

ABSTRACTS OF PAPERS PRESENTED AT THE SPRING 1996 COLLEGIATE MEETINGS

EASTERN REGION

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
KNOXVILLE, TENNESSEE

REPRODUCTIVE BIOLOGY OF *PITYOPSIS RUTHII*. *Jodi L. Allan, M. B. Cruzman, and J. V. Perumal, Southern College, Collegedale, Tennessee.* *Pityopsis ruthii* (Ruth's golden aster) is a rare plant that is listed as endangered by the United States Fish and Wildlife Service. It grows only in the crevices of phyllite boulders along a stretch of the Ocoee and Hiwassee rivers. There has been no study on the reproductive biology of this species. One of the problems is the fact that *P. ruthii* is dwindling in numbers and has a low seed set. Hypotheses concerning limited fecundity are low pollination activity leading to insufficient pollen loads or ovule abortion because plants in populations may be closely related. We have quantified pollen loads to determine whether the plants are pollen-lacking. Experimentation and research on the reproduction is expected to help address the problem and aid in the future restoration of *P. ruthii*. We have stained and studied pollen grains to determine if there are enough grains on the stamen to fertilize the flower.

GUANA CAY *CYCLURA RILEYI RILEYI* OBSERVATIONAL POPULATION ASSESSMENT. *Isabella Angelini, Carolyn Jones, and Gayle Livingston, The University of Tennessee at Chattanooga, Chattanooga, Tennessee (IA, CJ), and Western Carolina University, Cullowhee, North Carolina (GL).* An observational population assessment was conducted on Guana Cay, San Salvador, The Bahamas, on the endangered rock iguana, *Cyclura rileyi rileyi*. This survey served as a follow-up estimate from research performed in the springs of 1994 and 1995. Exterior and interior sweeps of the northeast and southwest ends of the cay were made, and a total of five to eight adult and two juvenile iguanas was sighted. The population size is thought to be ca. 25 iguanas. Although numerous carcasses were found on the last two trips, none was spotted during this expedition. The iguanas exhibited no evidence of disease and appeared to be very healthy. Vegetation also seemed healthy, and several species of plants known to be utilized by *C. r. rileyi*, the seven year apple (*Casasia clusiifolia*), the prickly-pear cactus (*Opuntia bahamana*), and the sea grape (*Coccoloba uvifera*), were highly abundant. We are optimistic that this population may be recovering from a possible past decline; however, further studies would be necessary to confirm such a development.

SEDIMENTARY STRUCTURES ACROSS THE MISSISSIPPIAN-PENNSYLVANIAN SYSTEMIC BOUNDARY ALONG ROUTE 27 (SUCK CREEK SECTION) ON THE KETNER GAP, TENNESSEE QUADRANGLE ENABLED INTERPRETATION OF ENVIRONMENTS OF DEPOSITION. *Jeremy Bramblett and Paul Van Alstyne, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* The Upper Mississippian Pennington Formation and the Lower Pennsylvanian Raccoon Mountain Formation are the stratigraphic units examined here. The systemic boundary is placed at the top of a paleosol (localized unconformity) in the Pennington. Carbonates, graywacke sandstone, and red and green shales mark the Pennington; whereas, intercalated thin gray shales and thinbedded, rippled graywacke sand-

stone as well as massive graywacke sandstone characterize the Raccoon Mountain. A model of the environments of deposition suggests interaction of meandering stream deposits with high intertidal, tidal flat deposits across a strand line.

CORAL REEF ECOLOGY OF RICE BAY AND SNOW BAY OF SAN SALVADOR, THE BAHAMAS. *William P. Brown, Kelly Bullock, Jennifer L. Conner, Jeff Flowers, George Johnson, Bridget McHale, and Scott Newland, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* Recent studies have shown increasing stress on coral reef ecosystems in the Caribbean. The stress may result in coral bleaching from abnormal ocean temperatures, changes in salinity, conductivity, dissolved oxygen content, and pH levels. Our study analyzed two reefs on the coast of San Salvador Island, The Bahamas. The parameters were tested throughout the water column and population counts of species of fish were conducted as well. Evaluation of water samples showed little variation between the control reef in Rice Bay and the experimental reef in Snow Bay. Visible signs of coral bleaching were present at the reef in Snow Bay. The data collected may have been biased by several days of heavy rainfall and extremely windy conditions.

BIOLOGICAL ASSESSMENT OF CUT CAY, SAN SALVADOR, THE BAHAMAS, WITH PARTICULAR ATTENTION PAID TO FOOD SOURCES OF *CYCLURA RILEYI RILEYI*. *Fran Camperlino, Susie Daffron, Paul Grant, Mark Gregory, Vince Hutton, Jeff Lane, and Allison Leitch, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* In March 1996, we conducted a biological evaluation of Cut Cay, a geographically isolated area off of the north point of San Salvador Island, The Bahamas. Our intent was to determine the feasibility of this area to sustain a population of and to serve as a protective sanctuary for *Cyclura rileyi rileyi*, the Bahamian rock iguana. This endangered species requires specific vegetation to obtain sufficient water and nutrients, a dry sand depth of 45 cm (18 inches) for nesting, and absence of predators. We established seven transects on the island along which we conducted a line-intercept vegetative analysis determining the type and abundance of food plants. We also used a measuring stick to determine the soil depth for nesting sites and searched for signs of predators and set live traps for rodents. Our results indicate that Cut Cay possesses appropriate vegetation to support a population of rock iguana as well as proper soil depth for nesting in two areas of the island. However, rodents were seen on the Cay. We conclude that Cut Cay could serve as a functional protective sanctuary for *C. r. rileyi* if a rodent-extermination program was established and maintained.

FEDERAL DELINEATION OF AMNICOLA MARSH. *Or Cingilli, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* During the spring semester of 1996, the Environmental Survey Methods class executed the necessary steps to federally delineate Amnicola Marsh in Chattanooga, Tennessee. The state-protected marsh was presumed to offer habitat for several federally and state endangered or threatened species. Topographic maps of the boundary, wet perimeter, boardwalk, and high-water zones of the marsh were constructed. A taxonomic

survey of the marsh flora, with the line-intercept method, to determine species composition was completed. The necessary forms for federally delineating a wetland were established after compiling and analyzing the data.

RELATIVE ABUNDANCE OF FISH POPULATIONS IN BACKWATER HABITATS OF NICKAJACK RESERVOIR (TENNESSEE) IN THE TENNESSEE RIVER GORGE. James R. Duffy and Mark S. Schorr, *The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* Backwater areas of reservoirs can provide valuable spawning and nursery grounds for many species of fish; however, there is little quantitative documentation on the significance of backwaters to fishes in lakes of Tennessee. The purpose of our study was to evaluate the ecological importance of backwater (versus channel border) habitats to fishes within the 41.8-km canyon section (Tennessee River Gorge) of Nickajack Reservoir, Tennessee. We sampled littoral fish assemblages using three seining techniques every 6 weeks, April-September 1995, at backwater and channel-border sites within three sampling zones. A total of 20 species and 4,838 individuals was collected from backwater sites versus 12 species and 1,095 individuals from channel-border sites. Statistical analyses (two-way analysis of variance models) indicated that fish abundance was significantly greater ($P < 0.05$) in backwater sites than in channel-border sites. Factors that impact backwater habitats (e.g., water level fluctuation, sedimentation, and pollution) could have localized effects on reservoir fish populations.

TREATMENT OF RESIDENTIAL WASTE WATER USING CONSTRUCTED WETLANDS. Rick C. Gehrke, William S. Gooding, and R. G. Litchford, *The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* The construction of a small artificial wetland, to be used as part of the sewerage system for a small residence, is described. Analyses of an existing system, servicing a 10-unit apartment complex revealed >90% reduction in NO_3 , PO_4 , and BOD and >99% reduction in *Escherichia coli*. All parameters meet or exceed the state requirements of Georgia for surface water.

THE NEW MATHEMATICS: AN INTRODUCTION TO CHAOTIC THEORY. Shand Griffith, *Lee College, Cleveland, Tennessee.* The study of chaos is one of today's most fascinating research topics in mathematics. The theory of chaos simply states that predictability will eventually break down. There has been a great number of scientific papers written illustrating that chaos is closer to the rule of nature while order is more like the exception. It is one of the biggest discoveries in recent history and will probably dominate mathematical thought for years to come. This was best stated by Gerd Binning, former winner of the Nobel Prize for Physics, when he said, "Research in chaos—the most interesting current area of research that there is. I am convinced that chaos research will bring about a revolution in the natural sciences similar to that produced by quantum mechanics."

COMPETITION OF *PITYOPSIS RUTHII* WITH *LIATRUS MICROCEPHALA* AND *ANDROPOGON TERNARIUS*. He Yun Lee, John Perumal, and Mitch Cruzan, *Southern College, Collegedale, Tennessee.* *Pityopsis ruthii* (Small), currently listed as an endangered species by the State of Tennessee and the United States Fish and Wildlife Service, is a perennial plant belonging to the family Asteraceae. The distribution of *P. ruthii* is limited to soil that has accumulated in cracks and crevices of phyllite or graywacke boulders along the Ocoee and Hiwassee rivers. Analysis of soil and boulders indicate neither the absence nor the presence of any unusual nutrient. *P. ruthii* is most likely restricted to this habitat mainly because of its inability to compete with other more vigorously growing associates. However, the construction of dams along both rivers, resulting in lower frequency of flooding and

reduced water flow, may have complicated the situation by creating a more favorable habitat for competitors, specifically *Liatrus microcephala* L. and *Andropogon ternarius* Michx. To study the competition between *P. ruthii* and its two main competitors, *L. microcephala* and *A. ternarius*, the natural environment has been simulated in the greenhouse using concrete blocks to create 0.64-cm cracks filled with sand. Six treatments were devised with different combinations of *P. ruthii*, *L. microcephala*, and *A. ternarius* planted at a density of one plant per 2.54 cm. The experiment was initiated in the greenhouse on 18 January 1996, and periodic measurements of plant growth will be obtained as the experiment is monitored on a regular basis. Before terminating the project, the blocks will be carefully removed to reveal the root patterns that have been established. By studying the root patterns and by comparing the different rates of plant growth, the occurrence and extent of competition among the three codominants of the boulder-crevice habitat will be determined.

MATHEMATICS + BIOLOGY = PROMISE. Jennifer Lyn McLeod, *Lee College, Cleveland, Tennessee.* In the beginning, mathematics and the sciences formed a general conglomeration of information. As discoveries in mathematics and life sciences were made, specialized fields were formed. Thus, the initial divergence of mathematics and life science began. As the fields became even more specialized, mathematics and life sciences actually began to need each other again. Technology brought the sciences, especially biology, so far that, today, experiments and phenomena require some mathematical formulations to make the science understood or simplified. The application of mathematics to biology has elucidated many problems. Many mathematical methods, such as the simplex method and Markov chains, have brought ease to the biological problems that would be almost impossible to solve without mathematics. Some difficulties do exist in bringing these two sciences together, but, with some effort, mathematical biology may bring the life sciences to an even greater level of understanding.

EFFECTS OF CHEMICALS COMMONLY USED TO MAINTAIN THE GROUNDS AT PELLISSIPPI STATE ON ITS AQUATIC ECOSYSTEM. S. Brad Mitchell, *Pellissippi State Technical Community College, Knoxville, Tennessee.* Populations in any ecosystem go through periods of growth and decline depending upon environmental conditions. The effects of several variables on a local aquatic ecosystem were examined using a microcosm experiment. Water samples for microcosms were collected from the catch basin at Pellissippi State Technical Community College. Chemicals commonly used on the campus were to treat the microcosms. The effects of the treatments on the microcosms were determined by measuring oxygen, pH, and absorbance and by visual observations of color, turbidity, detritus, and microorganisms. All microcosms experienced an initial decline in oxygen and pH and increase in absorption. Algal growth decreased and detritus content increased in all microcosms. After a period of time, oxygen and pH increased and absorption decreased in all samples. Algal growth began to increase in a few of the microcosms. These microcosms demonstrate the changes in communities within an ecosystem when environmental conditions are altered.

EUGENICS: BIOLOGICAL AND ETHICAL IMPLICATIONS. Esmerelda J. M. Naidoo, *Lee College, Cleveland, Tennessee.* Eugenics, or the selective breeding of a population was first espoused by Francis Galton in the early 1900s. During the early part of the 20th century, it received wide acceptance in the United States. In 1929, 44 states had sterilization laws and California had performed 600,000 selected sterilizations. A poll in 1937 found that 63% of those polled were in favor of sterilization of habitual criminals. Although sterilization laws were overturned in the United States, this ideology has not

disappeared and, on occasion, continues to be expressed. Eugenics is generally categorized into two types. Positive eugenics is concerned with the selective breeding as to produce the most physically and socially "fit" persons in a society. Negative eugenics involves the systematic elimination of the so-called "unfit" from a given society. With the increase in new genetic screening programs and contraceptive techniques and with the increase in abortions after the 1973 *Roe versus Wade* decision, the eugenics movement seems to be experiencing a new awakening.

APPROACH TO WATERSHED STEWARDSHIP MOSSY CREEK WATERSHED PROJECT. *Rebeckah Ogle, Dana Ball, Eric Eisiminger, Missy Paul, David Johnson, and Jenny Tomljanovich, Carson-Newman College, Nashville, Tennessee.* The Biology Department of Carson-Newman College with assistance from the Tennessee Valley Authority's Holston River Action Team initiated the Mossy Creek Watershed Project in September 1995. Students examined relationships of watershed activities to water quality and began to identify ways to create an awareness throughout the community of the need for watershed stewardship. The team's goals are to enhance and maintain ecological integrity of uses. Located in Jefferson Co., Tennessee, the 31-km² (12-miles²) watershed features a wide variety of land uses including water filtration, sewage treatment, zinc mining, agriculture, wildlife viewing, and residential and commercial development. The 3.75-km reach of stream from its main source at Mossy Creek spring to its mouth in Cherokee Reservoir was examined in detail during the first year of the project. Biological assessments using the index of biotic integrity and family-level EPT showed a fish and benthic community in poor condition. The downstream station received an index of 26 (very poor/poor) and zero EPT. Somewhat better scores were obtained from the upstream site, an index of 34 (poor) and four EPT. Similar results during a survey by the Tennessee Wildlife Resources Agency 4 years earlier strongly suggest that a significant, continuous impact is preventing recruitment and re-establishment of these benthic macroinvertebrates. Future activities will focus on determining the cause(s) of poor ecological health, recommending ways to mitigate the impacts, developing a plan to enhance the wildlife observation area, characterizing existing land uses using aerial inventory, continuing to monitor water quality, and developing community awareness projects.

SEDIMENTARY STRUCTURES IN THE UPPER PORTION OF THE PENNSYLVANIAN WARREN POINT SANDSTONE EXPOSED ALONG ROUTE 27 ON THE KETNER GAP, TENNESSEE, QUADRANGLE ENABLED INTERPRETATION OF ENVIRONMENTS OF DEPOSITION. *John Reiert, The University of Tennessee at Chattanooga, Chattanooga, Tennessee.* Sedimentary structures in the Warren Point interpreted as braided stream structures include scour and fill, in-channel bars, trough crossbeds, and thin-bedded, rippled units all of which are composed of quartz arenite. Structures associated with meandering stream deposits include thin gray shales and a coal seam as well as scour and fill and thin-bedded, rippled structures made up of graywacke sandstone.

PURIFICATION AND FUNCTIONAL RECONSTRUCTION ON TUMOR CELLS OF A GPI-MODIFIED ICAM-1 MOLECULE. *M. D. Robinett, S. N. Ahmed, R. S. McHugh, and P. Selvarai, Lee College, Cleveland, Tennessee (MDR), and Emory University, Atlanta, Georgia (SNA, RSM, PS).* Cell-adhesion molecules play an important role in cell recognition. They enable the immune system to recognize and destroy foreign organisms. However, it has been hypothesized that cancer cells lack cell-adhesion molecules, thereby facilitating their elusiveness and allowing them to metastasize in the body. To test this hypothesis, we endeavor to express a PRI-modified intercellular adhe-

sion molecule (ICAM-1) on the surface of tumor cells. Subsequently, LFA-1, a T-lymphocyte protein and ligand for ICAM-1, will be able to recognize and bind to the ICAM-1 receptor and enable the immune system to better combat the tumor through increased T-cell stimulation. The knowledge obtained from these studies will be useful in developing immunotherapy strategies for treating cancer patients in the future.

A SURVEY OF THE METHADONE TREATMENT PROGRAMS IN EAST TENNESSEE. *Ruth Robinette, Roane State Community College, Harriman, Tennessee.* A survey of 27 methadone patients from the Knoxville Center and 20 patients from the Chattanooga Center were studied. Of these 47 patients, 66% were male, 34% were female, 76% were single, and 24% were married. Occupations included 285 professional, 11% managerial, 26% sales, 13% clerical, 32% skilled labor, and 26% labor (totals of >100% indicate that some had more than one occupation). Educational level included 47% with vocational training, 28% with some college, 19% with a college degree, and 6% with less than a high-school education. Fifty-three percent were employed, 38% were disabled, and 19% were unemployed. The average years of drug use by patients was 13.93 at the Knoxville Center and 16.94 at the Chattanooga Center. The average spent on illicit drugs per week before treatment was \$562 at the Knoxville Center and \$1,150 at the Chattanooga Center ($P < 0.05$). The average cost of treatment is \$70/week.

DISCOVERY AND PERCENT COLONIZATION OF VESICULAR-ARBUSCULAR MYCORRHIZAE IN *PUERARIA LOBATA*. *C. M. Sager and J. V. Perumal, Southern College of Seventh Day Adventists, Collegedale, Tennessee.* *Pueraria lobata*, more commonly known as kudzu, was brought to the United States from Japan in 1876. Although originally planted for erosion control, kudzu's vigorous growth has facilitated its escape and caused it to spread into vast areas. Today, kudzu is found predominantly in the southeastern United States where it thrives during the summer months, growing up to 0.3 m/day. This growth leads to a vine-like canopy several layers thick with deep set roots which makes removal of the plant extremely difficult. Limited research has focused mainly on kudzu's role in erosion control and provides little insight into its success. Mycorrhizae, however, may hold the answer. This fungus, present in the roots of many plants, enhances the uptake of essential nutrients and could provide kudzu with the strength it needs for such an incredible growth rate. To discover if the interaction exists, roots of *P. lobata* were collected, stained, and viewed for mycorrhizal structures. The presence of vesicular-arbuscular mycorrhizal fungi was established. To further understand kudzu's dependence on this symbiotic relationship, two factors are important. First, the extent of association between the plant and fungus can be determined by percent colonization of the fungus using the magnified intersections method (McGonigle et al., 1990). Second, differences in experimental growth rate between *P. lobata* planted in sterile soil versus mycorrhizae-rich soil will provide direct evidence of kudzu's dependence on the fungus.

BIOLOGICAL INTEGRITY OF STREAMS THROUGHOUT THE HOLSTON RIVER WATERSHED AND SPATIAL DISTRIBUTION OF SELECTED SPECIES. *Jenny L. Tomljanovich, Jeff Powell, and Keith Patrick, Carson-Newman College, Nashville, Tennessee (JLT), and The University of Tennessee, Knoxville, Tennessee (JP, KP).* A comprehensive assessment of biological integrity was made in streams throughout the Holston watershed between fall 1993 and summer 1995. Results of 169 stream surveys are used by the Tennessee Valley Authority's Holston River Action Team to help decide where to focus efforts to enhance and protect water quality, document ecological recovery at sites where stream restoration or best management practices are implemented, and monitor trends in biological integrity through time

throughout the watershed. The fish community was sampled with backpack shocker and seine in run, riffle, pool, and shoreline habitats using the protocol described from the index of biological integrity, which measures 12 metrics and yields a range of scores from 12 (very poor) to 60 (excellent). Of the 169 sites, 13 sites were sampled twice during the survey period. Using only the most recent year for these sites, the average of 156 indices was 37 (poor/fair). Forty-four percent of streams yielded indices of <34 (very poor to poor). Eighty-seven percent of streams yielded indices of <44 (very poor to fair), leaving only 13% with indices between 46 and 58 (fair/good to good/excellent). Areas of the Holston watershed where streams had mostly poor ratings were the lower Holston drainage, the Boone drainage, and the upper Watauga drainage. The area with mostly fair ratings was the upper Holston River drainage, from upstream of Cherokee Reservoir to Kingsport. Most of the few good ratings were in the North Fork Holston River. Applications of the Geographic Information System are demonstrated as a way to present the indices and spatial distribution patterns for selected species.

MIDDLE REGION AUSTIN PEAY STATE UNIVERSITY CLARKSVILLE, TENNESSEE

LOCALIZATION OF CONFRONTING CISTERNAE BY MONITORING THE IMMUNOFLUORESCENCE OF α -TUBULIN AND LAMIN B IN HELA CELLS. *Jenny L. Thacker and John R. Palisano, The University of the South, Sewanee, Tennessee.* Although the origin and function of confronting cisternae remains an enigma, electron-micrograph studies have begun to characterize their structure. Confronting cisternae are stacked membraneous structures studded with ribosomes and found during all stages of mitosis in selected tumor and fetal cells. Several hypotheses concerning the source of confronting cisternae have been formulated, but current explanations are at best conjectures. One hypothesis is that confronting cisternae arise as fragments derived from the nuclear envelope as the fetal and tumor cells divide frequently and quickly, thereby foregoing a complete breakdown of the nuclear envelope. Several studies also indicate that the accumulation of confronting cisternae occurs due, in part, to improper microtubule polymerization. To test this last hypothesis in addition to localizing confronting cisternae, immunofluorescence of synchronized and unsynchronized cells was initiated. The feasibility of using lamin B, a nuclear envelope-specific protein, to study the distribution of confronting cisternae in cells was tested by labeling nuclear envelope using a monoclonal antibody to lamin B. In contrast, characterization of microtubule polymerization was followed using a monoclonal antibody to α -tubulin. Qualitative observations of the nuclear envelope and microtubules were then possible with respect to distribution and quantity. This study determined the optimal paraformaldehyde and monoclonal antibody concentrations necessary to individually and concomitantly localize the nuclear envelope and microtubules in HeLa cells. A lower concentration of paraformaldehyde (0.5%) was found to better stabilize the nuclear envelope for immunofluorescence, whereas 3.7% optimized visualization of microtubules. Dilutions of primary and secondary antibody solutions were increased to 1:1000 to diminish any nonspecific staining and aid in identification of the nuclear envelope and microtubules. A staining method employing two different fluorochromes to enable detection of both proteins simultaneously in the cell also is currently being evaluated. In the future, the distribution of confronting cisternae will be monitored using monoclonal antibody to lamin B.

A COMPARISON OF THE MICROBIAL EFFICACIES OF SULFAMYLYLON AND SILVER SULFADIAZINE SLURRIES USED IN BURN TREATMENT THERAPY. *Jennifer Koch, Mark Trawinski, and Keith Belcher, Austin Peay State University, Clarksville, Tennessee.* The control of bacterial growth in extensive burn injuries with use of 10% sulfamylon acetate cream (mafenide acetate) and 1% silver sulfadiazine cream has been demonstrated clinically. However, both these agents are far from being ideal topical chemotherapeutic agents. Sulfamylon is a potent carbonic anhydrase inhibitor; this combined with the osmotic effects of its breakdown results in diuresis and electrolyte abnormalities. In addition, application of the cream is painful due to its high osmolality. Silver sulfadiazine, although less painful to apply than sulfamylon, does not have the penetrating power of sulfamylon and occasionally produces a transient leucopenia. Both agents have resulted in cutaneous hypersensitivity reactions leading to a maculopapular rash that may require the discontinuation of the agents. Due to these problems and mechanical difficulties associated with the use of creams that must be removed prior to grafting a more suitable medium using more dilute solutions or slurries has been utilized in many burn centers. Although these slurries minimize some of the physiological and mechanical problems associated with topical use of sulfamylon and silver sulfadiazine, no determination of the microbial efficacies of these slurries has been determined. It is the purpose of this study to evaluate the time-kill effectiveness of such slurries with commonly encountered pathogens isolated from burn units such as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Candida albicans*.

SURVIVAL OF *CERIODAPHNIA DUBIA* EXPOSED TO NEWT TOXINS. *Gabriele M. Frederick, Cindy L. Taylor, and Willodean D. S. Burton, Austin Peay State University, Clarksville, Tennessee.* This experiment was designed to test the survival of *Ceriodaphnia dubia* exposed to different concentrations of water from an aquarium containing *Notophthalmus viridescens* (eastern newt). During the experiment, the following variables were kept constant: concentration of newt-treated water; temperature, water in the newt tank. The preliminary results show that *C. dubia* exposed to 100% newt water had a higher rate of survival than the *C. dubia* that had been kept in reconstituted water (control). One possible explanation for this result is that the reconstituted water may have been contaminated by polymers that were adsorbed from the plastic water container. A second possibility is that hormesis occurred. Hormesis is physiologic stimulation by low doses of any potentially harmful agent. Due to these ambiguous results, the experiment will be repeated with the reconstituted water stored in a glass aquarium. The experiment to assess hormesis is being designed.

IMPORTED FIRE ANTS: A CONNECTION BETWEEN SURVIVAL AND LIPID CONTENT? *Alice G. Meldrum and Linda A. Wilson, Middle Tennessee State University, Murfreesboro, Tennessee.* The imported fire ants *Solenopsis invicta*, *Solenopsis richteri*, and their hybrid are a concern in the southern United States due to increasing population expansion. Economically, the cultivation and harvesting of crops are difficult and expensive in areas that are infested. Ecologically, fire ants are problematic in that they tend to dominate the less-aggressive native species, reducing natural diversity. Northern migration was unexpected past the -12°C isotherm line. However, the ants' ability to adapt to harsh environments is evident in the populations of *S. invicta* in Tennessee that survived severe winters north of the isotherm line. Lipid content has been suggested as a possible factor in winter survival rates. Analysis was conducted of lipid content for the three species, during four seasons, collected from 10 mounds at six field sites. A method for determining the lipid content of mosquitoes was used as the basis for development of a spectrophotometric method to measure the lipids in ants. A comparison of *S. invicta* for surviving mounds versus nonsurviving

mounds, showed that the surviving mounds have a 23% higher lipid content in autumn than those that died that winter. The hybrid was observed to be 18% higher in lipids than *S. richteri* and *S. invicta* averaged over the four seasons.

REP-PCR FOR CHARACTERIZATION OF 2,4,6-TRICHLOROPHENOL DEGRADING ENRICHMENT CULTURE. *C. Rufus, T. Johnson, O. Maltseva, and P. Oriol, Tennessee State University, Nashville, Tennessee (CR, TJ), and Michigan State University, East Lansing, Michigan (OM, PO).* Polychlorinated phenols are used as antifungal agents and for the preservation of wood and leather. It has been found that these compounds are highly resistant to microbial attack and tend to accumulate in the environment as pollutants. Enrichment cultures capable of 2,4,6-trichlorophenol-degrading haloalkaliphilic bacteria were obtained from extreme environments. All traditional methods used to isolate pure cultures of 2,4,6-trichlorophenol-degrading bacteria have been attempted but without satisfactory results. REP-PCR was used to distinguish which strain was dominating in trichlorophenol-degrading enrichment culture. Six pure cultures were isolated from enrichment culture degrading 2,4,6-trichlorophenol and were designated as C1-C6 using this method. Each of these isolates have different REP-PCR patterns. The REP-PCR pattern of trichlorophenol-degrading enrichment culture is most similar to one of the pink isolate C6 suggesting isolate C6 is dominating in the enrichment culture. There was no degradation of 2,4,6-trichlorophenol by pink isolates after 10 days of cultivation in a liquid medium. Analysis of 2,4,6-trichlorophenol degradation by pure cultures C1-C5 and by pink isolate C6 will be conducted.

EFFECT OF CADMIUM ON THREE CULTIVARS OF SOYBEANS. *Kevin Hall, Lisa Griggs, E. Lewis Myles, Deborah Long, and Carolyn Caudle, Tennessee State University, Nashville, Tennessee.* Heavy metals in a plant's environment can cause stress to the plant. This can be exhibited by an unfavorable reaction displayed by the plant. Cadmium is a heavy metal pollutant and potential toxin which can be found in the soil of many crops as a result of environmental pollution from mining, smelting, manufacturing, or atmospheric fallout or through the use of agricultural fertilizers. At high levels, cadmium can be toxic. However, plants have developed multiple mechanisms for tolerating the presence of heavy metals and for reducing their toxic effects. In our laboratory, we are trying to determine the mechanism of tolerance of cadmium in soybean (*Glycine max*) seedlings by performing comparative studies on a variety of soybean cultivars to identify either a nontolerant (sensitive) cultivar in which the plants die or exhibit a reduced growth in a particular cadmium concentration or to identify a tolerant (resistant) cultivar in which the plants show little or no reduction in growth rate. Four cultivars were used: Forrest; Hutcheson; Ware T9410; and 416981. The seedlings were exposed to 0.0, 0.1, 0.5, and 1.0 μM of cadmium sulfate for 7 days using an in vitro system. At the end of the exposure period, measurements were taken, which included total weight, total length, root weight, root length, hypocotyl weight, and hypocotyl length. Results from cultivars Hutcheson, Ware T9410, and 416981 indicated cadmium primarily depressed root length, with the greatest effect at 1.0 μM , and to a lesser degree at 0.5 μM . Hypocotyl length also was depressed, particularly at 1.0 μM . This suggests that cadmium specifically affects the roots with a reduction in root growth, indicating possible accumulation. Also, our results indicated that the cultivar Forrest may be tolerant to cadmium.

GENETIC VARIATION IN THE YEAST *PICHIA KLUYVERI*. *Keona Washington and Philip Ganter, Tennessee State University, Nashville, Tennessee.* *Pichia kluyveri* is one of several species from the genus *Pichia* that are restricted to a unique habitat, necrotic cactus tissue, and

are commonly described as "cactophilic." Previous work has indicated that the cactophilic *Pichia* are closely related. Because almost all cactophilic *Pichia* species are confined to the cactus habitat, it has been difficult to understand their evolution within the habitat (from host type to host type and from region to region) and to identify the origin of the group. *P. kluyveri* is unique in that it also commonly occurs in acidic fruit (e.g., tomatoes and cactus fruit). This study will compare the DNA of *P. kluyveri* strains from outside the cactus system (tomatoes). The strains came from five sources: Stenocereinae cacti from Baja California, Mexico, and Antigua; *Opuntia* from Arizona and Florida; tomatoes from across the United States. Three strains from each source were used. The strains were chosen to represent the extremes in host type and locality available in North America. The DNA comparison will be done using randomly-amplified-polymorphic-DNA markers generated by polymerase-chain-reaction amplification using primers with randomly chosen sequences (10 base pairs long). Comparisons of the variation detected will be done by construction of a cladogram using the computer program PAUP.

EFFECTS OF METHAMPHETAMINE ON LOCOMOTOR ACTIVITY IN MALE AND FEMALE MICE. *Sonya Butler and M. Ann Blackshear, Tennessee State University, Nashville, Tennessee.* Previous studies in our laboratory have investigated the effects of the central-nervous-system stimulant methamphetamine on locomotor activity in mice. The present study compares the behavioral effects of methamphetamine in isolated male and female mice. All mice were given a dosage of 0.5 mg/kg for a period of 7 days. After observing a wash period of 48 h, a challenge dose of 0.25 mg/kg was administered. The mice were sacrificed after the challenge dose was injected, and brain norepinephrine and dopamine levels were determined. Preliminary results demonstrate that female mice are more sensitive to the stimulant than are male mice. These findings may have clinical relevance to differential sexual responses to methamphetamine in human behavior.

EFFECT OF POLYETHYLENE GLYCOL ON FOUR CULTIVARS OF SOYBEAN. *Chiquita Rockiemore, Tomeka Walker, Larry Hall, E. Lewis Myles, Deborah Long, and Carolyn Caudle, Tennessee State University, Nashville, Tennessee.* *Glycine max* (soybean) is a high protein crop. This crop is not only important in industrialized countries but also more important in underdeveloped countries where meat is not easily obtained. Often times in poor countries, the reason for lack of food is conditions that affect the growth of crops. One of the most common problems affecting crops is drought. In the present study, polyethylene glycol was used to screen for tolerance in soybean seedlings. Soybean seedlings were germinated in 22-mm tubes containing 0, 5, and 10% polyethylene glycol. Three cultivars were used Forrest, Ware, and T9402. The seedlings were exposed for 7 days. At the end of the exposure period, root and hypocotyl lengths were measured. The results for hypocotyl length of cultivar Forrest were 7.19, 1.32, and 1.31 cm at 0, 5, and 10%, respectively. The root lengths were 10.31, 3.80, and 0.76 cm at 0, 5, and 10%, respectively. The results for hypocotyl length of cultivar Ware were 8.36, 1.17, and 0.63 cm at 0, 5, and 10%, respectively. The root lengths were 21.85, 0.86, and 0.45 cm at 0, 5, and 10%, respectively. The results for hypocotyl length of cultivar T9402 were 13.66, 8.16, and 2.46 cm at 0, 5, and 10%, respectively. This data shows a substantial difference in the hypocotyl and root lengths from 0 to 10%. The samples then were stored at -70°C until phenol-protein extractions could be performed on them.

INTERACTIONS OF GLUTATHIONE WITH THE GOLD DRUG, AURANOFIN. *Kelli J. Jensen, G. Kenneth Weakley, Rod Hartwig, and Lori L. Slavin, Austin Peay State University, Clarksville, Tennessee.* The gold(I) drug auranofin is used in the treatment of rheumatoid

arthritis. Undesired side reactions may occur in the body with auranofin and glutathione leading to the formation of a stable adduct which may be an additional source of toxicity to the body. UV-Vis spectrophotometry and phosphorus-31 NMR spectroscopic methods were used to characterize the reactions of auranofin with glutathione and a xenotoxin, chlorodinitrobenzene. The auranofin inhibits the product formation of chlorodinitrobenzene and glutathione and forms a stable adduct with glutathione which may not be readily excreted from the body.

IDENTIFICATION AND PRELIMINARY KINETIC ANALYSIS OF POLYPHENOL OXIDASE IN BLACK SALSIFY (*SCORZONERA HISpanicum*). Barry Lumpkins, Amanda A. Akin, Michael G. Andrews, Kimberly Frazier, Jacqueline K. McGee, and Kent Clinger, David Lipscomb University, Nashville, Tennessee. A polyphenol oxidase (or tyrosinase) activity has been discovered in the root of scorzonera or black salsify (*Scorzonera hispanicum*). A crude enzyme preparation was prepared by homogenizing the *Scorzonera* root in cold 0.1 M phosphate buffer, pH 6.5, containing 20 mM ascorbic acid to prevent inactivation of the enzyme. The mixture was strained through cheesecloth and vacuum filtered on a Buchner funnel. The active enzyme was precipitated by adjusting the filtrate to 80% saturated ammonium sulfate and centrifuging at 6,000 g for 20 min at 4°C. The enzyme then was dissolved in a minimal amount of phosphate buffer, and insoluble solids were removed by centrifugation. The enzyme was found to have a K_m of 4.7 mM for DOPA and K_m of 5.3 mM for catechol. The enzyme was active throughout a wide range of pH with a maximum at ca. 7.0.

DETECTION OF A TYROSINE DECARBOXYLASE ACTIVITY IN *CHROMOBACTERIUM VIOLACEUM*. Scott D. Holliday, Kent Clinger, and Jon Lowrance, David Lipscomb University, Nashville, Tennessee. *Chromobacterium violaceum* has been shown to have tyrosine-decarboxylase activity. Moeller plates were used to detect amino-acid-decarboxylase activity. Acetone powders were prepared from *C. violaceum*, and the amino-acid-decarboxylase activity was quantitated using a Warburg respirometer and compared to *Escheria coli*, *Staphylococcus aureus*, and *Enterococcus faecalis*. *C. violaceum* was shown to release 19.5 μ l of CO_2 from tyrosine in a reaction mixture containing pyridoxal phosphate from 10 mg of acetone powder. This was comparable to the activity of *Escherichia coli* and *Enterococcus faecalis*. *S. aureus* showed no significant tyrosine-decarboxylase activity. The *C. violaceum* acetone powder also showed tryptophan-decarboxylase activity.

A SERIES OF UNDERGRADUATE LABORATORY EXPERIMENTS USING THE α -GALACTOSIDASE FROM A COMMERCIALY AVAILABLE PRODUCT. Mark Hollingsworth and Kent Clinger, David Lipscomb University, Nashville, Tennessee. Many undergraduate biochemistry laboratories perform enzyme kinetic experiments to learn Michaelis-Menten kinetics and other common enzymological techniques. Generally, the enzymes used are either purchased commercially from a biochemical supply company or isolated from some readily available source of tissue. A common enzyme preparation used to help in the digestion of food is available in most drug stores and can be used as a source of an α -galactosidase (EC 3.2.1.22). This enzyme was found to have a sharp pH optimum of 4.5 and a K_m for p-nitrophenyl- α -D-galactoside of 1.7 mM. This enzyme could be an inexpensive and interesting source of enzyme for undergraduate biochemistry laboratory analysis.

DETERMINATION OF ORTHOPHOSPHATE AND POLYPHOSPHATE LEVELS IN COMMERCIAL WATER TREATMENT PRODUCTS. Joe Valdez and Ron Robertson, Austin Peay State University,

Clarksville, Tennessee. Orthophosphate and sodium hexametaphosphate (a polyphosphate) are used in water treatment as anticorrosives. Although generally recognized as safe, allergic reactions have been documented recently to sodium hexametaphosphate. It was the purpose of this study to identify and determine the concentrations of orthophosphate and hexametaphosphate in commercial anticorrosives. Working with the Tennessee State Division of Water Supply, we surveyed water treatment stations known to use phosphate anticorrosives and analyzed their products using two methods: visible spectroscopy at 890 nm of an oxidized molybdenum complex; ^{31}P NMR. The survey results revealed that the majority of stations believed their products had some polyphosphate content. The commercial products analyzed were AquaMag, sodium hexametaphosphate, and zinc orthophosphate. It was confirmed by both methods that AquaMag contains appreciable hexametaphosphate and that sodium hexametaphosphate appears to hydrolyze over a period time to orthophosphate. No polyphosphate contamination was found in zinc orthophosphate. ^{31}P NMR analysis gave excellent qualitative results with a single peak at ca. 4 ppm for orthophosphate and peaks at -5 and -20 ppm for metaphosphate. Future work will involve a more extensive survey, kinetic studies of the hydrolysis, and determination of the exact chain length of the hexametaphosphate.

DETERMINATION OF REACTION RATES BY FAST SCAN CYCLIC VOLTAMMETRY AND DIGITAL SIMULATION: THE 9-OTOLYL FLUORENYL RADICAL AND TEMPO. Stephanie Steelman, Jeremy Anderson, Michael Conaster, Erin Emrich, Rudy Gostowski, and Rachel Peterson, Austin Peay State University, Clarksville, Tennessee. The 9-o-tolyl fluorenyl radical was produced by electrochemical oxidation of the in situ formed anion. The incipient radical may participate in bimolecular self-reactions to form a dimer. Decreasing the time frame of the cyclic voltammetry electrochemical experiment by utilizing ultramicroelectrodes and a current-to-voltage converter having a small time constant allows the radical to be reduced back to the anion before it may decay. Addition of a nitroxide trapping agent (TEMPO) to the solution should facilitate comparison of the self-reaction with the trapping process. However, no trapping was observed with this radical. This indicates greater steric hindrance in the trapping reaction.

DETERMINATION OF REACTION RATES BY FAST SCAN CYCLIC VOLTAMMETRY AND DIGITAL SIMULATION: THE 9-PHENYL XANTHENYL RADICAL AND TEMPO. Erin Emrich, Jeremy Anderson, Michael Conaster, Rudy Gostowski, Rachel Peterson, and Stephanie Steelman, Austin Peay State University, Clarksville, Tennessee. The 9-phenyl xanthenyl radical was produced by electrochemical oxidation of the anion and observed to participate in bimolecular self-reactions to form a dimer. Upon addition of a nitroxide trapping agent (TEMPO) to the solution, the anodic current was seen to increase with no change in the following cathodic scan. The mechanism of this reaction was investigated by means of digital simulation. An electron transfer process is thought to occur which would regenerate the 9-phenyl xanthene anion. Steric hindrance may serve to favor this process over bond formation with TEMPO.

TEMPERATURE DEPENDENCE OF COLOR CHANGE IN SILLY PUTTY. Debora A. Zartman, Gary D. White, and Judith M. Bonicamp, Middle Tennessee State University, Murfreesboro, Tennessee. Changeable Silly Putty[®] is one of the many toys currently on the market containing a pigment that changes color with temperature. Toy manufacturers are using these pigments in many of their older products to rejuvenate interest in those toys. Products that change color can illustrate to students that chemistry is used in many different ways and can have some fun applications. The color change in Changeable Silly Putty[®] occurs slightly above room temperature at 28-32°C and is

completely reversible. To study this phenomenon, we used the Shimadzu CS-930 Dual Wavelength TL Scanner to track the color change. Control of the sample temperature was accomplished using a constant-temperature water bath and a peristaltic pump to circulate water through a piece of copper tubing on which the Silly Putty[®] sample was placed. The temperature of the sample was monitored by a thermistor. Data collected on the changes in absorbance over time will be used to analyze the kinetics of the color change.

LIQUID CRYSTALLINE POLYENE DONOR-ACCEPTOR DYES.

Deborah G. Anderson and Andrienne C. Friedli, Middle Tennessee State University, Murfreesboro, Tennessee. Donor-acceptor polyene molecules are known to have strong, second-order, nonlinear interactions with light (β). The classical poling approach (covalently binding or doping molecules into high T_g polymers and using heat and high electric fields to align the chromophores) to achieve noncentrosymmetric alignment of chromophores can be destructive. Self-ordered liquid crystalline phases may increase the tendency toward order and require less harsh poling conditions. Here, we report the synthesis of polyenes, some of which are liquid crystalline over a broad temperature range. The compounds have been characterized by NMR, solvatochromism, and thermal analysis. Computational modeling is ongoing to establish trends in conformational shapes, NLO properties, and ultraviolet spectra, allowing comparisons to related known molecules.

A NAUTILOID LAGERSTATTEN FROM THE BIGBY-CANNON LIMESTONE, MIDDLE ORDOVICIAN, COFFEE COUNTY, MIDDLE TENNESSEE.

Terry Barton and Clay Harris, Middle Tennessee State University, Murfreesboro, Tennessee. In northwestern Coffee Co., hundreds of straight-shelled nautiloids litter the upper surface of a 20-cm thick limestone bed cropping out for several hundred meters along a hillside. Although nautiloids occur in adjacent beds as well, they are not nearly as abundant there. Based on outcrop observations, this rich fossil deposit, or lagerstätten, resulted from storm deposition in a near-shore setting, perhaps a lagoon protected by a coralline bar or shoal. A shoaling upward sequence is apparent from fossil evidence. At the base of the 2.8-m section under study, a single 150-cm thick bed contains abundant colonial coral heads. Scattered nautiloids and stromatolites, various brachiopods, and gastropods also occur. In the overlying 50-cm thick bed, the abundance of coral decreases while stromatolite abundance increases. This suggests a more restricted and perhaps protected environment than the underlying coral bed. These hemispherical to club-shaped stromatolites range up to 50 cm in diameter. Above the stromatolite bed, a similar 30-cm thick bed occurs but with fewer stromatolites. The upper part of this bed is transitional with the overlying nautiloid bed. This transitional contact consists of laminated, wavy to undulating layers of argillaceous to silty limestone (containing scattered, overturned stromatolites), such as might form during storm deposition near a terrigenous sediment source. Other evidence for storm deposition of the nautiloid bed includes multiple, coarse-grained amalgamated layers; abundant, well preserved, sparry calcite-filled nautiloid shells; lack of size sorting in nautiloid shells; and a few nautiloids oblique to bedding.

HOW WATER SOFTNESS CAN EFFECT SOIL HYDRAULIC CONDUCTIVITY.

T. E. Keim and W. L. Anderson, Middle Tennessee State University, Murfreesboro, Tennessee. Water-softener salts are thought to cause problems in soils and groundwater. It is known that some salts will decrease soil hydraulic conductivity in septic adsorption fields and will leach into the groundwater. To determine if the soil hydraulic conductivity changes and salt leaches, the following laboratory experiments were conducted. The falling-head-hydraulic-conduc-

tivity method was used on a sand and a silt loam soil. To establish the amount of salt, electrical conductivity of the leachate was measured.

TOXIC TUNNELS THROUGH TENNESSEE.

Donald A. Dehm and Robert A. Sirk, Austin Peay State University, Clarksville, Tennessee. Since the 1970s, the Clean Air Act and its subsequent amendments have served as the primary agents for comprehensive atmospheric air-quality improvement and protection in the United States. After a quarter-century of regulation, the Clean Air Act and its amendments can be credited with fostering notable air-quality improvements, but areas of nonattainment and statute nonattainment remain. Ground-level ozone from automobile emissions is one such area of ambient standard nonattainment for many urban centers, including several metropolitan areas of Tennessee. Following established compliance and attainment procedures, air quality in these metropolitan centers is improving. Rural transportation-pollution corridors of which ozone emissions constitute an element, represent a continuing area of regulatory nonattainment. Under existing regulations, less attention to monitoring and procedural protection has been afforded these rural sites.

FLOATING IN HYDROCARBONS: WATER-BASED RECREATION AND THE FUTURE OF TENNESSEE'S WATERWAYS.

Jennifer M. Kocak and Robert A. Sirk, Austin Peay State University, Clarksville, Tennessee. Careful environmental monitoring and preservation practices, when applied to surface water systems, provide necessary maintenance for aquatic ecosystem and human-needs satisfaction. For much of the state of Tennessee, recent history has seen a significant increase in the standard of living. Here, as elsewhere, increase in standard of living has often translated into increased leisure time and disposable income. Tennessee offers a wealth of recreational waters, and an increase in the number and duration of recreational boating experiences serves as a visible reminder of this affluence. With increasing access comes the potential for explosive growth in hydrocarbon-based air and water pollution. Given the increased emphasis in pollution control under Clean Air and Clean Water acts legislation, petroleum-based water recreation should be an issue for coordinated examination. Paradoxically, pollution from water-based recreation has remained almost wholly unregulated.

GEOLOGY OF THE 1994 DOTSON POINT ROCKFALL, SEWANE, TENNESSEE.

James J. Henley, Amanda J. Cook, T. Carlyle Knox, and Donald B. Potter, Jr., The University of the South, Sewanee, Tennessee. In June 1994, ca. 4100 m³ of Warren Point Sandstone collapsed onto colluvium and the Raccoon Mountain Formation below. This rockfall is located along the upper bluff on the northwestern side of the Cumberland Plateau ca. 457 m southwest of Dotson Point in the Sewanee Quadrangle. Contributing causes for the rockfall include undercutting of the Warren Point Sandstone by rapid weathering of the underlying siltstone and a 30-year record rainfall of 115.8 cm in the preceding 6 months. Stratigraphy, sedimentary structures, weathered surfaces, superposition, rock shapes, and the geometry of now-interlocking blocks of colluvium were used to reconstruct the sequence of events during the rockfall. The sandstone blocks that cover an area of ca. 2000 m² did not all fall at the same time or in the same manner from the bluff. Two large blocks on the northeastern side of the rockfall broke off the cliff first and overturned 180° as they came to rest on the Raccoon Mountain Formation. Following this initial movement, the two largest blocks, as well as several smaller ones above and below, broke off the southwestern end of the bluff. The large, upright blocks tilted downslope, away from the bluff, allowing the thinly bedded sandstone above to shear off. Colluvium beneath and beyond the rockfall was mobilized by the shock, and fault-sole scarps of freshly exposed colluvium 1-2 m high and 12-20 m beyond the limit of the rockfall

formed the peripheral parts of the disturbed area. The large blocks of sandstone have continued to move downslope on the clay-rich colluvium and bedrock in the 2 years since the rockfall. Movement has been monitored by measuring from marked points on each of the large blocks to fixed points on the cliff wall. Movements as great as 2 m were recorded from February to April 1995. Measurements in September 1995 and April 1996 show continued downslope movement of the large blocks. During these later stages, a few of the smaller blocks have overturned while the larger blocks have undergone rotation and translation.

DEVELOPMENT OF A COMPUTER MODEL TO OPTIMIZE ADMINISTRATION OF BOVINE SOMATOTROPIN TO DAIRY COWS. *Stephanie L. Keel, Celia D. Bigham, and Jonathon L. Beckett, Middle Tennessee State University, Murfreesboro, Tennessee.* A dynamic model to optimize administration of bovine somatotropin to dairy cows was developed and tested. The model determines the interval of administration which results in maximum profit. The model is based on daily iterations and includes energy requirements for maintenance, gain, and milk production following NRC requirements. Data inputs include parameters of production and bovine-somatotropin response, interval of administration of bovine somatotropin, feed costs, cost of bovine somatotropin per injection, increased labor expenses, and on-farm milk prices. The model estimates daily milk production, daily milk sales, cost of production, and increased profit attributable to use of bovine somatotropin. To test the model, data were generated for 225 scenarios in which five levels of production, five feed costs, three on-farm milk prices, and three costs of bovine somatotropin were evaluated independently. The number of injections yielding maximum increased profit and extent of maximum increased profit were determined. Results were analyzed by regression analysis, and regression coefficients were estimated. Numbers of injections yielding maximum profit and total maximum increased profit were reliably predicted by the model ($R^2 = 0.81$ and 0.86 , respectively). In conclusion, the current research indicates that the increased profit due to administration of bovine somatotropin is extremely variable and is dependent on several factors. The model described and resulting regression equations are effective predictors of management of bovine somatotropin for maximum profit.

SENDING SECRET MESSAGES USING NUMBER THEORY. *Lea L. Rosenberry and Floyd L. Christian, Jr., Austin Peay State University, Clarksville, Tennessee.* Organizations needing to store and communicate sensitive digital data put high priority on providing access to this information only to those with a "need to know." Cryptography is the science of making communications unintelligible except to authorized parties. RSA, the most widely used cryptographic system, is based on elementary ideas from number theory, including congruence theory. Based on expository material in David Burton's *Elementary Number Theory*, this talk provides a detailed example of the encryption and decryption process of the RSA system.

ACUTE PANCREATITIS: REVIEW AND CASE STUDIES. *Kelly L. Brown, Austin Peay State University, Clarksville, Tennessee.* Acute pancreatitis is an inflammatory process that affects 238 people per million per year with 10-20% of these cases resulting in death. Premature activation of pancreatic enzymes can cause pancreatic necrosis and systemic complications. Precipitating factors include mechanical obstructions, metabolic disturbances, infections, vascular diseases, or drugs. In the 15 case studies collected from Columbia Horizon Medical Center located in Dickson, Tennessee, the most common precipitating factors were demonstrated. The case studies showed many similarities in diagnostic values and treatment. To achieve prompt diagnosis, a collaborative effort between the clinicians and laboratory

and radiology departments must be accomplished. Twelve of the 15 case studies demonstrated an increased serum amylase; this along with other supportive findings such as radiographic imaging led to prompt diagnosis and effective treatment. Because there is no curative medication or therapy for acute pancreatitis, the health care team must be able to effectively manage and treat the symptoms and underlying factors. Acute pancreatitis can very easily turn into a life-threatening situation, therefore, immediate medical intervention is vital.

WESTERN REGION

THE UNIVERSITY OF TENNESSEE AT MEMPHIS MEMPHIS, TENNESSEE

ADVANCE IN THE PERIHELION OF MERCURY'S ORBIT. *T. R. Miller, Rhodes College, Memphis, Tennessee.* By modeling the outer planets as elliptical mass rings of constant density, an integrable expression for the net gravitational potential at an interior point is obtained. Mercury is envisioned as a point mass traveling in an elliptical orbit. In order to account for special relativistic effects, I allow the mass of Mercury to vary as a function of its velocity. It will be seen that the special relativistic effect alone will contribute to an advance in the perihelion of Mercury. Combining the special relativistic effect with the contribution of the other planets leads to an estimate of the advance of the perihelion of Mercury in the absence of general relativistic effects.

UTILIZATION OF A PHOTOCHEMICAL REACTION IN A PHYSICAL CHEMISTRY LABORATORY. *Gregory A. Duncan and Randy F. Johnston, Union University, Jackson, Tennessee.* The photochemical reaction of chromium hexacarbonyl and triphenylphosphine in cyclohexane and THF was followed through the formation of the substituted products, monosubstituted triphenylphosphine-chromium pentacarbonyl and bis (triphenylphosphine)-chromium tetracarbonyl. Both of these compounds were independently synthesized and spectroscopically characterized. The carbon-oxygen stretching frequencies of the substituted products are easily observed and can be identified by spectroscopy. The symmetry and bond strength can be determined from the vibrational spectra of the compounds. Realizing the educational value of the reaction, a physical chemistry laboratory was planned to utilize this link between group theory and the actual experimental results. This laboratory also would be a useful illustration of infrared spectroscopy in the identification of compounds. The procedure of this laboratory experiment and means in which to synthesize and isolate the substituted compounds will be presented.

COMPACTIFICATIONS OF TOPOLOGICAL SPACES. *Meg Johnson, Jay Blankespoor, and John Stoughton, Hope College, Holland, Michigan, and Christian Brothers University, Memphis, Tennessee.* When looking at a topological space, one element to investigate is its compactness. If a space is not compact, one may ask "How close is it to be compact?" and "What, if anything, can be added to the space to make it compact?" First of all, a space must be completely regular in order to allow compactification, and there are several ways in which to do this. Two such ways are the one-point and the Stone-Cech compactification of a topological space X . For some spaces, these compactifications are equal; hence, X has only one compactification. My research deals with the question "What conditions will guarantee that these two compactifications are different?"

EFFECT OF PH, 1-OCTANESULFONIC ACID, AND TEMPERATURE ON RP-HPLC ANALYSIS OF BENZENEDIOLS. *Tara K. Donnelly and Joseph A. Sam, Bethel College, McKenzie, Tennessee.*

Previous RP-HPLC investigation showed that increasing or decreasing C-18 column temperature resulted in changes in the retention sequence of N-acetyldopamine and catechol at pH 2.9. Selectivity changes are frequently observed in ion-exchange chromatography, and 1-octanesulfonic acid is often added to the mobile phase to form an ion pair with the analyte. This study showed that at pH 2.9, routinely used in analysis of catechols, the removal of 1-octanesulfonic acid resulted in little or no change in retention time at temperatures measured between 20 and 40°C. Similar results were observed at pH 1.7. At pH 4.5, corresponding temperature changes did not result in sequence changes whether or not 1-octanesulfonic acid was present. Using mobile phase with 1-octanesulfonic acid showed the greatest resolution at 20°C with catechol eluting first. Mobile phase without 1-octanesulfonic acid had the greatest resolution and 40°C with N-acetyldopamine eluting first. Removal of 1-octanesulfonic acid from the mobile phase resulted in a significant decrease in retention times at pH 4.5 with all temperatures measured between 20 and 40°C.

NONRELATIVISTIC CONTRIBUTION TO MERCURY'S PERIHELION PRECESSION. *Jacob Abraham, Rhodes College, Memphis, Tennessee.* The observed precession of Mercury is one of the direct confirmations of Einstein's theory of general relativity, and the calculation of the principal, classical contribution to the precession is, therefore, of critical importance. A previous study calculated this classical precession of Mercury's perihelion due to the perturbative force of the outer planets. It accounted for the time-averaged effect by replacing each planet with a circular ring of appropriate linear mass density. It assumed that these mass rings are concentric, lie in the ecliptic plane, and, thus, each planet produces a repulsive force on Mercury. The previous study found excellent agreement with the results of classical perturbative theory. In this presentation, the calculation is repeated by replacing the planets with discrete point masses placed at equal time intervals along real, elliptical orbits that are tilted with respect to the ecliptic plane. The results are compared to those of the previous study, and differences are assessed.

INVESTIGATION OF CORONAL SOFT X-RAY LINES FOR POSSIBLE OPTICAL DEPTH EFFECTS. *J. C. Chauvin and J. T. Schmelz, Rhodes College, Memphis, Tennessee.* The prominent assumption amongst solar physicists has been that the solar corona is perfectly transparent to photons within the soft x-ray spectrum (1-20Å). Certain investigators, however, have suggested that certain lines within this spectrum may experience optical depth effects. We have tested four lines, Ne IX (13.44Å), Mg XI (9.17Å), OVIII (18.97Å), and Fe XVII (15.01Å), for such effects. Our tests involved comparing theoretical predictions to observational data for 33 active regions. The results of these tests indicate that, of the four lines tested, only Fe XVII (15.01Å) experiences a significant optical depth effect.

FORMATION OF ENZYME-SUBSTRATE HETERODIMER DURING FOLDING OF INTERLEUKIN-2. *Christy J. Key, Jennifer M. Ye, and Janet L. Wolfe, The University of Tennessee at Memphis, Memphis, Tennessee, and Union University, Jackson, Tennessee.* Reduced, denatured recombinant human interleukin-2 (rIL-2) refolds spontaneously in vitro to acquire its native structure. However, nonproductive folding pathways result in the formation of aggregated and misfolded rIL-2. Foldases are enzymes that accelerate protein folding by catalyzing the slow chemical steps. While studying the efficiency of rIL-2 folding as a function of folding-buffer composition and foldase concentration, it was found by SDS-PAGE and western-blot analysis that a band with a molecular weight corresponding to that of a heterodimer of the foldase and rIL-2 appeared. Following incubation of

the foldase with rIL-2, aliquots of the reaction mixture were periodically withdrawn, and the reaction was quenched. Evidence will be presented in which the composition of the transient protein complex is characterized.

CYCLIC VOLTAMMETRIC INVESTIGATION IN THE OXIDATIVE PROCESSES OF CYCLOPENTADIENYL/MANGANESE TRICARBONYL DERIVATIVES. *Dartha D. Babcock and Randy F. Johnston, Union University, Jackson, Tennessee.* Two types of cyclopentadienyl manganese tricarbonyl derivatives were studied electrochemically. The first type were chemicals of the structure $\eta^5\text{-C}_5\text{H}_5\text{RMn}(\text{CO})_3$ where $\text{R} = \text{-C}(\text{O})\text{CH}_3, \text{-C}(\text{O})\text{CH}_2\text{SCH}_3, \text{-C}(\text{O})\text{CH}_2\text{CH}_2\text{SCH}_3, \text{-CH}_2\text{CO}_2\text{CH}_3, \text{-CH}_2\text{CH}_2\text{CO}_2\text{CH}_3$. The second type were similar but characterized by chelation of an atom in R or the replacement of a CO ligand by PPh_3 . The cyclic voltammetry studies of these compounds indicate that all of the compounds undergo one-electron oxidations at positive potentials relative to a Ag/AgCl reference electrode. A return reduction wave was not observed for any of the cyclopentadienyl manganese tricarbonyl derivatives which indicates nonreversibility. Furthermore, a residue was deposited on the platinum working electrode during each voltammogram. An explanation of this chemical change and other results will be presented.

LIPOPROTEIN CHOLESTEROL IN TWO GENOTYPES OF BEEF CATTLE. *Frank Kalume, LeMoyne-Owen College, Memphis, Tennessee.* Studies have shown that genotype and diet (forage) affect plasma lipid levels in cattle. The purpose of my project was to measure the cholesterol concentration in various lipoprotein fractions to determine which lipoproteins were changed by genotype or diet. It was hypothesized that the large HDL fraction would be affected the most, because this occurs when cholesterol rises in lactating cattle. Plasma from Angus (genotype AA) and Brahman (BB) heifers was obtained in 1991, and plasma lipoproteins were separated by sequential ultracentrifugation and frozen at -50°C. I enzymatically assayed these lipoproteins for cholesterol. To determine whether prolonged freezing affected cholesterol, whole plasma samples were compared to earlier results. Samples had not changed: mean difference = +0.3 mg/dl (+0.36%). Forage did not alter total cholesterol or lipoprotein-cholesterol as it usually does. Therefore, to test the effect of genotype, data from cattle on all forages were combined. A large effect of genotype on total plasma cholesterol was found, and this was due mainly to the large HDL. In cattle, most plasma cholesterol circulates in HDL (unlike humans who have much LDL-cholesterol). Compared to Angus heifers, the Brahman heifers had significantly higher plasma total cholesterol and large HDL-cholesterol. This suggests that the Brahmans have a higher rate of turnover of lipoprotein lipids (primarily triglyceride in the lipoprotein core) from the liver to peripheral tissues than do Angus heifers, and, consequently, they also have a higher rate to return of excess surface lipids (like cholesterol) to the liver, in the form of large HDL.

EFFECTS OF CHEMOTHERAPY ON LARGE CELL LYMPHOMA PATIENTS. *Alexis Gwin-Miller, Ephrem Belete, and Jovan Williams, LeMoyne-Owen College, Memphis, Tennessee.* The purpose of this project was to determine if high-dose chemotherapy could be an effective treatment for patients with large cell lymphoma. Data was collected from 30 patients, including white-blood-cell, platelet, and neutrophil counts, age, and cycle number. Although white-blood-cell counts in the first and second cycles of chemotherapy were poorly correlated, linear regression suggested that there was no significant difference between blood counts on the first and second cycles. However, because the distribution of counts was non-normally distributed, the analysis was repeated using nonparametric methods. This

second analysis suggested a significant difference between first and second cycle counts. The final conclusion was that high-dose chemotherapy could indeed be an effective treatment for the disease.

DEVELOPMENT OF A NONRADIOACTIVE LABELING METHOD FOR ELECTRON-MICROSCOPIC ANALYSIS OF SP-B TRAFFICKING. *K. H. Taylor, J. Breslin, and T. E. Weaver, Children's Hospital Medical Center, Cincinnati, Ohio, and Lane College, Jackson, Tennessee.* Surfactant protein B is complex hydrophobic polypeptide which along with surfactant protein C improves the adsorption and surface tension-reducing properties of surfactant phospholipids. In this study, we propose to label surfactant protein B with dinitrophenol, a nonradioactive label which could greatly reduce electron-microscopic-level detection time to facilitate the study of surfactant protein B recycling. To dissolve dinitrophenol 100 μg of surfactant protein B (10-fold molar excess over surfactant protein B) were added and incubated with stirring overnight. The dinitrophenol-conjugated surfactant protein B was fractionated over a C-8 column to remove unconjugated dinitrophenol. ELISA analysis was conducted to identify the surfactant protein B-containing fractions and the concentration of each fraction. Those fractions having the greatest concentrations of surfactant protein B were analyzed via western-blot analysis to verify dinitrophenol conjugation to surfactant protein B. Fractions containing dinitrophenol-conjugated surfactant protein B were combined, dried under N_2 and low heat, and reconstituted with whole-rat surfactant at 37°C for 3 h. The surfactant then was fixed and centrifuged, and the resulting pellet dehydrated with a series of ethanols $\leq 100\%$ and embedded in Eponate 12 for electron-microscopic analysis. The pellet was cut into ultra-thin sections, etched in saturated NaIO_3 for 40 min and rinsed. The sections then were washed for 1 h in 20 mM tris buffer (pH 8.5) containing 1% BSA, incubated overnight in 2 $\mu\text{g}/\text{mL}$ of rabbit antidinitrophenol IgG, and then rinsed 3 min in buffer. Next, the sections were incubated in gold-conjugated goat antirabbit IgG, rinsed 30 sec in a stream of ddH_2O , counterstained with 2% aqueous uranyl acetate and Reynold's lead citrate, and photographed. We found that colloidal gold was specifically associated with surfactant profiles. The success of this labeling method indicates that we can use double labeling to investigate the uptake of the tritiated surfactant lipid DPPC in the presence or absence of dinitrophenol-labeled surfactant protein B, thereby simultaneously visualizing the recycling pathways of surfactant lipid and protein in the same sections.

EFFECTS OF NERVE GROWTH FACTOR ON SLEEP IN RABBITS. *Sonja Gala, Satoshi Takahashi, and James M. Krueger, Christian Brothers University, Memphis, Tennessee, and The University of Tennessee at Memphis, Memphis, Tennessee.* It is hypothesized that nerve growth factor is involved in the regulation of sleep. Nerve growth factor, which is a well-characterized neurotrophic factor, elicits rapid-eye movement sleep in cats. Furthermore, antibodies to nerve growth factor receptive cells induce changes in rapid-eye movement sleep and electroencephalograph theta activity in rats. The purpose of the present study was to determine the effects of nerve growth factor on sleep and brain temperature in rabbits. The rabbits received recombinant human β -nerve growth factor intracerebroventricularly with 0.1 μg ($n = 6$), 1.0 μg ($n = 8$), or 10 μg ($n = 4$). The two highest doses of nerve growth factor significantly increased rapid-eye movement sleep and nonrapid-eye movement sleep dose-dependently. Brain temperature was not affected by any dose of nerve growth factor. These results suggest that nerve growth factor is involved in regulation of rapid-eye movement sleep and nonrapid-eye movement sleep.

EDUCATION OF THE GROWTH PATTERN AND FUNCTION OF CORTICOTHALAMIC NEURONS. *Tom R. Grant, Andrea Elberger, and Philip Pearson, The University of Tennessee at Memphis, Memphis, Tennessee.* This research attempted to elucidate the growth patterns of corticothalamic neurons. This was accomplished through the measuring of four components of rat corticothalamic neurons: primary dendritic length; terminal dendritic length; number of branches; somatic cross-sectional area. The data confirmed that the mean primary dendritic length increases from postnatal day 0 to 6, after which it degenerates. As for the mean terminal dendritic length, it also increases from postnatal day 0 to 6, followed by degeneration and regression. This research also discovered that the number of dendritic branches increase from postnatal day 0 to 6, after which they also regress and degenerate. Finally, the somatic cross-sectional area increased hyperbolically from postnatal day 0 through 20. Thus, the research elucidated the developmental pattern of the corticothalamic neuron.

SUCRALFATE FOR INTERSTITIAL CYSTITIS. *Larry M. Lloyd, The University of Tennessee at Memphis, Memphis, Tennessee.* Interstitial cystitis has been diagnosed in >0.5 million people in the United States. It is a urological disease of the bladder with unknown etiology and no reliable cure. Sucralfate is a drug labeled for treatment of duodenal ulcers. It binds to and coats ulcerated lesions, protecting them from further insult, which stimulates ulcer healing. My research has focused on the development of a dosage form of sucralfate which may utilize the cytoprotective properties of sucralfate in the bladders of patients with interstitial cystitis. Drug development has included suspension formulation, in vitro stability and degradation analysis, and, most recently, in vivo safety and efficacy projects. Current tissue sample assays are underway which will determine future directions for research.

EXPRESSION OF HIV ENVELOPE PROTEINS FROM RECOMBINANT SEMILIKI FOREST VIRUS VECTORS. *Charlotte D. Hyman and Randall J. Owens, Christian Brothers University, Memphis, Tennessee.* HIV envelope protein genes were excised from the plasmids, pS-T 713 , pDelta 701-706 , and pR-L 696 using Eco RI, Pst I, and Pvu I and then treated with Klenow polymerase. The Semiliki-Forest-virus expression plasmid pSFV-1 was cut with Sma I and then treated with phosphatase. Using standard molecular biological techniques, the env genes were ligated into the Semiliki Forest virus vector and screened by restriction-fragment analysis. Positive clones are being used to examine HIV-envelope-protein function in the absence of other HIV proteins through the use of the Semiliki Forest virus expression system.

EFFECTIVENESS OF ANTIGEN VERSUS ANTIBODY TESTING IN DETECTING HIV-1 IN PERIPHERAL WHOLE-BLOOD SAMPLES OBTAINED FROM CLINICAL TESTING CENTERS. *Emily Anne Oliver, Christian Brothers University, Memphis, Tennessee.* This experiment was designed to detect the effectiveness of antigen versus antibody testing in detecting HIV-1 in peripheral whole-blood samples which were routinely collected from clinical testing centers. The samples were exposed to a standard P-24 ELISA test to detect the presence of HIV-1. Quantitative optical density readings of the samples were obtained from a microplate autoreader. Positive and negative HIV-1 samples then were identified by comparison to known concentrations. In conclusion, the number of positives obtained from the antigen testing was compared to the number of positives obtained from the antibody testing to determine if there was any significant difference in effectiveness. The results of this experiment were gathered in the attempt to enhance the understanding of the degree of risk involved in the job of a health-care worker or allied professional as they treat hundreds of HIV-1 patients they may come in contact with each day.

MINIMIZING HUMAN T-CELL LYMPHOTROPIC VIRUS TYPE 1 (HTLV-1) REPLICATION BY THE USE OF SYNTHETIC DERIVATIVES OF HUMAN ENDOGENOUS COMPOUNDS. *Jodi E. Rump, Christian Brothers University, Memphis, Tennessee.* Synthetic derivatives of natural compounds produced in the human body have been proven to be effective against HIV-1 retrovirus; thus, an investigation was undertaken to determine if similar results could be obtained against another retrovirus, human T-cell lymphotropic virus type 1 (HTLV-1). HUT-102 cells were treated with eight different compounds and a placebo and then assayed to HTLV-1 production by p19 antigen capture ELISA, indirect immunofluorescence, and cell culture counts. All of the eight synthetic compounds are mutated forms of a natural body product which have been altered to be more effective than the original. Of the eight synthetic derivatives of natural endogenous compounds all showed significant reduction in p19 antigen production indicating an inhibition of viral output. The derivatives reduced the viral output of HTLV-1 producing HUT-102 lymphocytes in the range of 34.0-75.3%. The study illustrates that the synthetic derivatives of natural endogenous compounds are effective against not only HIV-1 but also HTLV-1/II, thus showing that they are effective against a broad range of retroviruses. These results are an indication that the synthetic compounds are boosting a fundamental internal element in ways that allow the body to increase its natural defense by kick-starting the immune system.

PLASMA NITRITE-NITRATE CHANGES DURING HEMODIALYSIS IN END-STAGE RENAL DISEASE. *Carolyn E. Waits, Ellen S. Kang, Yu-Bo Wang, Marjorie T. Tevlin, Don Miles, Linda Myers, and Sergio Acchiardo, Christian Brothers University, Memphis, Tennessee.* Nitric oxide plays a major role in blood-pressure regulation. Hypotensive episodes during hemodialysis have been linked to increase in the generation of nitric oxide by the observation that higher plasma concentrations of the stable end products of nitric oxide, nitrite, and nitrate were found at the end of dialysis than at the start of dialysis associated with hypotension. Whether changes in plasma nitrite-nitrate are characteristic for patients were examined. Studies were conducted on 10 patients during each of three consecutive hemodialysis procedures by serial analysis on nitrite-nitrate concentrations in plasma. Compared to controls, end-stage renal disease subjects had higher plasma nitrite-nitrate values ($141.6 \pm 19.67 \mu\text{M}$ versus 37.2 ± 5.48 , $P = 0.0057$) which were correlated with a decrease in systolic and diastolic blood pressure, decreased in skin temperature, and increased in pulse rate.

EFFECTS OF ACETYLCHOLINE MICROAPPLICATION ONTO CORTICAL NEURONS IN CHOLINERGIC-DEPLETED ANIMALS. *Nedra J. Exum, Rodney J. Beasley, and Paul Herron, The University of Tennessee at Memphis, Memphis, Tennessee.* The purpose was to determine if the effects of microapplication of acetylcholine onto cortical neurons restore evoked activity and alter receptive field size in cholinergic-depleted animals. Experiments were performed on the whisker representation in the somatosensory cortex of the rat. An immunotoxin, 192 IgG-saporin, was used to kill acetylcholine neurons in the basal forebrain. The basal forebrain provides ca. 80% of the acetylcholine input to the cortex. Triple barrel electrodes were used to inject acetylcholine and atropine (an antagonist of receptors for acetylcholine) and to do electrophysiological recordings. Recordings were done before, during, and after injections of acetylcholine and atropine. The results showed that the microapplication of acetylcholine increased evoked activity in 60% of the neurons, caused no change in 20%, and decreased evoked activity in 10%. The microapplication of acetylcholine decreased receptive field size decreased in 50% and caused no change in the remainder.

ACUTE EXERCISE EFFECT ON MODULATION OF BLOOD-PRESSURE RESPONSES TO COLD PRESSOR TEST. *Gary Leventhal, Hani Rashed, Patricia Hafford, Mohammed R. Uddin, Stanley Abell, Ernest C. Madu, Eldridge Johnson, and Sergio Cardoso, LeMoyne-Owen College, Memphis, Tennessee, Collierville High School, Collierville, Tennessee, and The University of Tennessee at Memphis, Memphis, Tennessee.* Modulation of cardiovascular functions by exercise as manifested by changes in blood pressures in response to cold pressor test was studied. A control group and an age-matched group of athletes were exposed to 1-min cold pressor test, one before and one after 10 min of bicycle exercise at 70% reserve heart rate. Blood pressures were recorded in the contralateral arm. The subjects demonstrated an increase in blood pressure as response to cold pressor test either before or after exercise ($P < 0.05$). While the elevation in diastolic blood pressure induced by cold pressor test was blunted significantly by exercise in both groups, only athletes showed a significant exercise-induced attenuation. In both groups, cold pressor test resulted in significant increase in blood pressure. Exercise blunted the cold-induced elevation of blood pressure.

BLOOD PRESSURE IN BLACK AND WHITE TEENAGERS LIVING IN URBAN, SUBURBAN, AND RURAL SETTINGS. *P. Hafford, M. R. Uddin, S. Abell, K. Baskerville, E. Johnson, G. Leventhal, H. Rashed, E. C. Madu, and S. Cardoso, LeMoyne-Owen College, Memphis, Tennessee, Collierville High School, Collierville, Tennessee, Rust College, Holly Springs, Mississippi, and The University of Tennessee at Memphis, Memphis, Tennessee.* It is widely recognized that resting levels of blood pressure are elevated in black subjects in comparison to age-matched Caucasians and that resting blood pressure and eventually the development of hypertension result from a life-long complex interaction between genetic, cultural, and socioeconomic factors. Hence, in our study, with using a Dynamap, we recorded resting blood pressures in freshman students at Rust (rural) and LeMoyne-Owen (urban) colleges, as well as in Germantown High School students. The results suggest that genetic and life-styles factors play a role in the control of blood pressure, as blood pressure in blacks was greater than that in whites, and residents of the rural setting had significantly lower blood pressure than their urban peers. Continuing studies will involve urban white college and rural, black, high-school students to further define the findings.

EYE PREFERENCE IN THE SMALL-EARED BUSHBABY, *OTOLEMUR GARNETTII*. *Crystal Keeney, Christian Brothers University, Memphis, Tennessee.* Eye preference was measured in the small-eared bushbaby, *Otolemur garnettii*, using three different stimuli: mealworms (*Tenebrio* larvae); a stuffed owl; a camera. The mealworms were used as a food attraction, the owl was used as a threatening stimulus, and the camera was used as a baseline stimulus. Monocular eye use was scored for viewing the various stimuli was found. The subjects seemed to have a stronger left-eye preference when viewing the mealworms than when viewing the owl. Comparison is made with the results of previous exploratory research with the same species.

MECHANISMS INVOLVED IN THE REGULATION OF CELL PROLIFERATION. *Duyen Thuy Nguyen, The University of Tennessee at Memphis, Memphis, Tennessee.* The polyamines and isoprenoid lipids biosynthesis are necessary for cell growth. The inhibition of the biosynthesis of either one of these causes a dramatic decrease in the cell-proliferation rate. The experiment was performed on the IEC-6 cells which were treated with difluoromethylornithine or lovastatin, inhibitors of polyamine and isoprenoid lipid synthesis, respectively. The treated IEC-6 cells were incubated for 2 days. The doubling time was calculated to determine the cell-proliferation rate. The doubling time of

difluoromethylornithine- or lovastatin-treated cells increased as compared to the control cells. However, when the cells were treated with difluoromethylornithine and exogenous putrescine or lovastatin and exogenous mevalonic acid, the inhibition of difluoromethylornithine or lovastatin can be overcome by the supply of the exogenous polyamine or mevalonic acid. Thus, the cell-proliferation rate and the doubling time return to normal.

GROWTH INHIBITION BY PINE ROOT TISSUE EXTRACT. *Michael Coleman and M. R. Uddin, LeMoyné-Owen College, Memphis, Tennessee.* These experiments examined the growth inhibiting properties of pine root tissues. One-week-old lettuce seedlings were sprayed for 3 weeks with hexane and methanol extract of pine roots. Seedling response were measured by recording fresh seedling weight, dry-matter weight and seedling survival. Hexane and methanol extract had significantly reduced fresh weight and dry weight of seedlings and seedling survival. Pure hexane killed all seedlings while almost 40% of the seedlings sprayed with hexane extract of pine roots survived through the experiments. There is no difference in survival rate of seedlings when pure methanol, methanol extract of pine root, or distilled water was sprayed on the lettuce seedlings. Seedling dry matter was significantly less when sprayed with methanol extracts as compared with pure methanol or distilled water. Methanol extract of pine roots applied on lettuce-leaf section cultured on Murashige and Skoog medium supplemented with 2 mg/l NAA inhibited morphogenesis whilst inducing callusgenesis. Leaf sections cultured on Murashige and Skoog medium with 2 mg/l NAA produced about eight to 12 adventitious roots 3-5 mm long.

BUTEO JAMAICENSIS DISTRIBUTION ALONG INTERSTATE 40. *Richard J. Reynolds, Rhodes College, Memphis, Tennessee.* I investigated the way *Buteo jamaicensis* (red-tailed hawks) was distributed along 161 km of Interstate 40 west of Memphis, Tennessee, on two occasions during January 1996. This area is part of the hawk's wintering grounds on the southern end of its range. Generally, the habitat adjacent to the interstate is flat farmland. I tested how the hawks were distributed, i.e., uniformly, clumped, or randomly. I recorded numbers of hawks per 1.61 km from a moving vehicle at each 1.61-km interval for 161 km. These data were reduced using two goodness-of-fit tests for the Poisson distribution. On both occasions, I found that the hawks were distributed randomly. This observation may indicate that perch sites or location of food resources are randomly distributed.

ABSENCE OF THE PALMARIS LONGUS MUSCLE IN THE FOREARMS OF CADAVERS AND LIVING SUBJECTS. *Travis L. Loveday, The University of Tennessee at Memphis, Memphis, Tennessee.* The palmaris longus muscle is a muscle that is seen variably in the forearms of humans. In 1944, investigators observed that the palmaris longus muscle was absent in 14.7% of all limbs. The purpose of this study was to calculate its rate of absence now, some years later. The data was collected by observing the muscle or tendon of 179 subjects. Both upper extremities of 30 cadavers were dissected, and their forearm contents examined. Also, both upper extremities of 149 living subjects were examined for the tendon of the palmaris longus on the volar aspect of the wrist. When present, the tendon is observable on the volar aspect of the wrist when there is simultaneous opposition of the thumb and little finger combined with resisted wrist flexion. These data suggest that the palmaris longus muscle was absent approximately double the rate in this study as compared to the 1944 study, as it was found that the palmaris longus muscle was absent in 26.5% (95 of 358) of all limbs studied.

SEROLOGICAL INVESTIGATIONS OF *ACREMONIUM* ENDOPHYTES. *J. D. Carter, O. J. P. Ball, and K. D. Gwinn, The University*

of Tennessee, Knoxville, Tennessee, and Union University, Jackson, Tennessee. Tall fescue, an important grazing grass, is often infected by *Acremonium coenophialum* which results in increased survival of the plant as well as detrimental effects in grazing cattle. Little is known about the *Acremonium*-like endophyte which infects annual rye grass. Serological tests, such as enzyme-linked immunosorbent assays (ELISAs) and tissue print immunoblots (TPIBs), are efficient methods for determining infection levels in large numbers of plants. In this experiment, methods of threshold level determination in ELISAs were evaluated, and the use of three antisera were compared in ELISAs and TPIBs. Attempts were made to detect the *Acremonium*-like endophyte with antisera specific for *A. coenophialum*. In samples of low variation, three times the negative mean yielded the most accurate threshold. All antisera worked for both tests. However, the clearest results for the ELISA came from UT1 and UT2, while the most distinctive results for the TPIB came from Arkansas. All antisera also detected the *Acremonium*-like endophyte using TPIB and ELISA. The implication is that the two endophytes share antigenic determinants and may be evolutionarily related.

EFFECTS OF EXPOSURE TO ULTRAVIOLET LIGHT ON THE DEVELOPMENT OF *RANA PIPIENS*, THE NORTHERN LEOPARD FROG. *J. J. Williams and H. W. Wofford, Union University, Jackson, Tennessee.* The increase in ultraviolet light intensity levels due to ozone depletion recently has been linked to the decline in amphibian populations. In this experiment, eggs and larvae of *Rana pipiens* were subjected to differing amounts of ultraviolet radiation to determine the effects of ultraviolet light on the development of amphibian tadpoles. The total length, length of body without tail, and maximum width of each specimen was recorded for a month of the tadpoles' development, including several measurements after the ultraviolet exposures were concluded. It was found that ultraviolet exposure significantly reduced the size of the organisms in comparison with the control group in all three measured areas. Ultraviolet radiation altered the health and appearance of the exposed organisms and was lethal at large amounts. This experiment showed that ultraviolet radiation could cause many problems in developing amphibians. By slowing their development and physically weakening predation, thus contributing to a decline in overall population levels.

EFFECTS OF EPRISTERIDE ON THROMBOXANE A_2 /PROSTAGLANDIN H_2 RECEPTORS IN HUMAN ERYTHROLEUKEMIA AND RAT AORTIC SMOOTH MUSCLE CELLS. *Elizabeth R. Morgan, Katsuhiko Higashiura, Perry V. Halushka, and H. Wayne Wofford, The Medical University of South Carolina, Charleston, South Carolina, and Union University, Jackson, Tennessee.* Testosterone has been shown to increase thromboxane A_2 /prostaglandin H_2 (TXA₂/PGH₂) receptor densities in RASM and HEL cells, which may be associated with increased incidence of cardiovascular disease. In vivo, 5 α -reductase catalyses the conversion of testosterone into dihydrotestosterone. L-645390 and epristeride, both 5 α -reductase inhibitors, inhibit the action of testosterone in RASM cells. In HEL cells, however, the effects of testosterone are not inhibited by L-645390. In this study, HEL cells were cultured and treated with epristeride (400 nM) \pm testosterone (200 nM), while RASM cells were cultured and treated with epristeride (10 nM) \pm testosterone (200 nM). All cells were treated for 48 h. The cells were harvested, and the number of TXA₂ receptors were assessed using ¹²⁵I-BOP radioligand-binding assays. Epristeride did not inhibit the effect of testosterone to increase the receptor density in HEL cells. However, preliminary results showed that low concentration epristeride did inhibit the effects of testosterone in RASM cells. In HEL cells, testosterone may act directly, or there may be either no 5 α -reductase or presence of a unique subtype of 5 α -reductase. The results obtained suggest that epristeride may have clinical value in controlling cardiovascular disease.