jackson, M. E. C. Fitzgerald, and A. Reiner, Christian Brothers University, Memphis, Tennessee.* Changes in the baseline choroidal blood flow or its adaptive neural regulation may contribute to photoreceptor loss, causing age-related macular degeneration. In birds, one neural circuit involved in the adaptive regulation of choroidal blood flow is the suprachiasmatic nucleus-Edinger Westphal circuit. This neural pathway consists of retinal ganglion cells, the suprachiasmatic nucleus, the medial subdivision of Edinger Westphal, and the ciliary ganglion, which projects to the blood vessels of the choroid. Immunocytochemical staining for choline acetyl transferase, nitric oxide synthase, and leucine enkephalin was done in addition to NADPH-diaphorase histochemistry to determine if the amounts of these neuroactive substances in neurons of the ciliary ganglion or their inputs were altered with age in a way that might affect choroidal blood flow. All neurons in the ciliary ganglion produce a neurotransmitter called acetyl choline and contain choline acetyl transferase, an enzyme used to produce acetyl choline. Staining for choline acetyl transferase showed that the populations of neurons in the ganglion did not change with age. Neurons of the ciliary ganglion also produce nitric oxide for use as a neurotransmitter, NADPH-diaphorase histochemistry stains darkly cells that produce high amounts of nitric oxide and lightly cells that produce low amounts of nitric oxide. The number of dark-staining neurons within the ciliary ganglion increased from 25-30% in the young birds to 45-50% in the older birds. This technique also stained more cells than staining for choline acetyl transferase. Staining for nitric oxide synthase, an enzyme used to produce nitric oxide, was compared with the diaphorase staining to make sure that the diaphorase was marking cells producing nitric oxide. Both techniques labeled the same cells, at the same intensity. Leucine enkephalin is a neurotransmitter present in the preganglionic inputs of the neurons of the ciliary ganglions, and can be used to differentiate between choroidal and ciliary neurons. When compared with the NADPH-diaphorase stained sections, the increase in abundance of darkly staining cells was due to the dark staining of many choroidal neurons (which stain lightly in young birds.) The increase in diaphorase staining suggests an upregulation in production of nitric oxide in neurons innervating the choroid in the aged animals. Nitric oxide is a vasodilator and, therefore, increases choroidal blood flow, but older animals show decreases in choroidal blood flow. The upregulation of nitric oxide could be due to an age-related decrease in the responsiveness of the choroidal vessels to nitric oxide. This research was supported by grants NIH-EY-05298 to A. Reiner and NIH-AG-10538 to M. E. C. Fitzgerald.

**ALBUMIN-LIKE IMMUNOREACTIVITY IS INCREASED IN BOTH THE CHOROID AND RETINA OF AGED PIGEONS.** *Amy L. Price, N. Greenberg, M. E. C. Fitzgerald, and A. Reiner, University of Tennessee, Knoxville, Tennessee (ALP, NG), and University of Tennessee, Memphis, Tennessee (MECF, AR).* We sought to determine if vascular permeability was increased in aged animals using albumin as a marker for the leakiness of the choroidal blood vessels to serum proteins. White Carneaux pigeons (*Columbia livia*) were divided into two groups: young, 6 months-2 years; old, 17-20 years. In both groups, albumin immunolabeling was observed within the choroid extravascular space. The intensity of label was 10% more in the older animals as revealed by image analysis. Although we did not observe any extracellular staining within the retina, unexpected cytoplasmic labeling was observed in the retina of both groups. In the young birds, labeling was

observed in the inner segments of the photoreceptors, the neuropil of the inner plexiform layer and ganglion cell bodies throughout the retina. Also observed in the young birds was sparse cell-body labeling in the inner nucleus layer along its edge with the inner plexiform layer in the temporal and extreme peripheral nasal retina. The same retinal cell types were labeled, but more intensely, in the aged animals. The retinal cells of the inner nucleus layer were more abundant in the aged birds, forming a continuous row along the edge of the inner plexiform layer in the temporal and nasal retina. Increased albumin immunoreactivity within the extracellular compartment of the choroid suggests an increase in vascular derived albumin in the aged animals. This increase in the choroid might alter the osmotic gradient and might affect the transport of molecules to and from the retina. Albumin was not observed to penetrate the blood retinal barrier with this method. Increases in retinal cytoplasmic immunoreactivity were observed in the aged animals and may reflect an increased need for thyroxin which is transported by albumin. Albumin accumulation may represent a compensatory mechanism for age related metabolic decline in the retina. This research was supported by grants NIH-EY-05298 to A. Reiner and HIG-AG-10538 to M. E. C. Fitzgerald.

**RESISTANCE OF STRIATAL NEURONS CONTAINING CALCIUM-BINDING PROTEINS TO NMDA-RECEPTORS MEDIATED EXCITOTOXICITY: IMPLICATIONS FOR THE BASIS OF SELECTIVITY OF NEURONAL LOSS IN HUNTINGTON'S DISEASE.** *Jennifer Rita Mankowski, Christian Brothers University, Memphis, Tennessee.* Huntington's disease is characterized by the loss of striatal projection neurons and the relative sparing of striatal interneurons. Neurons containing different neuropeptides display different extents of vulnerability, possibly due to the cell's death to buffer the influx of calcium that results from excitotoxicity at the N-methyl-D-aspartate receptor. To explore this idea, the vulnerability of striatal neurons containing the calcium-binding proteins calbindin and parvalbumin to an N-methyl-D-aspartate excitotoxin were studied. Analysis of nine male rats that had been injected with quinolinic acid, an N-methyl-D-aspartate receptor excitotoxin, indicated that neither those neurons containing calbindin nor those containing parvalbumin showed significant decreased vulnerability to quinolinic acid compared to other striatal cell types. Therefore, it is possible that the hypothesized calcium-buffering proteins may not help neurons survive in Huntington's disease.

**PRODUCING ANTIBODIES AGAINST TRANSFORMING GROWTH FACTOR-BETA RECEPTOR 1.** *Rachna Gulati and R. Raghov, Christian Brothers University, Memphis, Tennessee.* Transforming growth factor-beta (TGF-B) is an extremely pleiotropic cytokine capable of eliciting a wide variety of biochemical and biological responses when it binds to the TGF-B receptor on the target tissue. However, at the present, there is no well-defined reagent by which the TGF-B receptor can be studied so as to observe these biological effects once the ligand TGF-B binds to this receptor. Therefore, the aim of this research project was to produce polyclonal antibodies of high affinity to human transforming growth factor-beta receptor 1, so that they could specifically react with the TGF-B receptor 1 in the same manner as the ligand, TGF-B. Next, these specific antibodies were utilized to investigate the expression of TGF-B type 1 receptor in mammalian fibroblast, because the biological effects of TGF-B can be achieved with the addition of concentrations of antibodies corresponding to the known binding constants for the TGF-B type 1 receptors. Thus, the availability of these specific antibodies can essentially be used to further research the effects of antibody binding to the TGF-B receptor 1 (as the ligand, TGF-B, itself) on the cell membrane of various cells to detect the different inhibitions or generations of any biochemical or biological responses.

**ISOLATION AND CHARACTERIZATION OF GROWTH FACTOR-LIKE PHOSPHOLIPID MEDIATORS IN BLOOD SERUM.** *J. T. Travis and G. J. Tigy, Christian Brothers University, Memphis, Tennessee.* Biologically active phospholipids, such as lysophosphatidic acid (LPA), are found in blood serum and are responsible for a number of biological responses. Isolation of LPA-like phospholipids from blood and its constituents, in a purified form, has presented a problem using past methods. For example, two-dimensional, thin-layer chromatography separates the active components, and subsequent bioassay reveal the active components and offer a direct way to quantify and purify the eluates for further investigation. Recently, LPA-like phospholipids from certain blood components were shown to elicit oscillatory currents in *Xenopus* oocytes. LPA-like phospholipids also have been shown to cause neurite retraction in PC-12 pheochromocytoma cells. Both of these bioassays demonstrated activity from LPA-like phospholipids found predominantly in serum produced after blood coagulation and not present in fresh blood and plasma. In this study, blood components were isolated using centrifugation and allowed to clot, and lipids were extracted using a methanol-chloroform technique. Phospholipid samples derived from different components of blood were fractionated further by silica-gel, high-performance, liquid chromatography (HPLC) using an ultraviolet detector. Purified fractions of each sample were collected, and bioassays indicated the presence of LPA-like activity in clots and a high degree in serum, both eluting between 23 and 26 min. Only traces of LPA-like phospholipids were detected in whole blood, plasma, and EDTA-treated plasma. No activity was observed in cells. Due to ultraviolet absorbance of the solvent, certain components with low molar-absorbance coefficients were masked using ultraviolet detection. To overcome this problem in detecting lipids, we applied HPLC using an evaporative, light-scattering detector for monitoring of lipids in the active fractions identified previously by the oocyte bioassay. The results provided further data indicating presence of multiple components not yet observed in previous studies. HPLC coupled with an evaporative, light-scattering detector provides an effective method of detection (and is the preferred method) in the separation of biologically active phospholipid mediators generated in the cell during blood coagulation.

**CHARACTERIZATION OF RAT LIVER NITROUS-OXIDE SYNTHESIS AFTER ENDOTOXEMIA.** *Christy Hardin, Christian Brothers University, Memphis, Tennessee.* Characterization of synthesis of nitrous oxide in livers of rats after endotoxemia is described. The endotoxin-induced form of the enzyme was expected to be different than the constitutive form. The reaction used in this experiment was the conversion of L-arginine to L-citrulline and nitrous oxide by the enzyme nitrous oxide synthase. The endotoxin, lipopolysaccharide, was injected peritoneally into the experimental group, and normal saline was injected into the controls. The livers then were perfused, and the assay was performed. The assay used was the modified resin method for the rapid analysis of the co-product citrulline by Dr. Ellen Kang. This was performed in the presence of NADPH, which served as the electron donor, and tetrahydrobiopterin, which is a necessary cofactor. The endotoxemic livers showed twice the activity as the normal livers. Various modulators were introduced into the assay to see their effects including magnesium, calcium, three antimetabolites, EDTA, and EGTA, and removal of NADPH and tetrahydrobiopterin. This revealed that the inducible and the constitutive forms of the enzyme are present and the two-fold increase in the livers treated with the endotoxin is due to the inducible form.

**THE EFFECT OF INSULIN ON THE SUBSEQUENT RESPONSE OF CULTURED ADIPOCYTES TO CATECHOLAMINES AS A FUNCTION OF TIME.** *Christopher Michael Dress, Christian Brothers University, Memphis, Tennessee.* Adipose cells (adipocytes) treated



with insulin on a chronic basis subsequently respond excessively to catecholamine hormones like isoproterenol, resulting in increased lipolysis that releases glycerol and free fatty acids. Glycerol is the product used to measure the rate of lipolysis since free fatty acids can be reutilized within the adipocytes to form triglycerides. Inasmuch as these findings were observed after the adipocytes were exposed to insulin for 16 to 18 h, determination of the earliest time when this change is expressed was deemed important. Furthermore, extension of the period of exposure to 48 h also was considered to be important. Therefore, lipolysis experiments were designed, performed, and coupled with the standard glycerol assays to determine the lipolytic response of this phenomenon during a period of 48 h. This entailed providing a rate curve displaying the amount of glycerol released by the isolated adipocytes taken from epididymal fat pads of adult, male Sprague-Dawley rat over this period, since the current data has only been determined over a 16-h interval. It was determined that a measurable, significant lipolytic response of the cultured rat adipocytes to the catecholamine isoproterenol following prior reaction with insulin occurred in as little as 4 h of incubation time. This finding is neither surprising nor unexpected, since the only previous time-frame measurements of this response were performed at 16 h of incubation of the adipocytes with insulin. However, these new time-frame measurements do serve to provide a much better approximation of the actual occurrence of the lipolytic response.

**TUMOR NECROSIS FACTOR-BINDING PROTEIN SUPPRESSES SLOW-WAVE SLEEP IN RABBITS.** Dawn D. Tooley, Christian Brothers University, Memphis, Tennessee. Cytokines such as tumor necrosis factor have characteristic somnogenic properties. The purpose of the present study was to determine whether or not the administration of tumor necrosis factor-binding proteins would affect spontaneous sleep. Theoretically, these binding proteins should bind tumor necrosis factor in the bodily fluids, away from the cell membrane, thus, reducing the factor's biologic effect. Since tumor necrosis factor previously has been shown to increase non-rapid-eye-movement sleep, the administration of tumor necrosis factor-binding protein was expected to decrease non-rapid-eye-movement sleep. Three doses of tumor necrosis factor-binding protein were administered to rabbits. Non-rapid-eye-movement sleep was significantly suppressed after both the highest and lowest doses but not after the intermediate doses. Furthermore, neither rapid-eye-movement sleep nor brain temperature were significantly affected after any of the three doses; however, there was a tendency towards increased rapid-eye-movement sleep after the intermediate dose. These results support the hypothesis that endogenous tumor necrosis factor is involved in the maintenance of normal, baseline sleep-wake activity.

**IN VITRO EFFECT OF TUMOR NECROSIS FACTOR-BETA ON THE REPRODUCTIVE CAPACITY OF HIV-1 IN THE PROMONOCYTIC CELL LINE U937.** Jack A. Griffith, Christian Brothers University, Memphis, Tennessee. Tumor necrosis factor beta, also known as lymphotoxin, was demonstrated to upregulate expression of human immunodeficiency virus type 1 (HIV-1) in infected promonocytic U937 cells. Concentrations of tumor necrosis factor beta as low as 12.5 ng/ml and as high as 100 ng/ml induced increases in expression of HIV-1 as determined by p24 antigen (an indicator of HIV-1 infection) concentration. In addition, cell samples infected with virus diluted 1:1,000 were shown to provide the most optimal conditions for the action of tumor necrosis factor beta while all others were considered repeatably reactive for HIV-1 p24 antigen. These observations not only provide evidence that tumor necrosis factor beta may play a crucial role in the pathogenesis of HIV-1 infection but also suggest a possible target for therapeutic intervention.

**INTERACTION OF FIBRONECTIN WITH FUSOBACTERIUM NUCLEATUM AND EPITHELIAL CELLS.** Hitesh Jeevan and J. P. BaBu, Christian Brothers University, Memphis, Tennessee. Fibronectin facilitates adhesion of *Fusobacterium nucleatum* to freshly cultured, gingival epithelial cells. Fibronectin also was shown to bind to epithelial cells and to *F. nucleatum*. Two strains of *F. nucleatum* (ATCC 0953 and a clinical isolate) were employed in these studies. Fibronectin was found to bind to both strains of *F. nucleatum* and to the cultured epithelial cells, in a dose-dependent manner. The binding was found to be saturable and reversible and showed that the bacteria possess a limited number of fibronectin-binding sites. Analysis of the binding data suggests a single binding site. Further analysis showed that fibronectin binding to bacteria is mediated by a proteinaceous 34-kDa adhesion molecule. Antibodies prepared against the 34kDa adhesion molecule blocked the binding of fibronectin to *F. nucleatum*. These results suggest that fibronectin promotes colonization of *F. nucleatum* in the oral cavity by its ability to interact with bacteria and epithelial cells.

**BINDING CHARACTERISTICS OF HYDROPHOBIC-VS-HYDROPHILIC CANDIDA ALBICAN YEAST CELLS TO LAMININ (ECM) DURING PATHOGENESIS.** Willie Ozier, P. Glee, and K. Hazen, Lane College, Jackson, Tennessee (WO), and University of Virginia, Charlottesville, Virginia (PG, KH). Immunoblot and immunofluorescence analysis of hydrophobic and hydrophilic yeast cell-surface proteins of *Candida albicans* were performed. Hydrophobic and hydrophilic yeast cells were obtained by growth at 23 and 37°C, respectfully. Western blots revealed hydrophilic cell-surface proteins had four distinct proteins that interacted with the laminin while hydrophobic cells had at least eight surface proteins that interacted with laminin. These results suggest that hydrophobic subtypes of *C. albicans* are better equipped to bind to animal host tissues, as compared with hydrophilic cells. This was confirmed by assessing the avidity of yeast cells to laminin through immunofluorescent assays. Laminin-exposed cells were treated in an indirect immunoblot system with the secondary antibody being FITC-labeled. Cells then were observed with a microscope to compare avidity for laminin. In the FITC system, hydrophobic yeast cells illuminated at approximately 70% while hydrophilic cells illuminate at <5%. These results corroborate earlier western-blot experiments where cell-surface proteins were subjected to sodium dodecyl sulfate polyacrylamide gel electrophoresis. Taken together, the data indicate that both hydrophobic and hydrophilic yeast cells have the ability to bind to laminin; however, the avidity of the cells to laminin are greatly increased when cells are in a hydrophobic state. This further suggests that in in-vivo conditions, hydrophobic cells are more virulent to the host during pathogenesis. This research was supported by NIGMS.

**AN UNKNOWN BACTERIUM THRIVES IN HIGH CONCENTRATION OF XYLENE AND HEXANE.** Jay Patel, E. Stevens, Jr., Harris, and Berk, Christian Brothers University, Memphis, Tennessee. Hexane and xylene, like many organic solvents, are highly biotoxic and kill most microorganisms at low concentrations (0.1% v/v). They are often used, therefore, to sterilize microbial cultures and lyse bacterial cells in the assay of bacterial enzymes. The physiological basis of such solvent toxicity, however, remains poorly characterized. Although some microorganisms, including *Pseudomonas*, *Achromobacter*, and *Nocardia*, can assimilate hexane and xylene, their tolerance for the solvent is <0.3% (v/v). We report the discovery of a variant strain of *Pseudomonas putida* which is capable of growing in media culture containing >50% (v/v) hexane and xylene or high concentrations of cyclohexane, xylene, styrene, and heptanol. By studying this unusually tolerant strain, we illustrate that the relative toxicities of different solvents are determined by their polarities.

**ISOLATION AND CHARACTERIZATION OF PEROXIDASE IN *SELENASTRUM CAPRICORNUTUM*.** *Latha Madhavan, Christian Brothers University, Memphis, Tennessee.* *Selenastrum capricornutum* is a freshwater, unicellular green alga. This organism exhibits a unique peroxidase that requires ascorbate as the sole electron donor. The effect of temperature, pH, substrate ascorbate concentration, and the inhibitor 8-hydroxyquinoline (HQNO) on this peroxidase was studied. A mathematical model of a two-level, factorial clear signal (Resolution V) design FF0416 (fractional factorial with four factors and 16 runs) was used to analyze the interactions of these factors on the expression of enzyme activity. Ascorbate concentration was the prime factor activating enzyme activity. Enzyme activity was affected, in the order from greater magnitude to least, by ascorbate, the ascorbate-HQNO interaction, pH, temperature, the temperature-ascorbate interaction, HQNO, and the temperature-HQNO interaction. Differential inhibition was indicated when peroxidase activity decreased upon addition of HQNO, but only at a low ascorbate concentration. Results in this study supported previous kinetics studies of the enzyme showing two isozymic forms of the peroxidase.

**ANALYSIS OF PULSED-FIELD ELECTROPHORESIS OF ESTERASES OF THE COTTON BOLL WEEVIL.** *Joanna S. McCormack, C. J. Biggers, and T. Y. Wong, The University of Memphis, Memphis, Tennessee.* Previously, pulsed-field electrophoresis has been used to separate limited-mobility DNA molecules. The objective of this study was to determine the most effective separation technique for hemolymph of the cotton boll weevil. The effectiveness of pulsed-field electrophoresis on proteins of the cotton boll weevil was analyzed. Pulsed-field protein separation was compared to the results of standard polyacrylamide-gel electrophoresis. The pulsed-field was created using the PPI-200 apparatus with 12 variable timed programs. The results of the individual programs used in this investigation will be discussed.

**THE EFFECT OF COMMAND 4EC HERBICIDE ON THE CHLOROPHYLL OF *VIOLA TRICOLOR*.** *Kelly Walker and H. W. Wofford, Union University, Jackson, Tennessee.* Command 4EC herbicide is effective in eliminating weeds that infest crops, but its use has caused severe bleaching of the leaves of plants in outlying areas. This study was designed to determine how various concentrations of Command 4EC affect leaf bleaching. Also, the amount of time required for chlorophyll to return to leaves was determined. The effects of Command 4EC were determined to be quick-acting and long-lasting. The amount of bleaching was determined to be directly proportional to the concentration of herbicide applied, with the bleaching ranging from 10% at 0.001% to 90% at 1.24%. Higher concentrations caused a higher percentage of leaves to be bleached. One week after Command 4EC was applied, the plants exposed to the lowest concentration (0.001%) had an average of seven bleached leaves, while plants exposed to the highest concentrations (1.24%) had an average of 14 bleached leaves. The carryover into adjacent areas appears to be related to both wind drift of aerosols during application and to the volatility of the active agent.

**THE EFFECTS OF AN ELECTRIC FIELD ON A SIMPLE ESTERIFICATION REACTION AS AN ALTERNATIVE TO CHEMICAL CATALYSIS.** *Brent Todd and R. Cantrell, Union University, Jackson, Tennessee.* In this research, we studied an alternative method of catalyzing esterification reactions as compared to the current industrial method. The goal was to use an electric field as a catalyst to accomplish the same thing as the traditional acid catalyst. Data from the research showed that the electric field did not appreciably increase the velocity of the reaction as compared to no catalyst and the industrial catalyst, bis(tri-n-butyltin)oxide. The electric-field-catalyst reaction was appreciably slower than the traditional acid-catalyst reaction. A thorough on-

line word search showed no previous research had been done on this topic.

**THE ATTEMPTED SYNTHESIS OF A POLYAMIDE BY A CONDENSATION-POLYMERIZATION REACTION OF A DIAMINE AND AN ACID CHLORIDE.** *Brian Lewis and R. Harry-O'Kuru, Union University, Jackson, Tennessee.* Polyamides can be prepared by the Schotten-Baumann reaction, in which an amine reacts with an acid chloride in the presence of a chlorinated hydrocarbon solvent. This research involved the attempted synthesis of a polyamide by a condensation polymerization reaction of diaminomaleonitrile and succinyl chloride. In successive runs of this synthesis, adjustments were made in the amounts of reactants and necessary solvents to provide optimum reaction conditions. Each product was scanned using a fourier transform infra-red spectrometer. The improved synthetic runs yielded a product containing polyamide functional groups.

**THE EFFECTS OF VARIOUS TERTIARY AMINES ON HALOACETIC ACIDS TO FORM POLYGLYCOLIDE.** *Blake Watkins, R. Hariharan, and A. G. Pinkus, Union University, Jackson, Tennessee.* Polymerization of haloacetic acids by triethylamine to form polyglycolide in good yields by a one-step procedure discovered about a decade ago has been recognized as a simple and inexpensive method of preparing polyglycolide. Comparable results were obtained with tripropylamine, and no reaction took place with N,N-dimethylaniline. Molecular weights were not obtainable because of polyglycolide insolubility. Since procedures for obtaining molecular weights of relatively insoluble polymers have been developed, the systematic study of the effects of various tertiary amines on haloacetic acids to form polyglycolide became feasible.

**SYNTHESIS OF TELECHELIC PIB IONOMERS-PIB SULFONAMIDE FOR HOT-INK-MELT APPLICATIONS.** *Linh T. Nguyen, R. F. Storey, and K. R. Choate, Christian Brothers University, Memphis, Tennessee.* A PIB telechelic sulfonamide was synthesized using conventional cationic polymerization to produce a telechelic, low-molecular-weight ionomer, 2,4,4-trimethylpentene, served as a model for the isobutylene chain end obtained in the controlled cationic polymerization of isobutylene. The room temperature sulfonation of 2,4,4-trimethyl-1-pentene was found to be quantitative after -h reaction. Two major products of sulfonic acids were produced, differing only in the double bond obtained from the sulfonation of 2,4,4-trimethyl-1-pentene. The sulfonic acid was used to synthesize a sulfonfyl chloride using PC15, and, finally, sulfonamide was produced using NH<sub>3</sub>OH or NH<sub>3</sub> gas in a methylene chloride-hexane solution. The linear 2-arm polyisobutylene was synthesized under conventional, cationic polymerization conditions using t-BuDCC/BC1 in methylene chloride. Direct sulfonation of the tertiary chloride was conducted to produce the telechelic sulfonic acid. The sulfonic acid was converted to the sulfonyl chloride using PC15. Finally, the telechelic PIB sulfonamide was produced by reaction with NH<sub>3</sub> gas. The products were subjected to <sup>1</sup>HNMR and FTIR for structural characterization. Telechelic PIB sulfonamides of varying molecular weights will be used as an additive in hot-ink-melt formulations for improvements in properties.

**HIGH-PRESSURE-LIQUID-CHROMATOGRAPHY ANALYSIS OF PRONOTAL AND ABDOMINAL CUTICLE IN *PERIPLANETA AMERICANA* (AMERICAN COCKROACH).** *Angie Hedge and J. Sam, Bethel College, McKenzie, Tennessee.* A preliminary, high-pressure-liquid-chromatography analysis of diphenolic compounds extracted from adult, fully-tanned cuticle of the cockroach *Periplaneta americana* with 1.2N HCl shows a major chromatogram peak with a retention time the same as that of catechol (o-dihydroxybenzene)

between 7 and 8 min. Samples extracted from both pronotal and abdominal cuticle either with or without alumina adsorption show this peak. Addition of authentic catechol to cuticle extract continues to show only a single chromatogram peak between 7 and 8 min.

**EFFECTS OF GAMMA IRRADIATION ON FLUORESCENCE YIELD IN SCINTILLATING, WAVELENGTH SHIFTING AND CLEAR FIBERS.** *David Thomas and M. S. Jahan, The University of Memphis, Memphis, Tennessee.* Considerable effort has been mounted to determine the radiation tolerance of fibers used in particle detectors in high-energy accelerators such as the proposed LHC in Europe. X-ray-excited fluorescence yield in scintillating and wavelength-shifting fibers was significantly reduced by radiation damage (Co 60). For a dose of 14 MRad, the loss in the fluorescence yield varied between 65 and 75%, and, for a dose of 50 MRad, the loss was found to be about 85%. For a low dose (-5 MRad), however, the variation was wide, 20 to 60% between the fibers. Fluorescence yields measured following thermal anneal of the gamma-irradiated fibers at 40 to 70°C showed a recovery of 10 to 15% for all except for the green wavelength-shifting fiber (PHT-S0050). For the PHY-S0050 fiber, a recovery of only 5% was achieved.

**DETERMINING MOLECULAR STRUCTURES BY X-RAY DIFFRACTION ON A MICROCOMPUTER.** *Michael Gaines, Christian Brothers University, Memphis, Tennessee.* In recent years, the power of microcomputers has become such that difficult calculations are within their capability. This presentation will outline the solution of several single-crystal structures using a GATEWAY 486 DX-33 microcomputer.