

## ABSTRACTS OF PAPERS PRESENTED AT THE SPRING 2002 COLLEGIATE MEETINGS

## EASTERN REGION

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE  
KNOXVILLE, TENNESSEE

YEAST MATING RECEPTORS ARE SENSITIVE TO ANTI-FUNGAL AGENTS. **Sebastien Demoiny, Drew Reynolds, and Stephen Wright**, Carson-Newman College, Jefferson City, Tennessee. Alpha-factor is an external signaling molecule that binds to the surface of yeast cells and signals the production of proteins within the cell involved in the mating response. The receptor that binds  $\alpha$ -factor is similar to the most abundant group of receptors in mammals. Using brewers yeast, *Saccharomyces cerevisiae*, we studied the activity of the membrane receptor after the cells were treated with the anti-fungal drug ketoconazole. This drug reduces the levels of sterols in the membrane by inhibiting their synthesis. Using an assay where we could measure the ultimate effects of receptor activation on gene activity, we found that total receptor activity was reduced in the presence of the drug even at high concentrations of  $\alpha$ -factor. These findings lead us to believe that the drugs may reduce the number of receptors or change the membrane lipids so that the receptors are disabled.

THE ANTIFUNGAL DRUG DIFLUCAN ALTERS THE ACTIVITY OF A CELL SURFACE RECEPTOR. **Drew Reynolds, Sebastien Demoiny, and Stephen Wright**, Carson-Newman College, Jefferson City, Tennessee. We examined the effects of the antifungal drug Diflucan on the growth and pheromone response in the yeast *Saccharomyces cerevisiae*. Pheromones are released from yeast cells to signal the mating response with yeast of another mating type. The pheromone  $\alpha$ -factor binds to a cell surface receptor that then activates many proteins within the cell and eventually turns on genes that allow the cells to fuse. One of these genes has had a marker gene fused to it so these events may be quantified. Diflucan is a drug that inhibits growth of yeast cells by changing the levels of sterols in the membrane where the receptor is located. We found that the drug significantly reduced the level of receptor activity as determined by the gene activation assay. The affinity of  $\alpha$ -factor for the receptor does not seem to be as strongly affected as the total activity.

THE ACCURACY OF THE GRAVITATIONAL FLOTATION TECHNIQUE USING ZINC SULFATE FOR DETECTING *GIARDIA DUODENALIS* CYSTS IN FECES. **Wendy L. Lane, Charles Faulkner, and Sharon Patton**, Pellissippi State Technical Community College, Knoxville, Tennessee, and The University of Tennessee School of Veterinary Medicine, Knoxville, Tennessee. A direct comparison of the centrifugal and gravitational flotation techniques, using Zinc Sulfate (ZSF), for the detection of *Giardia duodenalis* cysts in feces was accessed. The purpose of this experiment was to: 1) determine the practicality and diagnostic accuracy of detecting the protozoan *Giardia duo-*

*denalis* using gravitational techniques in the context of daily veterinary practice, 2) determine the adequacy of ZSF as a reliable flotation medium that does not extensively compromise and distort the integrity of the cysts when the gravitational flotation technique is allowed to incubate for 10, 15, and 20 min respectively, and 3) to discover the optimal incubation period for diagnostic purposes. The data observed and recorded strongly suggest that the gravitational fecal flotation technique is extremely inferior in kind to the centrifugal flotation technique, recovering only 10% of the cysts that were recovered from the centrifugal method.

TREATMENT OF HYDROGEN CYANIDE AND HYDROGEN CHLORIDE INHALATION IN MICE WITH HYPERBARIC OXYGEN THERAPY VERSUS SUPPLEMENTAL OXYGEN. **Renee Rader**, Southern Adventist University, Collegedale, Tennessee. Hyperbaric oxygen (HBO) therapy promotes faster tissue healing by increasing the amount of oxygen carried to the tissues. HBO is currently used to treat carbon monoxide poisoning as well as smoke inhalation. Based on this information, it is believed that HBO will promote faster healing for hydrogen cyanide gas or hydrogen chloride gas inhalation, which are encountered in burning material. To test this theory, mice were exposed to HCN or HCl gas. The mice were then placed in hyperbaric oxygen or given supplemental oxygen. Weight change and overall survival rate were used to establish what method of treatment promoted the fastest healing after gas exposure. It was determined that mice treated with supplemental oxygen alone healed as quickly as those treated with hyperbaric oxygen. Therefore, in the case of hydrogen cyanide or hydrogen chloride inhalation, supplemental oxygen alone is the preferred treatment.

POLYMER QUANTUM DOTS: EVIDENCE FOR A NANOCRYSTALLINE PHASE OF A SEMICONDUCTING POLYMER. **Pradeep Kumar, Mark Dadmun, Adosh Mehta, and Michael D. Barnes**, University of Tennessee, Knoxville, Tennessee, and Chemical Sciences Division of Oak Ridge National Laboratory, Oak Ridge, Tennessee. The optoelectronic and luminescent properties of MEH-PPV, a well-known semiconducting polymer, has made it the material of choice in a number of research and development directions aimed at engineering polymer-based low-threshold microlasers, light-emitting diodes, and other photonics applications. The chain configuration and chromophore alignment, probed extensively in thin films, are important parameters in determining the performance of these devices. Here we discuss novel probes of polymer chain organization and chromophore alignment of isolated MEH-PPV nanoparticles using Atomic Force Microscopy (AFM) and fluorescence emission pattern imaging. The results show that the polymer chains are highly organized in a rod shaped nanoparticle whose long axis can be uniformly oriented perpendicular to a glass substrate. This has important implications for nanoscale photonics and microlaser applications.

UTILIZATION OF OPTICAL TWEEZERS FOR THE TRAPPING AND MANIPULATION OF 1–3  $\mu\text{M}$  SIZED LATEX PARTICLES AND SUSPENDED *STAPHYLOCOCCUS EPIDERMIDIS*. *Esther Kim, Ann Foster, and Chris Hansen, Southern Adventist University, Collegedale, Tennessee.* A so-called optical tweezer setup is being constructed to trap and manipulate *Staphylococcus epidermidis*. As a preliminary step, the capabilities of the optical trap were tested using small latex spheres (1–3  $\mu\text{m}$ ) in place of bacteria. Results from these studies and initial attempts to trap planktonic bacteria will be presented.

THE EFFECTIVENESS OF A FAR LATERAL L5–S1 MICRDISCECTOMY IN PAIN REDUCTION. *Jamie Griffin, Southern Adventist University, Collegedale, Tennessee.* Diagnosis of far lateral disc herniations has become more common in recent years. This study describes the surgical procedure used for L5–S1 far lateral disc herniations, shows the benefits derived from a far lateral approach, and retrospectively evaluates the outcome of the surgery. Eight patients were included in the study, five females and three males. The mean age was 62 years (range 45–77 years). VAS pain scale, OSW index, and SF-36 forms were used to evaluate the surgical outcome. Both the VAS pain scale and OSW index were improved postoperatively.

MATURATION OF DENDRITIC CELLS MAY EXCEED ESTIMATED 24 HOUR PERIOD. *Sarah Reeves, Southern Adventist University, Collegedale, Tennessee.* Dendritic cells (DCs) are responsible for antigen uptake, presentation, and stimulation of T cells responsible for recognizing these antigens. During their immature stage they constantly endocytose fluids and particles from the interstitial fluid in the periphery, such as the skin, organs, and mucous membranes. Maturity is reached after the uptake of antigen stimulates the loading of a foreign peptide on their major histocompatibility complex class II (MHC II) molecules, which then are expressed on the cell surface. Dendritic cells cease antigen uptake and presentation at some point between the uptake of a maturation stimulus (such as bacteria) and the point at which the DC is fully mature. Dendritic cells have been estimated to have a 24 h maturation period. However, recent experimental results indicate this period is longer than 24 h.

RADIO SIGNALS FROM JUPITER. *Yvan De Repentigny, Roane State Community College, Harriman, Tennessee.* The project consists of assembling a short-wave receiver that picks up radio signals from the great planet Jupiter. This receiver contains many electronic components such as resistors, capacitors, inductors, and a transistor among other pieces of hardware. Fabrication included the handling of small, fragile, electronic parts, most of which are mounted and soldered onto a printed circuit (PC) board. A dipole antenna was installed outside. Once the radio became functional, it was connected to a computer. The monitoring system called Radio Jove Program was implemented so that data can be observed not only at Roane State, but also from anywhere else in the world, even your own living room.

ASTROPHOTOGRAPHY AT THE TAMKE-ALLAN OBSERVATORY. *Whitney Styles and Larry Byrge, Roane State Community College, Harriman, Tennessee.* We have done Planetary and Cometary Astrophotography at the Tamke-Allan Observatory using two CCD Cameras and an 8" Schmidt-Cassegrain Telescope. The two cameras are the Starlight X-press MX5-C color CCD Camera and a Santa Barbara Instruments Group CCD

Camera. These photographs were made over a period of six months. In several cases, selected photographs were overlaid to get significant improvements in contrast and resolution. This work was done to gain experience in taking astrophotographs of faint and distant objects. We expect to apply these techniques to obtain astrophotographs of planetary and diffuse nebulae and galaxies.

## MIDDLE REGION

AUSTIN PEAY STATE UNIVERSITY  
CLARKSVILLE, TENNESSEE

AN EXAMINATION OF GENDER DIFFERENCES IN THE CONCEPTUALIZATION OF MENTAL ILLNESS IN COLLEGE STUDENTS. *Ursula Bailey and Peter Millet, Tennessee State University, Nashville, Tennessee.* The difference between genders in the conceptualizations of mental illness was investigated. Previous studies have concluded that conceptualizations of mental illness occur on three levels, identification of the mental illness (including severity and abnormality), the cause of the mental illness, and the suggested treatment for the mental illness. The participants were 93 college students obtained using a subject pool at Tennessee State University. The sample included African-American and Caucasian-American students from a sign up sheet with space for 50 males and 50 females to participate. A consent form, a short demographic questionnaire, and the Mental Illness Vignette Instrument II (MIVI II) were self administered in survey form. The MIVI II is an instrument consisting of 9 vignettes; with 8 of the 9 vignettes having a DSM IV diagnosed mental illness. Although there was no significant difference in abnormality and severity in men and women, men viewed behavior less abnormal and severe than women. This may have an effect on men being less likely to seek treatment. The results suggested that while men are less likely than women to seek treatment for mental illness, when they do go, they find it just as helpful. In this study and a previous study of a more general sample, moral weakness was found to be the leading perceived cause of mental illness in men and women. However, although spiritual reasons were the least likely perceived cause, religious treatment was the highest suggested treatment for men and women.

G1 STRESS, ROLE CONFLICT, AND SOCIAL SUPPORT AMONG MULTIPLE ROLE COLLEGE STUDENTS. *Jacinta Tibbs and Linda Knieps, Tennessee State University, Nashville, Tennessee.* Nearly 60% of college students today are non-traditional students. These students are more often characterized as occupying several roles (including parent, employee, and student). Thus, role conflict is more likely to occur. Role conflict occurs when two or more roles are partially incompatible; for example, when parenting obligations interfere with class attendance. Several studies indicate the presence of role conflict in women with dual roles. While most universities are designed for students that are only obligated to one role, these studies show that women who combine a student role with a family role have indicated an increase in the level of stress and role conflict in their lives. Stress and role conflict may decrease with an increased level of social support. African Americans often have closer family ties and friends often take on the role of 'fictive

kin'. Thus, non-traditional African-American students may have additional social support to buffer the effects of stress and role conflict. The goal of the present study is to investigate the literature regarding role conflict, stress, and social support among college students who are also parenting, with particular attention to the literature regarding African American students. This literature review will identify appropriate measures and hypotheses for research to be conducted with multiple-role students at Tennessee State University.

**THE INTERNAL WORKING MODEL OF ADULTS INTERPERSONAL RELATIONSHIPS.** *Jewell Hartwell and Dorothy Tucker, Tennessee State University, Nashville, Tennessee.* Abstract not available.

**BRIEF TRIPHENYL TIN EXPOSURE CAUSES IRREVERSIBLE INHIBITION OF THE CYTOTOXIC FUNCTION OF HUMAN NATURAL KILLER CELLS.** *Sharnise Wilson and Margaret Whalen, Tennessee State University, Nashville, Tennessee.* Phenyltin (PT) contamination has been reported in water, sediment, and fish. Triphenyltin (TPT) has been implicated in a wide spectrum of toxic effects in exposed animals, including increased tumor formation. Human exposure to TPT might come from occupational exposure as well as consumption of contaminated food. Natural Killer (NK) cells are a primary immune defense against tumor and virally infected cells. Previously, we reported that TPT exposure significantly inhibited the tumor killing capacity of human NK cells. In this study we examine whether the inhibition of NK-cell cytotoxicity induced by a 1 h exposure to TPT is reversible, when the cells are allowed to recover in TPT-free media for up to 6 days. Exposure to 750 nM TPT for 1 h decreased NK-cytotoxic function by approximately 57%. However, if the cells were allowed to incubate in TBT-free media for 24 h NK cytotoxicity was inhibited by 84%. There was no significant recovery of NK-cytotoxic function when the lymphocytes were allowed to incubate in TPT-free media for up to 6 days. The results indicate that short-term TPT exposure causes persistent negative effects on NK-cell ability to kill cancer cells.

**EFFECT OF TRIBUTYL TIN EXPOSURE ON THE EXPRESSION OF GRANZYME AND PERFORIN AND THE PHOSPHORYLATION STATE OF C-AMP RESPONSE ELEMENT BINDING PROTEIN IN HUMAN NATURAL KILLER CELLS.** *Tarrah Williams, Stephanie A. Green, and Margaret Whalen, Tennessee State University, Nashville, Tennessee.* Tributyltin (TBT) is found in dairy products, meat, and fish, and appears to increase the risk of cancer and viral infections in exposed individuals. We have demonstrated that the ability of human natural killer (NK) cells (our primary immune defense against tumor cells) to kill tumor cells is greatly diminished after a 1 h exposure to 300 nM TBT. We also have shown that a 1 h exposure results in dramatic decreases in NK-cell cyclic-adenosine monophosphate (cAMP) levels. This decrease in cAMP levels could alter expression of proteins regulated by the cAMP response element binding protein (CREB). The NK-cell tumorlytic molecules granzyme and perforin both are regulated by CREB. The current study examined granzyme and perforin levels following a 1 h exposure to 300 nM TBT. Results show that a 1 h exposure of NK cells to 300 nM TBT followed by 24 h in TBT-free medium causes decreased expression of granzyme and perforin. Granzyme and perforin levels were measured using specific antibodies. Antibody binding was visualized using a chemiluminescent

detection system. This study also investigated the effects of TBT exposure on CREB phosphorylation state utilizing specific antibodies to CREB and phosphorylated CREB. CREB and phosphorylated CREB levels were determined by densitometric analysis of film exposed to the chemiluminescent blot.

**THE EFFECT OF IRON ( $Fe^{+2}$ ) ON LIPID PEROXIDATION IN ARACHIDONIC ACID.** *Omari Bandele and William Boadi, Tennessee State University, Nashville, Tennessee.* Iron ( $Fe^{2+}$ ) is a heavy metal and an environmental contaminant that can cause gene mutations and cancer. Iron induces lipid peroxidation through the Fenton chemistry. The purpose of this experiment was to investigate how high doses of  $Fe^{2+}$  as iron chloride can cause peroxidation in lipids, especially those of the essential group. Controls, samples, and blanks were prepared in triplicate. The control included Tris-HCl buffer containing 0.2% SDS and 0.05 M KCl, pH 7.4, arachidonic acid, and hydrogen peroxide. The samples contained all of the control ingredients in addition to 5 mM  $Fe^{2+}$ . Assaying for the thiobarbituric reactive substances using the molar extinction coefficient of thiobarbituric acid of  $1.56 M^{-1} \times cm^{-1}$  assessed the extent of lipid peroxidation. The effect of incubating arachidonic acid for 24 h with  $Fe^{2+}$  on lipid peroxidation resulted in a dose-dependent increase of lipid peroxidation. The results indicate that environmental exposure to  $Fe^{2+}$  can cause oxidation in the essential fatty acids that could lead to serious health problems.

**TOWARD UNDERSTANDING THE EFFECTS OF ION COORDINATION ON THE SITE-SPECIFIC DYNAMICS OF A LOW MOLECULAR WEIGHT POLY (ETHYLENE OXIDE).** *John Sears and John Shibata, The University of the South, Seawane, Tennessee.* Ion-conducting polymers, polymer-salt systems that exhibit increased conductivity even in the solid state, have been the focus of numerous studies. Of particular interest have been the properties and transport mechanisms of systems containing poly(ethylene oxide) (PEO) as either the host polymer or, in the case of low MW PEO, as a cross-linking agent and a non-volatile plasticizer in various host polymers exhibiting improved mechanical properties. Dynamic bond percolation theory, the proposed transport mechanism, involves an associative/dissociative process of transient "crosslinks" between the cation and multiple sites along the polymer backbone. Tetra(ethylene glycol)dimethyl ether (TEGDME) has been studied in  $D_2O$  and  $CH_3OD$  with added NaI as a model for the high MW systems. The system has been studied at different polymer concentrations and different ether oxygen to sodium ratios (EO:Na).  $^{13}C$ -NMR relaxation measurements of the spin-spin relaxation times ( $T_2$ ), spin-lattice relaxation times ( $T_1$ ), and the nuclear Overhauser effect (nOe) have been carried out to investigate the nature of the ether oxygen-sodium bond and its effect on the segmental motion of the host polymer. Various models have been employed to rationalize the experimental NMR data with varying degrees of success. The validity of the model, when combined with the presumptions formed to create it, can reveal information pertaining to the local motions in the polymer. Some of the experimental data will be presented along with explanations of the interpretation process and the information revealed.

**BINDING OF ECHINOMYCIN TO DNA.** *Kennita Jobe and Fu-Ming Chen, Tennessee State University, Nashville, Tennessee.* Echinomycin (ECHN) is a cyclic octadepsipeptide antibiotic that contains a thioacetal cross bridge and two quinoxaline rings at-

tached to the two D-Ser residues. It has been shown to bind tightly to duplex DNA as a bisintercalator with a preference to the CpG sequence. This report describes the absorption titration and melting studies on ECHN binding to oligonucleotides containing three CpG sites. Specific sequences studied were d(TCGTCGTCGA)/d(TCGACGACGA) and d(ACGACGACGT)/d(ACGTCGTCGT). The results indicate that ECHN binds strongly to both duplexes, with binding stoichiometries somewhat higher than 1 drug to 1 strand (or 2 drugs to 1 duplex). The strong binding is further supported by the considerable melting temperature increases upon drug binding. The melting profiles of the drug+DNA complexes exhibit some biphasic character. Attempts were made to interpret these results in terms of the coexistence of complexes with two and three drugs bound to a duplex DNA in the solution.

**EFFECT OF AGITATION ON THE PRODUCTION OF  $\delta$ -ENDOTOXIN BY *BACILLUS THURINGIENSIS* ISOLATES. *La Tasha D. Taylor, Sharon Spark, Shartondra Jackson, Anthony O. Ejiofor, and Terrance L. Johnson, Tennessee State University, Nashville, Tennessee.***

The insecticidal crystal  $\delta$ -endotoxins of *Bacillus thuringiensis* are useful in the control of agricultural insect pests and vectors of human diseases. Three isolates of this bacterium, BT10, BT24 and BT25, identified as subspecies *kurstaki*, *aizawai*, and *kenyae* were grown to stationary phase at three agitation speeds of 100, 200, and 300 rpm at 30°C for 36 h in a semi synthetic medium containing (w/v) glucose, 10.0 g; yeast extract, 5.0 g; Na<sub>2</sub>HPO<sub>4</sub>, 5.57 g; KH<sub>2</sub>PO<sub>4</sub>, 2.4 g; MgSO<sub>4</sub>·7H<sub>2</sub>O, 50.0 mg; MnCl<sub>2</sub>·4H<sub>2</sub>O, 4.0 mg; FeSO<sub>4</sub>·7H<sub>2</sub>O, 2.8 mg; CaCl<sub>2</sub>·2H<sub>2</sub>O, 1.5 mg; and agar, 15.0 g. The spore/crystal mixtures were harvested by centrifugation at 7000 g, 4°C and 10 min and washed six times in ice-cold deionized water. Spores and crystals were separated on a 45, 67, and 87% discontinuous sucrose gradient by ultracentrifugation at 80,000 g. The separation was confirmed by examination of smears by polarized light microscopy. The crystals at 2 mg/ml were solubilized by treatment with 50 mM Na<sub>2</sub>CO<sub>3</sub>·HCl (pH 10.5), incubation at 37°C for 60 min and centrifugation at 10,000 g, 4°C for 10 min. Protein concentration in the crystals was determined by the method of Lowry. The banding patterns of the solubilized protein crystals were determined by SDS-PAGE according to the method of Laemmli and Favre. Bipyramidal crystals were obtained from all three isolates. Changes in protein concentrations showed an increasing pattern in BT10 but not in the others. The banding patterns showed significant differences in the isolates.

**THE ANALYSIS OF C-FOS EXPRESSION USING IMMUNOHISTOCHEMISTRY OF DOPAMINE D<sub>3</sub> RECEPTOR OF METHAMPHETAMINE-INDUCED MICE. *Mark Owusu and M. Ann Blackshear, Tennessee State University, Nashville, Tennessee.***

PD128907, a putative selective dopamine D<sub>3</sub> agonist, has been used to study the function of brain dopamine D<sub>3</sub> receptors. Recent reports have shown that PD128907 causes both an increase and a decrease in locomotor activity, presumably mediated by dopamine D<sub>3</sub> receptors in the nucleus accumbens. Also, studies in our laboratory suggest that D<sub>3</sub> receptors may play a role in the chronic locomotor effects of methamphetamine (MAP). The purpose of this study was to determine whether there are dose-related changes in the locomotor effects of PD128907, and if so whether these changes modify MAP sensitization. Additionally, since rapid and transient expression of the immediate early gene, *c-fos*, occurs following administration of MAP. Analysis of *c-fos* expression will be used to further access the action

of PD128907 at the D<sub>3</sub> receptors using immunohistochemistry. Swiss, male mice (26–30 g) were divided into groups of five depending on the treatments administered including Saline, MAP, Saline/MAP, 0.25 PD/MAP, 0.5 PD/MAP. All measurements were done in mg/kg. All PD128907 treatments were done 10 min prior to MAP injection. Locomotor activity was measured immediately after MAP injection on days 1, 7, and day 18 after a ten-day withdrawal period. All mice received a challenged dose of one-quarter of the original dose of MAP. Differences in *c-fos* expression occurred for the different treatments. Most importantly, *c-fos* expression was high in animals with the Sal/MAP and MAP treatments, while animals receiving 0.25 PD/MAP and 0.5 PD/MAP had very low *c-fos* expression. This indicates that the PD128907 caused a decrease in the effect of the MAP at the D<sub>3</sub> receptors at the nucleus accumbens of the mouse brain. (Supported by NIH Grant # RR-11808 and MARC Grant 5 T34 GMO7663)

**GENETIC SCREENING FOR REGULATORS OF P150GLUED-DYNACTIN AND DYNEIN FUNCTION IN *DROSOPHILA*. *Tiffany R. Oliver, Tonja D. Dandy, A. Monique Johnson, Anne Ilvarsonn, and John T. Robinson, Tennessee State University, Nashville, Tennessee.***

Microtubules and associated motor complexes are required for a number of motility functions within eukaryotic cells. Disruptions in microtubule based transport affect numerous aspects of cell behavior including mitosis and cell division, differentiation, viability, and morphogenesis of tissues. Cytoplasmic dynein, a 1.2 mD minus-end directed microtubule mechanochemical complex facilitates a variety of intracellular transport processes. Moreover, dynactin (dynein activator), another multisubunit complex, co-fractionates with cytoplasmic dynein and further is required for cytoplasmic dynein-based motility functions in vivo and in vitro. In *Drosophila melanogaster*, the Glued gene encodes the homologue of the largest vertebrate dynactin subunit known as p150Glued. A dominant mutation in the Glued gene, Glued1 (G11) exists which encodes a truncated p150Glued polypeptide that produces an aberrant rough eye phenotype in heterozygous adults (G11/+). To identify novel regulators of dynein-dynactin based motility, genetic and molecular approaches are being used to screen for mutations throughout the *Drosophila* genome that modify (suppress or enhance) the G11 eye phenotype. From these screens, we are identifying expected intrinsic and novel extrinsic regulators of dynein-dynactin function. Results from this work are aimed at determining the range of function of cytoplasmic dynein based motility during *Drosophila* and metazoan development. (Supported by NIGMS Grant # S06GM08092 to JTR and MARC to TRO)

**EXAMINATION OF THE EFFECTS OF TWO SPECIES OF *HYPERICUM* ON CELL LINE BT549. *Alicia Cleveland, Timothy Udoji, T. Gary, R. Sauve, S. Bhatti, D. Long, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.***

St. John's Wort is a herbal plant with a complex and diverse chemical composition. Hypericin is the most active constituent in the herb and is nonfunctional unless combined with other constituents of the plant. Hypericin is a unique photosensitizing plant pigment that is reported to induce apoptosis in tumor cells. Human diseases such as AIDS, neurodegenerative disorders, and cancer occur due to failure of apoptosis. Thus, knowledge about the role of anti-neoplastic drugs will become an important tool in cancer therapy. The objective of this study was to show the effect of the herbal extracts, *Hypericum perforatum* cv anthos

(HPA) and *Hypericum calycinum* (HC) on cultured BT549 cancer cells. The one significant thing about this plant is its property to act like an anti-cancer agent. Through aseptic techniques, the influence of HPA and HC on the BT549 cell line was determined via extract concentration and cell density analyses. The amount of HPA and HC added to each plate varied inversely with the number of recovered cells. The data indicate that hypericin may induce apoptosis in BT549 cancer cells.

**REGENERATION OF *HYPERICUM TOPAS* AND EXAMINATION OF ITS ANTICARCINOGENIC CAPABILITY.** *Rosalind S. Johnson, T. Gary, R. Sauve, and E. Lewis Myles, Tennessee State University, Nashville, Tennessee.* Traditional use of *Hypericum* (St. John's Wort) is as a herbal remedy to treat mild depression. Our lab first published its anti-cancer activity in August 2000. Our lab is investigating *H. topas* for its regeneration capability and its potential as an anti-carcinogen. *Hypericum topas* was germinated under sterile conditions and maintained under greenhouse conditions. All plants were grown in pots consisting of peat, perlite, and pine bark. The regeneration of plants initiated from seeds. The seed plants were initiated with seeds. The seeds were surface sterilized and allowed to germinate on Murashige and Skoog (MS) basal medium. After germination, the hypocotyl sections were removed. These sections were placed on MS media containing 2 mg/l of 2,4 Dichlorophenoxy-acetic acid. Once the hypocotyls section formed callus it was transferred to MS media supplemented with 0.2 mg/l of benzyladenine (BA). Cultures were maintained in complete darkness at 26°C. After three weeks, the cultures were placed under constant light, which allowed the shoots and leaves to turn green. Extraction of secondary compounds was prepared using the Soxhlet and an evaporator. Secondary compounds were extracted from the regenerated shoots with the same protocol as non-regenerated plants. Tissue samples were first frozen with liquid nitrogen and dehydrated by lyophilization. Tissue samples were extracted with acetone and distilled for 16 hours with a Soxhlet. After extraction, the sample was evaporated to dryness and then re-dissolved into dimethyl sulfoximine (DMSO). This crude extract was applied to actively growing cancer cells. Both non-regenerated plants and regenerated plants reduce the growth of cancer cell line BT549. The non-regenerated plants reduce cell growth more than the regenerated plants.

**GEOGRAPHY EDUCATION IN TENNESSEE'S COPPER BASIN.** *J. Douglas Heffington and Lisa H. Mayo, Middle Tennessee State University, Murfreesboro, Tennessee.* Fieldwork and field observations are at the core of geographic education, but the sad truth is that many K-12 educators are never afforded opportunities to get out of the classroom and into the field. The need for such experiences is tremendous, and the benefits of the knowledge gleaned there have direct relationships to the classes, students, communities, and regions of the teachers involved. We were able to involve K-12 educators, teachers of science and social studies, in a mentoring exercise with pre-service teachers, conducting fieldwork and observations in the Copper Basin of extreme southeast Tennessee. A National Council for the Social Studies grant for the Enhancement of Geographic Literacy made such an excursion possible. The short, one-day field experience exposed these educators to geographic fieldwork, especially the concepts and realities of physical and cultural landscapes and human-environment relationships.

**DETECTION OF *BORRELIA LONESTARI* IN *AMBLIOMMA AMERICANUM* TICKS OF SUMNER COUNTY, TENNESSEE.** *Eric McLaughlin, Robert Grammer, Jennifer Thomas, and Steve Murphree, Belmont University, Nashville, Tennessee.* In recent years, several patients in the American Southeast have exhibited the clinical symptoms of Lyme disease associated with a tick bite but have tested negative for Lyme's causative bacterium. This condition was described as Southern Tick-Associated Rash Illness, or STARI. Since 1996, STARI has been linked to a new bacterium, *Borrelia lonestari*, which is a close cousin of the traditional Lyme bacterium. Being such a newly discovered bacterium and a suspected pathogen, any information on the prevalence of *B. lonestari* is helpful to our understanding of how to deal with it and the disease it seems to cause. Only a handful of studies across the nation have investigated a tick population to check for the bacterium. These few studies are the very beginning of a map of *B. lonestari*'s prevalence. The purpose of this study was to check a specific geographical location for *B. lonestari* to see if we should add another point to its epidemiological map at Sumner County, Tennessee.

## WESTERN REGION

LEMOYNE OWEN COLLEGE  
MEMPHIS, TENNESSEE

**BINDING INTERACTIONS BETWEEN *ARF* AND *HDM2*.** *April D. Jones, Brian Bothner, and Richard W. Kriwacki, Union University, Jackson, Tennessee (ADJ), and Saint Jude Children's Research Hospital, Memphis, Tennessee (BB, RKW).* *Hdm2*, *p53* and *Arf* form a cell cycle regulatory network that is disrupted in most human cancers. *Hdm2* is a negative regulator of *p53* mediated cell cycle arrest. In a hyperproliferative cell, *Arf* acts as a tumor suppressor by binding *Hdm2*, thus stabilizing *p53* leading to cell cycle arrest or apoptosis. Understanding the mechanism by which *Arf* and *Hdm2* interact and the role of *Hdm2* in the ubiquitination of *p53* are important goals of cancer biologists. In this study, we have determined that it is possible to monitor the binding of *Arf* and *Hdm2* using fluorescence spectroscopy. It is known that the *Hdm2* RING domain is involved in the degradation of *p53*. However, its mechanism, as well as the three-dimensional structure, remains unknown. In pursuit of determining the high-resolution structure of the RING domain, we developed a method for purifying this domain that retains the native fold.

**GENE IDENTIFICATION IN THE LAMINATION OF THE HIPPOCAMPUS OF MICE.** *Justin Deaton and Dan Goldowitz, Christian Brothers University, Memphis, Tennessee, and University of Tennessee, Memphis, Memphis, Tennessee.* Identifying the gene locus responsible for controlling cell placement and axonal growth in the mouse hippocampus was the focus of this study. Two different strains of mice, one wild-type and one mutant, were used to locate the gene locus. The two species of mice were crossbred to produce recombinant inbreds. These recombinant inbreds were then crossed and the hippocampal tissue of the offspring was studied. The hippocampal tissue of each of these mice was classified as normal, abnormal, or unknown, and the data analyzed through mapping Quantitative Trait Loci and Chi

Square analysis. It was found that a gene locus located on Chromosome 14 near marker 185 (14Mit185) was the likely candidate for controlling cell placement and axonal growth in the mouse hippocampus.

**MAPPING THE PURKINJE CELL DEGENERATION (*PCD*) LOCUS IN MUTANT MICE.** *Jason Higdon and Jian Zuo, Christian Brothers University, Memphis, Tennessee, and St. Jude Children's Research Hospital, Memphis, Tennessee.* Purkinje Cell Degeneration (*pcd*) is an autosomal recessive mutation in mice that results in degeneration of Purkinje neurons, retinal photoreceptors, mitral cells, and thalamic neurons and also results in male infertility. The region on chromosome 13 where the *pcd* gene is thought to be located is referred to as the *pcd* region and is located on chromosome 13. It is approximately 1.5 MB in length and is flanked by two sequence-tagged site (STS) markers, D13MIT157 and D13MIT167. This region was sequenced and found to be syntenic to a region of human chromosome 9. Six known genes are located in this region on human chromosome 9, one of which is likely to be responsible for the *pcd* mutation. This is a report on the mapping of the *pcd* region and the comparison of that region to the human genome in order to extract candidate genes for the *pcd* mutation. (Supported by NIH Cancer Center Support CORE grant (CA21765), American Lebanese Syrian Associated Charities (ALSAC), March of Dimes Birth Defects Foundation (#5-FY98-0725 to J.Z.), NIH grants EY-12950 and DC-04761 to JZ, and POE-5 R25 CA23944 to JH)

**AFFINITY OF HIGH MOBILITY GROUP PROTEIN 1 TO MODIFIED AND NATURAL DNA.** *Tiffany Baldi, Natalia Krynetskaia, Eugene Krynetski, and W. E. Evans, Christian Brothers University, Memphis, Tennessee (TB), St. Jude Children's Research Hospital, and University of Tennessee, Memphis, Memphis, Tennessee (NK, EK, WEE).* Mercaptopurine treatment leads to the incorporation of thioguanine into DNA ( $G^S$ -DNA). Specific proteins that trigger apoptosis may recognize this modification. High mobility group 1 protein (HMGB1) is a non-sequence specific DNA-binding protein, which has a preferential affinity for unusually structured DNA, such as cruciform DNA and cisplatin-modified DNA. The binding of HMGB1 to  $G^S$ -DNA has been postulated to mediate the antileukemic properties of thiopurines. Using electrophoretic mobility shift analysis, we showed HMGB1-DNA complex formation with cruciform (positive control), normal DNA duplex, mismatched DNA duplexes, and  $G^S$ -DNA duplexes at steady-state conditions. At low protein concentrations (1.67  $\mu$ M), HMGB1 binds only to  $G^S$ -DNA giving 1:1 DNA-protein complex (7.24% binding activity). At higher protein concentrations (5–8.33  $\mu$ M), HMGB1 exists as a multiprotein complex that binds to all DNA types with similar affinity (natural duplex, 66.7–97.42%; mismatched duplex, 52.63–91.17%;  $G^S$ -duplex, 60.24–97.21% binding activity). (Supported by NIH R37 CA 36401, RO1 CA 78224, and POE-5 R25 CA23944)

**CHARACTERIZATION OF TUMOR TISSUES BY ANALYSIS OF DNA CONTENT.** *Will Brooks, Jerry T. Thornthwaite, and Joe Deweese, Freed-Hardeman University, Henderson, Tennessee.* For over 150 years, pathologists have been looking at tumor tissues through microscopes to make subjective decisions about their malignancy. With the use of high resolution Flow Cytometry, a new element of cells may be observed that would otherwise be neglected: DNA content. By simultaneously measuring

the nuclear volume of a cell and the mass of DNA present, one can make a quantitative, objective interpretation of a tumor. Tumor samples previously determined to be benign or malignant were studied. A comparison was made between frozen tissue samples and paraffin-embedded samples to determine any adverse effects of a new deparaffination technique on tissue. We report data indicating the usefulness of paraffin-embedded tissues and the importance of DNA content as a prognostic tool in oncology.

**THE ROLE OF PKC- $\delta$  IN CELLULAR RESISTANCE TO AD 445.** *Shay Carter and Len Lothstein, Christian Brothers University, Memphis, Tennessee, and University of Tennessee, Memphis, Memphis, Tennessee.* N-Benzyladriamycin-14-pivalate (AD 445) is a novel 14-O-acyl ester anthracycline. The primary mechanism of action does not appear to include damage to DNA or the cytoskeleton. Instead, AD 445 appears to stimulate the apoptotic-signaling pathway through direct activation of PKC- $\delta$  despite the expression of the anti-apoptotic protein Bcl-2. In this study, we determined whether resistance to AD 445 in 32D.3 mouse myeloid cells was due to changes in PKC- $\delta$ . We found that in resistant cells, the amount of mitochondrial PKC- $\delta$  decreased, suggesting that AD 445 is less able to trigger mitochondrial-dependent apoptosis by PKC- $\delta$  activation. (Supported by Susan G. Komen Breast Cancer Found.)

**MURINE MODEL TO STUDY CISPLATIN (CDDP)-INDUCED OTOTOXICITY.** *Evgeny Krynetskiy, John Goss, Michael Hood, M. Kirstein, and C. Stewart, Rhodes College, Memphis, Tennessee (EK, JG), University of Memphis, Memphis, Tennessee (MH), and St. Jude Children's Research Hospital, Memphis, Tennessee (MK, CS).* CDDP is extensively used in children with brain tumors and solid malignancies because of its antitumor activity. The primary dose-limiting toxicity is ototoxicity, the mechanism of which is poorly understood. To gain a better insight into the mechanism of CDDP-induced ototoxicity we have utilized a murine model. First, we assessed the maximum tolerated CDDP dose in two mice strains: FVB (Green Fluorescent Protein (GFP) positive and GFP negative) and NMRI mice. We determined that the LD<sub>50</sub> was 22 mg/kg for both strains. We established a protocol to analyze murine cochleae after CDDP administration. Utilizing confocal microscopy we have visualized hair cells located in the basal turn of murine cochleae. Cytotoxic effects of CDDP treatment was detected through decrease of fluorescence in hair cells of GFP(+) mice. In GFP(-) mice, hair cell death was evaluated by TUNEL assay. We have established a murine model that allows quantification of CDDP-induced ototoxic effect.

**THE ROLE OF POLYAMINES DURING APOPTOSIS IN HUMAN RETINAL PIGMENTED EPITHELIAL CELL LINES.** *Patrick D. Briese, Dianna Johnson, and Rajesh Sharma, Christian Brothers University (PDB), Memphis Tennessee, and University of Tennessee, Memphis, Memphis, Tennessee (DJ, RS).* The retinal pigment epithelium (RPE) overlays the outer segments of photoreceptors in the retina and is required for normal function of retinal neurons. When RPE degenerates due to disease such as age related macular degeneration, the neural retina subsequently dies and visual function is lost. The polyamines, spermidine, spermine, and their precursor putrescine, have been shown to play a role in many cellular functions, including apoptosis. This study examined the effect of polyamines on apopto-

sis induced by Daunorubicin (DNR), a chemotherapeutic agent that causes DNA fragmentation function and thus induces apoptosis. An immortalized RPE cell line, APRE19, was exposed to different concentrations of DNR in the presence or absence of the polyamine synthesis inhibitor, DL- $\alpha$ -difluoromethylornithine (DFMO). Cells depleted of polyamines by DFMO showed only a slight decrease in apoptosis. However, addition of exogenous polyamines, particularly spermine, both in the presence and absence of DFMO, significantly decreased apoptosis. These results indicate that increased levels of polyamines may protect against apoptotic cell death in RPE. (Supported by the Crane Research Fellowship (PB), NIH RO1-1655, and Research to Prevent Blindness (DJ))

**SYNERGISTIC EFFECTS OF VITAMIN E AND VITAMIN C IN CELL PROLIFERATION.** *Carrie Coleman, Christie Sexton, and Hao Nguyen, University of Tennessee, Martin, Tennessee.* Vitamin E has been shown to be an effective chemopreventive agent against various carcinogens. It scavenges free radicals and active oxygens that may cause many pathophysiological conditions, including inflammation, Alzheimer's disease, and cancer. However, high concentrations of vitamin E also are toxic to the cell. The oxidized form of vitamin E can be regenerated by a variety of agents, including selenium and vitamin C; therefore, vitamin E will still be effective at much lower concentrations when coupled with such agents. We report the synergistic effect of vitamins E and C in mouse fibroblasts that have been mitogenically induced to hyperproliferate by tetradecanoylphorbol-13-acetate (TPA). Identification of the formation of foci in tissue culture and immunoblots against cyclooxygenase-2 were the methods used to determine the anti-proliferative, thereby chemopreventive, activity of the vitamins.

**COMPARISON OF CAMPS HAYO-WENT-HA AND ARBUTUS/HAYO-WENT-HA HEALTH CENTER ACTIVITY.** *Lawrence LeBlond and Elizabeth Tolley, Christian Brothers University, Memphis, Tennessee, and University of Tennessee, Memphis, Tennessee.* This study determined Health Center (HC) activity at the boy's, Hayo-Went-Ha, and girl's, Arbutus/Hayo-Went-Ha, YMCA summer camps in Michigan and provide recommendations on areas of concern to improve the camper's summer camp HC experience. Three years' worth of data was examined from camp health records and comparisons made between both camps in: total activity per day and time and type of concerns brought before the HCs. Similar trends in overall times of the day that the HCs were visited and days of the session were discovered. The boy's camp had higher incidences of medication administration and poison ivy while the girl's camp saw higher rates in most other areas examined. Recommendations to the both camps include better education and supervision to prevent contraction and incidences of medical concerns. Further analysis of the "other medical" category needs to be undertaken. (Supported by YMCA Camps Hayo-Went-Ha and State YMCA of Michigan)

**THE RELATIONSHIP OF SMOKING HISTORY WITH HEALTH STATUS OF BLACK AND WHITE NURSING HOME RESIDENTS.** *Jana Pierini, V. F. Engle, M. J. Graney, and M. E. C. Fitzgerald, Christian Brothers University, Memphis, Tennessee (JP, MCEF), and University of Tennessee Health Science Center, Memphis, Tennessee (VFE, MJG).* This study investigated relationships among smoking history (ever smoked;

pack-years), health status, gender, and race in 930 Black and White nursing home residents. Residents were interviewed using the Minimum Data Set during their first 2 weeks following admission to two safety-net nursing homes. Data were analyzed using SPSS co-relational techniques. White or male residents had greater tobacco exposure. For all residents, there was a positive relationship of smoking history with male gender, better mental status and function, COPD, and cancer. Compared to men, women's smoking history was positively related to depression, disruptive behavior, stroke, and self-ratings of being more alert and less tired. Women's smoking history was negatively related to dementia. Compared to White residents, Black residents' smoking history was positively related to cancer and chewing problems, and inversely related to Body Mass Index. (Supported by NIH NINR)

**STUDENTS' PERSONALITY CHARACTERISTICS RELATING TO THEIR PERCEPTIONS OF GOOD TEACHERS.** *Wendy Brown, Tracey Keel, and Lee McBee, Christian Brothers University, Memphis, Tennessee.* For years, people have studied and written about what it takes to be a good teacher. In this study, we sought to determine whether a relationship existed between a student's personality and their perceptions of a good teacher. Scores from 83 students from Christian Brothers University on a survey of the Christian Brothers "Twelve Virtues of a Good Teacher" were correlated with the students' scores on the BFI-54 (Big Five) personality inventory. The twelve virtues were printed in a circular as a guide to being a quality teacher. According to the circular, this teacher should be respectful, reflective, honest, understanding, knowledgeable, patient, even-tempered, moral, passionate, optimistic, spiritual, and generous. The Big Five, or extraversion, agreeableness, conscientiousness, emotional stability, and openness, are seen as key characteristics used to define one's personality. Seven significant correlations were found between the Big Five personality traits and the twelve virtues.

**SOCIAL BEHAVIOR IN AN ALL-MALE GORILLA GROUP AT THE MEMPHIS ZOO AND AQUARIUM.** *Shanna Wall, Chris Kuhar, Meghan Carr, and John Ouellette, Christian Brothers University, Memphis, Tennessee (SW), Zoo Atlanta, Atlanta, Georgia (CK), and Memphis Zoo and Aquarium, Memphis, Tennessee (MC, JO).* The arrangement of family units of captive gorillas (*Gorilla gorilla*) with one silverback male, several adult females, and their progeny is designed to mimic natural group structures and encourage species-typical behavior. However, current numbers of male and female gorillas in captivity are roughly equal, so many male gorillas cannot be kept in typical family groups. The only acceptable alternative to most zoo officials is the formation of all-male gorilla groups, which have been observed in wild populations of mountain gorillas. As part of a larger study headed by Zoo Atlanta, the behavioral profiles of three western lowland gorillas on display at the Memphis Zoo and Aquarium, Memphis, Tennessee, were examined in the hopes of providing insight into the longevity of their housing arrangement. Scan data indicate no social affiliative or solitary play behaviors, and the predominant proximity pattern for all three individuals was "far distant," indicating low overall cohesiveness within the group. All-occurrence data show low incidence of contact aggression and displace behavior. However, the most common social interaction was non-contact aggression. This information may be used in future management decisions if it is later

decided that this group should be separated. (Supported by Memphis Zoo and Aquarium)

**SELF-GROOMING IN PRAIRIE VOLES.** *Jerry O. Wolff, Matthew H. Watson, and Shawn A. Thomas, The University of Memphis, Memphis, Tennessee.* Self-grooming by mammals is a form of scent dissemination in which individuals anoint themselves with salivary, anogenital, and other body odors. Self-grooming has been proposed to be a sexually selected trait favored in reproductive competition and sexual attraction. We tested the hypothesis that females would show a mating preference for males that self-groomed more than a reproductive competitor that groomed less. In mate-choice experiments in which females had a choice of two tethered males, non pair-bonded females copulated the most with males that groomed the least. In a second experiment in which pair-bonded females in postpartum oestrus had access to their current mate and two strange males, strange males groomed significantly more than pair-bonded mates, yet attained the fewest copulations. Non pair-bonded females and pair-bonded males and females groomed significantly less often than did non pair-bonded males and females. Self-grooming behavior was consistent with the sexual attraction hypothesis, but the frequency of self-grooming did not increase a male's mating success. Self-grooming may occur, in part, out of frustration or anxiety of not having access to a prospective mate. We conclude that the frequency and time spent self-grooming are not good predictors of mating success. The frequency of self-grooming, and other forms of scent dissemination, may be used as criteria in mate choice, but are not sufficient to predict male mating success.

**CONTRIBUTION OF ANIMAL BEHAVIOR RESEARCH TO CONSERVATION BIOLOGY.** *Kelly B. McIntyre, Guillermo Paz-y-Miño C, The University of Memphis, Memphis, Tennessee.* Behavioral research encompasses the study of the physiological and sensory mechanisms that control behavior, the development or ontogeny of behavior, and the function and evolution of behavior. Conservation biologists have debated about these paradigms for decades, at times not realizing their discussions have contributed directly or indirectly to the area of animal behavior and conservation. To assess the relevance of behavioral paradigms in conservation studies, we examined 576 articles ( $n = 1442$ ) published in the journal *Conservation Biology* from 1987 (when CB was created) to 2001. The majority of these studies were empirical, conducted in the field, and included terrestrial vertebrates. Paradigms most commonly addressed in these studies were: dispersal and settlement, reproductive behavior and social organization, species interactions, foraging/feeding and pollination, genetic variability and behavior, cognition, behavioral endocrinology and physiology, communication, and behavioral evolution. These paradigms have helped biologists to understand and alleviate habitat destruction, biodiversity loss, and ecosystem restoration.

**THE ROLE OF INTRINSIC/EXTRINSIC MOTIVATION ON RECYCLING BEHAVIOR.** *Angela Devould, Tracey Mulligan, David Walters, and April Himel, Christian Brothers University, Memphis, Tennessee.* The purpose of our study was to determine if there was a relationship between recycling and intrinsic/extrinsic motivation. Seventy-eight Christian Brothers University undergraduate students participated in our study. The Work Preference Inventory was used to determine the degree to which stu-

dents perceive themselves to be intrinsically or extrinsically motivated. A recycling survey was used to measure attitudes towards recycling. The results indicated that people who are intrinsically motivated are more likely to recycle if encouraged by family and friends. People who are extrinsically motivated are more likely to recycle if given money or rewards. Most of the participants stated that education plays a vital role in recycling behavior. This suggests that the best way to encourage recycling is to educate the public and give steps on how we can improve recycling behavior.

**MECHANICAL RESPONSE OF THE CANINE HEART DURING BLOOD PRESSURE COLLAPSE PRODUCED BY WEAK ELECTRICAL PULSES.** *Stuart Johnston, Brent Hoffmeister, and Robert Malkin, Rhodes College, Memphis, Tennessee (SJ, BH), and University of Memphis, Memphis, Tennessee (RM).* Weak AC electrical currents have been shown to produce blood pressure collapse in both human and animal studies. This study tests the hypothesis that such currents produce pressure collapse by disrupting the organized mechanical activity of the heart. Three canine subjects were used for this study. A pacing catheter was placed in the right ventricle of the heart and used to deliver weak electrical pulses ranging between 10–1000  $\mu$ A. During stimulation two dimensional ultrasound images of the left ventricle were captured and saved to videotape for analysis. The frequency of the mechanical response of the heart was compared to the electrical stimulating frequency. Our results indicated a strong correlation, showing that mechanical responses occurred once for every 1, 2, or 4 electrical pulses, depending on pulse frequency. This suggests highly organized mechanical activity during blood pressure collapse episodes.

**USE OF MODELING TO EVALUATE CHANGES IN THE CEREBROVASCULAR ACTIVITY.** *Roberto Young, University of Memphis, Memphis, Tennessee.* Patients with severe head injury tend to develop secondary complications that can result in further brain injury. Therapeutic options used in management are based on assumed functional pressure autoregulation, the brain's capacity to maintain a relatively constant blood flow in spite of changes in blood pressure. However, the application of these therapies to patients with impaired autoregulation could cause further brain injury. The purpose of this work was to explore the development of a method to determine the status of autoregulation by examining the relationship between clinical pressure recordings and a proposed analogue electrical circuit model for brain pressure dynamics.

**DEVELOPMENT OF CABLE DE-RATING DATA BASE.** *Kristin Britt, Sean Whitt, Lisa Thron, and Tomeka Scruggs, University of Memphis, Memphis, Tennessee.* Utility companies utilize many planning tools to provide economical, reliable, and safe electric energy to consumers. As a community grows, its electrical network expands. A major concern for utility companies is cable de-rating. This decrease in conductor capacity is caused by heat generated from current flowing through underground cables. Memphis Light, Gas, and Water uses co-op students to determine the de-rated value of underground cables so that customers are provided with properly sized conductors. A computer program is used to identify overloaded areas. From duct maps, students input information including the spacing between and the number of primary and secondary cables in each duct bank in the downtown



Memphis area. Once problem areas are identified, they can be corrected and the integrity of the grid is maintained.

**GALOIS FIELDS AND PUBLIC-KEY ENCRYPTION.** *Chris Meador, Christian Brothers University, Memphis, Tennessee.* The now-commonplace RSA encryption algorithm relies on big prime numbers alone; the next generation in public-key cryptography has basis in finite fields (or "Galois" fields). Attention, computer hackers of tomorrow: Now is the time to study abstract algebra. My discussion introduces the audience to the "state of the art" in Elliptic Curve Cryptography (ECC), including an overview of the mathematical topics involved (my discussion should be accessible to anyone with basic knowledge of algebra), and debates the merits and drawbacks of ECC with RSA.

**ISOLATION AND IDENTIFICATION OF CHLORINATED PESTICIDE RESIDUES FROM URBAN SOIL.** *R. L. Aquadro, Richard Redfearn, Charles Stinemetz, and Carol Ekstrom, Rhodes College, Memphis, Tennessee.* The soil along the creek bed of Cypress Creek in North Memphis has been shown to have significant residues of such chlorinated pesticides as aldrin, dieldrin, endrin, chlordane, and heptachlor. The deposition of these pesticides occurred decades ago, yet they still persist in this urban environment. We have isolated these and related compounds from a soil sample taken from a plain adjacent to the creek channel, and attempted to isolate the same compounds from plant sources growing in the same area. Evidence for the degradation and/or metabolism of the pesticide species has been inferred from these studies.

**MOLECULAR CHROMATOGRAPHY IN DENSE-PHASE CARBON DIOXIDE.** *Denis Okumu, Phillip Wells, and Jon Parcher, LeMoyné-Owen College, Memphis, Tennessee (DO), and The University of Mississippi, University, Mississippi (PW, JP).* This is a technique that aims to achieve chromatographic separations in chromatographic columns devoid of stationary phases. Normally, no separation would be expected in such a system since all the solutes would spend the same amount of time in the mobile phase and elute at the same time. However, results in our laboratory indicate that under certain conditions of temperature, pressure, and density, it is possible to achieve solute resolutions in such columns. CO<sub>2</sub> has properties that make it suitable as a mobile phase in this investigation. It has a critical temperature, critical pressure, and critical density that are easily accessible using modern chromatographic equipment. Above its critical point, CO<sub>2</sub> has density and solvating power approaching that of a liquid, but viscosity similar to that of a gas, and diffusivity intermediate between those of a gas and liquid. The exact retention mechanisms involved in the separations observed is/are not clear. Certain conditions, however, seem to be necessary, if not always sufficient, for the resolution of mixtures in empty columns.

**DUAL ENERGY CONTRAST ENHANCED X-RAY IMAGING USING GADOLINIUM AS AN AGENT.** *Ben Evans, Gunnar Lovhoiden, and Herbert Zeman, Rhodes College, Memphis, Tennessee (BE), and University of Tennessee, Memphis, Tennessee (GL, HZ).* Heavy elements such as gadolinium are convenient as contrast agents for X-ray imaging because they readily absorb radiation at a particular energy in the X-ray spectrum. Dual energy imaging exploits this property by exposing the object and contrast agent to radiation specifically designed to be of slightly

higher and lower energies than the absorption level of the contrast agent. This creates two images: one exhibiting a high absorption and prominence of the contrast agent, and the other with low absorption and low prominence. The images can be digitally subtracted to remove the background and leave only the contrast agent. The goal of this project was to design an apparatus to produce the desired X-ray energies and demonstrate dual energy subtraction with gadolinium in a phantom and a live animal.

**EFFECT OF A NEURAMINIDASE INHIBITOR ON INFLUENZA AND PNEUMOCOCCAL SYNERGISM.** *Kimberly Bartmess and Jon McCullers, Rhodes College, Memphis, Tennessee, and St. Jude Children's Research Hospital, Memphis, Tennessee.* A lethal synergism exists between influenza virus and pneumococcus, accounting for excess mortality in humans. Utilizing a recently developed mouse model, it was determined that the neuraminidase inhibitor oseltamivir reduces morbidity and mortality from secondary bacterial pneumonia following influenza. Groups of mice were infected with low dose mouse adapted influenza followed pneumococcus. Treatment for 5 days with water or oseltamivir began either 4 h before the onset of influenza (prophylaxis) or 48 h after (treatment). Survival was significantly prolonged in both the prophylaxis and treatment groups compared to controls, despite no significant reduction in viral or bacterial titers in the treatment group compared to controls. These data indicate that oseltamivir can interrupt the lethal synergism between influenza virus and pneumococcus by a mechanism independent of total viral titer in the lung. This finding has important implications for the prevention of secondary bacterial infections in humans through treatment of influenza, even in cases where no impact on viral replication or clinical symptoms is expected.

**A POPULATION GENETICS STUDY OF ESTERASE-4 AND BODY COLOR IN THE BOLL WEEVIL, ANTHONOMUS GRANDIS.** *Candice L. Johnson, Charles J. Biggers, and Melvin L. Beck, University of Memphis, Memphis, Tennessee.* Allozymic variation at the esterase-4 locus and body color polymorphism were examined in populations of the boll weevil. Changes in gene frequencies in boll weevil populations would indicate the influence of environmental factors such as intensive insecticide treatment. Polyacrylamide gel electrophoresis of whole body squashes of weevils revealed two codominant alleles, Est-4<sup>f</sup> and Est-4<sup>s</sup>, at the esterase-4 locus. No significant differences in esterase-4 allelic frequencies occurred between two laboratory populations. Body color polymorphism was examined in seven counties in western Tennessee. Three color morphs (ebony, bronze, and red) were found. Body color showed deviations from Hardy-Weinberg expectations in some counties.

**PRODUCTION OF ESTERASE 4 DURING THE ANTHONOMIS GRANDIS BOH. LIFE CYCLE.** *Melita Smith, Union University, Jackson, Tennessee.* Esterase 4 was surveyed in the various life stages of the cotton boll weevil, *Anthonomus grandis* Boh. The production of esterase 4 during the life cycle of the cotton boll weevil was examined using 7.5% native polyacrylamide gel electrophoresis. Ten µl of whole body squashes were run at 100 volts for two h and then stained with various substrates to demonstrate esterase activity. Two codominant alleles occurred at the esterase 4 locus, one of which was labeled Est4<sup>f</sup> (for fast) and the other Est4<sup>s</sup> (for slow). Esterase 4 was present during the larval and adult stages, but was absent during the pupal stage.

Newly emerged adults did not exhibit esterase 4 activity until they were at least one day old. Thus, polyacrylamide gels analysis revealed a qualitative profile of esterase 4 that varied among the life cycle stages of the cotton boll weevil.

**QUANTITATIVE STRUCTURE ACTIVITY RELATIONSHIP MODEL OF RAT ADENOSINE A1 RECEPTOR AGONISTS.** *C. B. Duke and A. L. Parrill, University of Memphis, Memphis, Tennessee.* A number of agonists for the rat adenosine A1 G-protein-coupled receptor with previously experimentally measured binding affinities were chosen for their varying affinities and structures to create a quantitative structure activity relationship (QSAR) model which was then tested for accuracy. These agonists make up the training set. The structures were characterized by a series of quantitative descriptors that were then ordered in terms of relationship to binding affinity. The descriptors that were the most correlated to binding were worked into an equation or model that described the binding of the ligand to the receptor. A test of the model on the training set gave an  $r^2 = 0.901$  and cross validation gave  $r^2 = 0.839$ . The model was then applied to a second, smaller test set of ligands with varying binding affinities and geometries in attempt to reproduce their known binding affinities. An accurate and precise model would aid traditional structure activity relationship (SAR) studies by reducing random testing of compounds and giving faster leads to novel selective agonistic ligands.

**CREATING AN ANATOMICAL MODEL OF LEVATOR PALPEBRAE PREMOTOR NETWORKS IN THE RAT BRAIN BY DEFINING FIRST, SECOND, AND HIGHER-ORDER LEVATOR PALPEBRAE AFFERENTS WITH TRANSNEURAL TRACERS.** *Janelle Meeks and Mark LeDoux, Christian Brothers University, Memphis, Tennessee, and University of Tennessee, Memphis, Tennessee.* The purpose of this study was to identify neurons within a projection pathway for the levator palpebrae (LP) muscle of the eye. To identify the neurons, pseudorabies virus (PRV) was injected into the LP muscle of eight Sprague-Dawley rats (250–350 g) using a 31-gauge needle and micro syringe. The rats were allowed to live for three to five days to allow the virus to be absorbed into the brain. The rats were sacrificed, and the brain and spinal cord were removed and cut on a cryostat. Using immunohistochemistry, the neurons that absorbed the PRV were labeled using an ABC kit and a DAB kit. All slides were then examined under a microscope for the presence of neurons. The data collected suggests the nerves that innervated the LP muscle of the eye project from the oculomotor nucleus of the midbrain region of the rat brain.

**DROSOPHILA MELANOGASTER AS A MODEL FOR FETAL ALCOHOL SYNDROME.** *Dayan A. Perera and Stan Eisen, Christian Brothers University, Memphis, Tennessee.* Three strains of *Drosophila melanogaster* were used to test the effects of alcohol on fecundity, adult hatch weight, and alcohol dehydrogenase concentrations. The liquid fraction of the medium had levels of ethanol ranging from 0–8%. The CHPD strain has a genetic mutation that induces increased sensitivity to alcohol among the adults, while its y-control strain (G-22) does not. The third strain was a wild-type control purchased from Carolina Biological Supply Company. Flies hatching from each vial were sexed, counted, and weighed on a periodical basis and tested for alcohol dehydrogenase. The CHPD, G-22, and Carolina wild-type strains showed evidence of alcohol dehydrogenase induc-

tion. The CHPD strains also had a smaller number of individuals hatching, and they had a lesser individual mass, compared to the other two strains. All strains showed a steady decline in the number of individuals collected as the concentration of ethanol in the medium was increased.

**LEUKOCYTE ADHESION-MOLECULES IN WOMEN WITH PREECLAMPSIA.** *Rebekah K. Meadows,\* Jeffrey Livingston, and Robert Ahokas, Christian Brothers University, Memphis, Tennessee, Department of Obstetrics and Gynecology, Roanoke, Virginia, and University of Tennessee, Memphis, Tennessee.* A clinical trial was designed to study the relationship between the magnitudes of leukocyte responses to the severity of preeclampsia. Fifty-six consenting patients from the Regional Medical Center at Memphis and the University of Tennessee OBGYN clinic were included in the sample; 19 preeclamptic patients, 17 pregnant controls, and 20 non-pregnant controls. Statistical analysis indicated significant differences,  $P$  value  $< 0.50$ , between preeclamptic patients and non-pregnant controls as well as between pregnant controls and non-pregnant controls in instances of white blood cell count, % lymphocytes, and % neutrophils. However, there was no significant difference between preeclamptic subjects and pregnant controls with any of the criteria investigated. These results illustrate that an exaggerated inflammatory response does not appear to be either the result of preeclampsia nor its severity. Thus, pregnancy itself results in an exaggerated inflammatory response. Further studies are needed to determine the nature of this pregnancy induced heightened inflammatory response.

**HEAT SHOCK PROTEIN 70 IN PREGNANCY AND PREECLAMPSIA.** *Reem Awwad, Robert Ahokas, and Jeff Livingston, Christian Brothers University, Memphis, Tennessee, University of Tennessee, Memphis, Memphis, Tennessee, and Department of Obstetrics and Gynecology, Roanoke, Virginia.* Preeclampsia is a primary cause of perinatal morbidity and mortality. There is no test or cure for preeclampsia. A means of early detection of this disease would be beneficial. Heat shock protein 70 (hsp70) is a marker for cellular stress. Our hypothesis is that since preeclampsia is associated with oxidative stress, then inducible hsp70 may be increased in preeclampsia. Maternal blood was collected from women with severe preeclampsia ( $n = 47$ ) matched for delivery gestational age to normotensive pregnant controls ( $n = 51$ ). Hsp70 concentrations were measured by standard ELISA techniques. Data were statistically analyzed by a Student  $t$  test and Chi square test. There were no statistical differences in the mean concentrations of hsp70 between women with severe preeclampsia and the normotensive pregnant controls ( $35.4 + 96.7$  vs.  $30.1 + 11.5$ ,  $P = 0.80$ ). From our data we conclude that hsp70 concentrations were not elevated in women with severe preeclampsia. Further studies with non-pregnant age-matched individuals might show differences during pregnancy significantly, per se. (Supported by NIH- R07-0124-18-001-01, Memphis McNair Program)

**EVALUATION OF MAGNESIUM SULFATE EFFICACY FOR THE PREVENTION OF ECLAMPTIC CONVULSIONS IN MILD PREECLAMPTIC WOMEN.** *Elizabeth A. Lendermon and Jeffrey C. Livingston, Christian Brothers University, Memphis, Tennessee, University of Tennessee, Memphis, Tennessee, and Department of Obstetrics and Gynecology, Roanoke, Virginia.* A randomized clinical trial was designed to evaluate the efficacy of magnesium sulfate prophylaxis for prevention of

eclamptic seizure in mild preeclamptic patients and to evaluate the drug's adverse effects associated with uterine relaxation. Consenting patients who met study characteristics were randomized to receive either magnesium sulfate or placebo. A total of 222 patients comprised the sample, 109 of which received magnesium sulfate and 113 of which received placebo. No patient experienced an eclamptic convulsion, and statistical analysis of outcome revealed no significant difference between groups in terms of progression to severe preeclampsia ( $P = 0.41$ ) or cesarean section rate ( $P = 0.35$ ). These results suggest the possibility that seizure prophylaxis may not be needed in the mild preeclamptic patient, and indicate that magnesium sulfate does not alter progression from mild to severe disease. In addition, the results provide evidence against the association of magnesium sulfate with increased cesarean section rate. It is concluded that further investigation seeking to demonstrate the need for seizure prophylaxis in mild preeclamptic patients is needed. In addition, clinical evidence of a reduction in eclamptic convulsions due to magnesium sulfate prophylaxis in a much larger sample size is also necessary if the routine use of the drug is to be justified.

**RAPID DECALCIFICATION OF VERTEBRAE AND INTER-VERTEBRAL DISKS PROVIDING IMPROVED MORPHOLOGY AND ANTIGENICITY.** *Jennifer Tzefakes and Sharon Frase, Christian Brothers University, Memphis, Tennessee, and University of Memphis, Memphis, Tennessee.* Multiple types of calcified tissue have created problems for morphological studies due to the length of traditional protocols and the typical acidic environments of decalcifying solutions. In this study, pig vertebrae and intervertebral disks were decalcified in a short period of time in ethylene diamine tetra-acetic acid (EDTA), a chelating agent, using a temperature controlled laboratory microwave. The purpose of this study was to determine a technique for rapid decalcification while preserving morphology and antigenicity. Some vertebrae and disks were traditionally decalcified, not exposed to microwave irradiation, to serve as a comparison. The use of the laboratory microwave was the only variable; fixation and processing of the tissue followed routine protocols. Through light microscopy observations, the cellular integrity of the tissue exposed in the microwave was equal to or better than the cellular integrity of the tissue exposed to traditional decalcification. The time needed to process tissue was greatly reduced (h as opposed to weeks). Thus, shorter time in the decalcifying solution improves antigenicity. These data provide groundwork for individuals interested in immunocytochemistry of bone and bone matrix. (Supported by IM Center)

**EVALUATION OF KORDON BREATHING BAGS FOR THE TRANSPORTATION OF FISH.** *Jennifer Hoskinson and Bill Simco, Christian Brothers University, Memphis, Tennessee, and University of Memphis, Memphis, Tennessee.* Kordon Breathing Bags were evaluated for transportation of fish. Traditional transportation bags contain an oxygen atmosphere with a minimum amount of water. Fish may become stressed and even die as the oxygen levels decrease in transport. Fish also may become stressed due to the "sloshing" movement of water. Kordon Breathing Bags are made of a type of ethylene plastic that allows

oxygen to diffuse into and carbon dioxide out of the bag. This should lower fish stress level by preventing oxygen depletion and keeping the fish in an all water environment. Two different sizes of Kordon Breathing Bags containing two different densities of fish were compared with traditional shipping bags for 48 and 72-h intervals. Oxygen concentrations remained high and carbon dioxide low in the Breathing Bags, but only if the amount of fish to surface area ratio was kept low.

**LEG GROWTH AND ALLOMETRY IN TARANTULAS.** *Alan Jaslow and Andi Lynch, Rhodes College, Memphis, Tennessee.* Only a limited amount of research has been done investigating allometry or scaling in spiders. We used tarantulas as a representative model because of their large size range. Their periodic molts enabled us to accurately measure segment lengths without handling the live individuals. We explored the developmental relationship between body parts and body size measured by cephalothorax length across seven species. In most cases, we found no evidence for allometry, and no distinctive pattern was found in the growth rates of leg segments.

**EFFECTS OF CHYTRID FUNGUS ON LIFE HISTORY TRAITS IN LARVAL *HYLA VERSICOLOR*.** *Tenitia Hobson and Matthew Parris, Christian Brothers University, Memphis, Tennessee, and University of Memphis, Memphis, Tennessee.* The effects of exposure to a chytrid fungus, *Batrachochytrium dendrobatidis* was observed on tadpole development in *Hyla versicolor*, a species of frog native to the Memphis, Tennessee area. Larvae obtained from field collected egg masses were raised in artificial ponds, and exposed to the chytrid via an infected adult frog. Survival, body mass, and larval period length were the responses observed to determine tadpole fitness. Presence of a predator was found to have a negative effect on survival. Density and presence of disease both had a negative effect on survival. Disease  $\times$  predator combination had a negative effect on larval period length. Overall, density, disease, and disease  $\times$  predator combination had effects on tadpole development. The presence of disease alone did not have a significant effect on all aspects of tadpole development, although presence of disease in combination with other factors often did, and was also dependent on the structure of the individual community.

**CORRELATIONS BETWEEN LEAF EPIDERMAL FEATURES AND AMPHISTOMATY IN *SALIX* SPECIES.** *Jasmine V. Ware and Ranessa L. Cooper, University of Tennessee, Martin, Martin, Tennessee.* Amphistomaty is characterized by evenly distributed stomata on both upper (adaxial) and lower (abaxial) leaf surfaces; it has been shown to be an adaptation to high light conditions. Amphistomatic leaves occur in two willows, *Salix turnorii* and *S. planifolia* ssp. *tyrrellii*, from the Athabasca sand dunes in Canada. In this study, the leaf epidermal features, cuticle thickness and overall leaf thickness, were investigated in relation to amphistomatic leaves. These data were gathered from leaf cross-sections using light microscopy. By examining correlations between amphistomaty and leaf thickness, as well as amphistomaty and cuticle thickness, attempts can be made to more clearly understand the functional significance of amphistomatic leaves in *Salix*.