

## ABSTRACTS OF PAPERS PRESENTED AT THE SPRING COLLEGIATE MEETING

### EASTERN REGION CARSON-NEWMAN COLLEGE

*Preliminary Studies of Competitive Carbonyl reactions of Imidazole-1-methyl-2-trimethyl silane.* Jeff Drinnen, Carson-Newman College. The equimolar reaction of imidazole-1-methyl-2-trimethyl silane (I) with para acetamido benzaldehyde (II) was carried out to determine the reactivity of I towards the carbonyls of II (aldehyde carbonyl vs. amide carbonyl). It is presumed that the aldehyde carbonyl is the position which is added to by I as is evidenced by GC analysis data. Other achievements of this research are the synthesis of starting materials (I) and the successful GC analysis of the starting materials and products. Compound I was synthesized with reduced amounts of the 2,5-disilyl by-product at near 0°C by reducing the reaction times (rxn conditions: 0.1 mole BuLi, 0.1 mole Cl-SiMe<sub>3</sub>, 0.1 mole 1-methyl imidazole, solvent anhydrous THF 50 ml, rxn tempo. -15°C, rxn time 20 min. add BuLi to THF and 1-methyl imidazole, 5 min. stir, 10 min. add Cl-SiMe<sub>3</sub> to rxn vessel). An OV-17 column on a flame ionization GC was used to successfully separate and analyze the starting materials and products (GC conditions: column dimensions 6' x 1/8" dia. column packing 3% OV-17 on Gas Chrom Q, temp. programming 120°C for 1 min. to 220°C at 16°/min.).

*Female Physicians.* Deborah Warren, Lee College. Sex roles, or stereotypes applied to sex, are important in medicine. Inferior roles for women date back thousands of years to Biblical laws and ancient Greek philosophies. As scientific medicine developed in the United States, women were almost always limited to the position of nurse.

In 1965 women made up only 6 percent of entering medical students. Today approximately 30 percent of entering medical students are women. Despite this increase, female pre-medical students have three basic questions: Will women be accepted to medical school? Will women do well in medical school? In what fields will women physicians practice? This paper will endeavor to explore these questions.

The percentage of women applicants accepted to medical school is now comparable to the percentage of men applicants accepted. 88 percent of women accepted to medical school complete their medical education. After graduating from medical school, most women become primary care physicians.

*Avenues of Sedimentation of Carbonate Skeletal Sands in Rice Bay, San Salvador, Bahamas.* Pamela D. Alley, S. David Cooksey Ron Dow, John Isham, Scott Kirby, Joseph Matthews, Scott Morie, Becky Roof, Thomas Thornburgh, Walter Ward and Richard E. Bergenback, Ph.D., University of TN at Chattanooga. The purpose of this paper is to map avenues of sedimentation within Rice Bay, on San Salvador, Bahamas. Five traverses were laid out across the eastern portion of the bay which formed a grid pattern that was used to prepare a map. Samples were taken along these traverses to determine the percent contribution of various calcium carbonate hard part secreting organisms to skeletal carbonate sands. Rice Bay's subsea environment consists of five major channels (avenues of sedimentation) which form a distributary pattern. Interference ripple zones occur where there is opposing channel flow. The east-central portion of the bay consists of an algae field which is populated by various stalked algae. This field can be considered to be a subtidal sand flat. East-west trending patch reefs are scattered throughout the southern half of the bay. Seagrass patches flank the channels and can be considered to be underwater levees. Recent beach-rock forms the southeastern portion of the bay and the major portion of the beach at Rice Bay is formed by the action of waves in the mill.

### MIDDLE REGION AUSTIN PEAY STATE UNIVERSITY

*Medium and Small Springs in Dickson County, Tennessee.* Keith E. Owens and S.M.S. Bhatia, Austin Peay State University. One hundred seventy-three perennial springs were located and studied, of which thirteen were large, thirty-eight were medium, and one hundred twenty-two were small in size. Their classification is based on an estimation of water flow.

The use of the springs vary from domestic to agriculture to no use. The spring water is used for a variety of purposes, but mainly for domestic and/or agricultural consumption.

In addition to being useful, some of the springs have colorful histories, such as: the first county court (Nesbitt A), homesteads (Daniel-Loggins, Holland, Sam Brown), smelters (Loggins-Luten).

Correlating the location of these springs with the geological maps, it

appears that of the small springs, sixty emanate from the Warsaw Formation, seventeen from the St. Louis Formation, and forty-four from the Ft. Payne Formation. Of the medium springs, four springs emanate from the St. Louis Formation, twenty-nine from the Warsaw Formation, and six from the Ft. Payne Formation.

*Preliminary Studies on the Vascular Flora of Dunbar Cave State Natural Area, Montgomery County, Tennessee.* Kevin H. Souza and Edward W. Chester, Austin Peay State University. Dunbar Cave State Natural Area is a 44.5 ha facility located in Montgomery County, northwestern Tennessee. It has been owned by the State of Tennessee and managed by the Department of Conservation since 1973. The main attraction is a large cavern which is an important archeological site and former center of social activity. Other features include a 6.1 ha lake, visitor center, and hiking and nature trails through secondary, mostly oak-hickory woodlands and successional fields. The purpose of this research was to determine (1) the species of vascular plants present, (2) the number of these which are not native and hence the human influence on the present flora, and (3) whether or not any rare or endangered species occur. During the fall of 1983 and throughout the 1984 growing season, more than 300 specimens, representing 286 species, 202 genera and 83 families were collected and accessioned into the Austin Peay State University herbarium. Analysis showed that the flora is dominated by taxa of Asteraceae and Poaceae which comprise more than 26 percent of the species. About 21 percent of the species are not native, indicating a large human influence. *Asclepias purpurascens* L., a species of special concern on the official list of Tennessee rare plants, was found.

*Kinematics Used in a Search for Bound Systems of Neutrons\**. M. G. Prahovic, T.R. Campbell, and R. L. Kozub, Tenn. Technological University.—The kinematics calculations involved in planning an experiment in which heavy-ion reactions are used to search for bound clusters of neutrons will be discussed. The usefulness of some very basic principles of classical mechanics and electromagnetism in the realm of nuclear physics will be demonstrated through examples from this work. The constraints imposed on the experiment by the results of the calculations will be discussed. \*Supported by U. S. Dept. of Energy Contract DE-AS05-79ER10335.

*Analysis of the Decomposition Products of Sodium Hydrosulfite.* Danny Ray Bingham, Marissa Evans, and Martin V. Stewart, Middle Tennessee State University. Sodium hydrosulfite, Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, is a reducing agent (E°<sub>ox</sub> = + 1.12 v in basic solution) whose limited shelf life is attributed to air oxidation [TAS Annual Meeting, University of Tennessee, Nov. 1984]. A tedious redox titration against Indigo Carmine confirms the high purity of newly purchased sodium hydrosulfite [TAS Collegiate Meeting, Tennessee Tech., April 1984], but older samples obtained from the departmental stockroom were found to be largely decomposed. The heterogeneous nature of the older samples is revealed by electron microscopy; however, the classical anion-analysis scheme fails to identify the components of the mixture due to the presence of residual hydrosulfite which reduces several of the test reagents and is itself oxidized in acid solution to the anions being tested for. Infrared spectroscopy is being explored as a technique to both identify the decomposition products of the older samples and to rapidly establish their purity. Another analytical method based on the rate of reduction of the dye Naphthol Yellow S is also being investigated. Acknowledgment is made to the donors of the Petroleum Research Fund, administered by the American Chemical Society, and the MTSU Subcommittee on Research for financial support.

*Quantitative Determination Of  $\Delta^9$ -Tetrahydrocannabinol-11-OIC Acid By Scanning Densitometry.* Lorie Pryor and Judith M. Bonicamp, Middle Tennessee State University. An analytical method for the confirmation and quantitative analysis of the major metabolite ( $\Delta^9$ -THC-COOH) of  $\Delta^9$ -tetrahydrocannabinol in urine is presented. Urine samples undergo basic hydrolysis followed by purification using acidic extraction with organic solvents. The TLC separation is followed by derivatization of the metabolite using Fast Blue BB salt. Cannabinoid calibrators are prepared then by extracting and derivatizing the  $\Delta^8$ -isomer of the metabolite ( $\Delta^8$ -THC-COOH) at varying concentrations in urine. A working curve is established using absorbance vs. concentration data from densitometry of the  $\Delta^8$ -THC-COOH—Fast Blue BB derivatives. Comparison to the working curve of absorbances of  $\Delta^9$ -THC-COOH derivatives allows a quantitative determination of the metabolite in urine.

*Isolation Of The Major Metabolite of  $\Delta^9$ -Tetrahydrocannabinol From The Urine Of Marijuana Users.* Nancy K. Fletcher and Judith M. Boni-



camp, Middle Tennessee State University. A liquid-liquid extraction method is described for separating unconjugated from conjugated  $\Delta^9$ -tetrahydrocannabinol-11-oic acid, the major urinary metabolite of  $\Delta^9$ -tetrahydrocannabinol, from marijuana. After hydrolysis with base, the unconjugated form of the metabolite is extracted with hexane-ethyl acetate and the conjugated form remains in the aqueous phase along with other urinary components. The residue of the extract is chromatographed in an acidic solvent, and then the metabolite is detected with East Blue BB salt.

**Slope Stabilization.** Nath S. Parate and Martin Merenj. Slope failure is very important in practically all Geotechnical/Geomechanical, mining, civil and geotechnical engineering projects.

This project deals with slope stabilization by vacuum drainage as well as ground failure and landslide problems. The project explains that billions of dollars are lost in property damage by ground failures. Failure processes in Marine environment are briefly discussed. The project discusses geometrical methods, hydrological methods, and mechanical/chemical methods.

The stability analysis principles are explained. The two main forces involved in the equilibrium process are the acting and resisting forces. The three modes of failure are base failure, slope failure and toe failure. The different methods of analysis are Culmann method, Bishop method and Spencer method. These methods are used to calculate the slope angle and cut depth that are safe during excavation. Various factors that affect stability are listed and these are tension cracks, failure plane geometry. Nonhomogeneity of soil layers, dynamic loading or earthquake and seepage flow. The influence of water on slope stabilization are also discussed. They are: Reduction in shear strength, water in tension crack, development of seepage forces, ice glaciers and increase flows. Evaluation of the stability which then deals with permeability is also discussed. Instrumentation and the role of ground water is important.

Vacuum drainage method is explained in detail with practical examples which include: Case I - Highland Valley open pit copper mine. The result of this is before vacuum was installed the total drawdown from three drains was 92 liter/minute but after vacuum was introduced the total drawdown became 124 liter/minute.

Case II - Tar Sand project - Flow from drains under gravity initially was 5 gallons per minute and later it reduced to 3.5 gallons per minute after three days. When vacuum was applied the flow increased to 20 gallons per minute and this flow after about 16 to 31 days, reduced to 5 gallons per minute.

Observations are as follows:

- There is an increase in the rate of drawdown because of vacuum assisted drainage.
- A vacuum can be created in a jointed media.
- Vacuum drainage results in immediate drawdown and the maximum drawdown occurred during the initial period of operation.
- Vacuum drainage develops drawdown below the level of drains.
- There is a direct relationship between the amount of vacuum and the drawdown.
- The use of vacuum increases the flow from horizontal drains by 2-5 times.

The project results are taken from available literature.

**A Portable Pascal Interpreter/Debugger: A DEC-10 Implementation.** Vicky Chambers. It was necessary to modify a high-level Pascal interpreter/debugger when it was transported from a UNIVAC 1100/81 to a DEC-10. The debugger has the advantages that it is fully portable since it is written in standard Pascal and takes standard Pascal programs as input, and it has more capabilities than the debugger supplied with the DEC-10. It has the ability, for example, to debug dynamic records stored on the heap. The debugger was not used on the DEC-10 because of the differences between standard Pascal and DEC-10 Pascal, a superset of standard Pascal. Modifications were necessary so that it would debug DEC-10 Pascal.

Some of the modifications, such as adjusting machine dependent constants, were anticipated since these types of modifications are necessary any time a program is transported. However, most of the modifications involved altering the debugger to correctly compile and interpret the extra functions and statements that exist in DEC-10 Pascal. The debugger on the DEC-10 is now non-portable to systems that do not use DEC-10 Pascal. It was well worth losing portability so that the students could have a debugger with more capabilities than the existing debugger on the DEC-10.

## WESTERN REGION CHRISTIAN BROTHERS COLLEGE

**Detection Of Lactate Dehydrogenase Isozymes In Bovine Heart Serum By Electrophoretic Fractionation.** Mark Woods, Christian Brothers College. Four different electrophoretic fractionations of a crude preparation of bovine heart L-lactate dehydrogenase were performed. One electrophoretic investigation involved the native lactate dehydrogenase which migrated toward the anode with a pattern indicative of a single tetramer. In subsequent investigations by use of a freezing-thawing technique in the presence of a salt solution containing a reducing agent, the pattern indicated a separation of the tetrameric native enzyme into subunits, and hybridization of these subunits to form new isozymes.

**Four-Factor Crosses For Mapping Loci That Suppress cs Eclipse Mutations In Phage  $\Phi$ X174 Virus.** Sheila M. Thomas, Christian Brothers College. A quantitative method of mapping gene markers in  $\Phi$ X174 was sought in order to determine the location of unknown markers. It was decided to use three and four-factor genetic crosses, which were plaque assayed, and 48 plaques from each assay were chosen and tested for cold sensitivity, viz., failure to lyse a significant number of host cells at 25°C, as compared to the number lysed at 37°C. It was discovered by using this method that the cs70 marker and a suppressor marker of cs70 are both located in gene F of  $\Phi$ X174 between markers am244 and am375. It was also discovered that am299 may not be located in gene F of  $\Phi$ X174, as previously detected by others, but in gene G or gene H between am116 and am257 markers. In addition, the recombination frequencies of  $\Phi$ X174 were found to be unpredictable, and non-additive if used to map markers.

**Development Of A Reverse-Phase HPLC System Detecting Nanomole To Picomole Amounts Of Derivatized Amino Acids In Plasma.** Jane Sneed, Christian Brothers College. Among the various pre-column fluorescence labeling techniques, pre-column formation and chromatographic separation of the dansyl-amino acid derivatives were determined to be the most desirable, based on numerous studies. The gradient elution system used was 0.03 M  $\text{NaH}_2\text{PO}_4$ : acetonitrile (12-55% linear gradient) solution, with a flow rate of 1 ml/min. Three different reverse-phase C-18 columns were evaluated for their use in the separation of the dansyl-amino acid derivatives, with the Nova-Pak C-18 column providing sufficient separations and a relatively long life span. Two separate HPLC systems were also analyzed and it was found that the Perkin Elmer Series 400 liquid chromatograph, LS-1 Fluorescence detector, and LCI-100 Laboratory Computing Integrator provided the optimal chromatographic separation. However, the Waters system with the M-45 solvent delivery system, 6000 A injector and a Fluora-Monitor Detector provided the most sensitivity ( $1.7 \times 10^{-10}$  mole).

**Does The Availability Of Food Affect The Daily Rhythm Of Transferrin In Mus Musculus?** Maureen Robinson-Prather, William J. Lamoreaux and Priscilla S. Rushton, Memphis State University. A study on the effect of food availability on the diel rhythm of transferrin in *Mus musculus* was performed. The investigation was designed for determination of total iron-binding capacity (TIBC) using a microprocedure. Each mouse was sampled under ether narcosis at eight time periods, with a one week interval between sampling. The investigation used three groups of mice to test if the rhythm was due to food availability. One group was fed during the light period, a second during the dark period, and a third, fed *ad libitum*, served as a control. Statistical analyses showed that all three groups had similar rhythm and that the TIBC was significantly higher in the dark. Thus, the rhythm exhibited by transferrin is not dependent upon food availability.

**Enumeration Of Total And Viable Bacteria Indigenous To A Contaminated Aquifer.** J. A. Gallen, L. Mallory and S. Klaine, Memphis State University. Bacteria indigenous to a contaminated intermittent aquifer, located at Kelly Air Force Base near San Antonio, Texas, were enumerated using direct epifluorescence microscopic examination, and a plate-counting procedure using seven different media. This site received chlorinated solvents, cresols, and chlorobenzenes between 1960 and 1966. Recent analysis has shown that these chemicals are still present. The seven media consisted of three groundwater-agars, two high-nutrient media, both amended and unamended with 1,4-dichlorobenzene, and two low-nutrient media both amended and unamended with 1,4-dichlorobenzene. Subsurface samples were collected from five boreholes located at the dump site. Direct count estimates ranged from  $7.6 \times 10^6$  wet gram sample. The data indicated the pollutants present did not reduce the number of total bacteria compared to other sites. Of particular note was the apparent lack of selectivity of any of the seven media. All media recovered similar numbers of cells for any one sample. This lack of selectivity may indicate the presence of highly adaptive populations of bacteria.



*Nephrotoxicity Of Solid Tumor Patients Receiving Ifosfamide.* Linda Dunalewicz, Christian Brothers College. The nephrotoxicity of ifosfamide and the effectiveness of mesna against this toxicity were investigated in mice and humans. Pretreatment of the mice and humans with cisplatin was also studied for evidence of any longterm damaging effects to the kidneys of the mice or humans. Assays to measure the levels of mesna and its oxidized form, dimesna, were modified and validated. The assays are linear from 0-10 mM concentrations in the urine. Mesna was found to be present in very low concentrations in the urine of the humans shortly after its injection. This observation demonstrates the need for more frequent mesna injections post-ifosfamide. Both mice and humans pretreated with cisplatin were shown to have reduced output of mesna. This shows the need for increased protection from the nephrotoxic effects of ifosfamide with either more frequent injections or continuous infusion of mesna, especially for those patients pretreated with cisplatin.

*The Effect Of Yohimbine On Clonidine-Induced Suppression Of Copulatory Behavior In Male Rats.* Imogene Canady and Daphne Jones, Christian Brothers College. Clonidine, an antihypertensive agent, produced dose-related suppression of ejaculatory behavior in male rats treated with 0.25 or 0.50 mg/kg of body weight. Clonidine inhibits the firing of noradrenergic neurons in the locus coeruleus of the brain by acting directly upon adrenergic receptors. Clonidine treatment with 0.25 mg/kg inhibited ejaculatory behavior. However, sniffing, mounting and penile intromission occurred. Those rats treated with 0.50 mg/kg were inhibited from all copulatory activity, viz., mounting and intromission as well as ejaculatory behavior. Pretreatment with Yohimbine (a supposed "aphrodisiac," extracted from the bark of an African tree, *Coryanthe johimbe*) prevented the Clonidine-induced suppression of ejaculation in a few cases by blocking alpha-2-adrenoceptors. However, Yohimbine caused no statistically significant increases in copulatory behavior in male rats during the mating tests.

*Fatigability In Regenerates Of Denervated, Nerve-Crushed, Muscle-Crushed, And Normal Mouse Soleus Muscles.* Tim Ammons, Christian Brothers College. The right soleus muscles of two-four month old C57BL/6J mice were denervated, nerve-injured, or muscle-injured. After two months, the regenerates were compared mechanophysiological and histochemically to the contralateral, untreated control solei. There was no statistical difference between test and control muscles in terms of isometric twitch tension, contraction time, half-relaxation time, and total contraction time. The tension remaining at the end of tetanus of 10, 15, 20, or 30 seconds was measured as percent of the maximum tetanus tension for each muscle. The muscles were removed and weighed. Relative numbers of fiber types were studied using myosin ATPase stain at pH 9.4. Both test and control groups contained approximately 50% FOG fibers and 50% SO fibers. There were no statistical differences between test and control muscles in any of the parameters. Two months of regeneration seemed to repair the damaged solei completely.

*Science Education In The Middle Schools.* Alicia Swain and Kyle Hathcox, Union University. This study summarizes the results of science education research in the middle grades. The objective of this project was to determine if students are learning science and maintaining that knowledge. A science test based on seventh grade work was administered to eighth grade students. Their low performance on the test was indicative that there is a need for science improvement and that science education in our middle grades deserves our immediate attention. The test was also administered to future school teachers in area colleges.

*Origin Of Clays From Pinson Mounds.* Charlotte Stockton and Jimmy Davis, Union University. Two pottery shards from the Pinson Indian Mounds State Archaeological Site were analyzed quantitatively for trace elements. Sample #1 was from the Duck Nest Sector of the mounds and Sample #2 was from Mound 12, Feature 66. The percentage of the trace elements Mg, Fe, Ca, Na and K were found using the Jarrell Ash Dial

Atom Atomic Absorption Spectrometer. After the absorption was obtained the percentages of the trace elements were calculated and compared to a table of clays called "The Clays of West Tennessee."

*The Synthesis Of Cholesterol Ethers.* Brenda Ross and Eugene Gooch, Union University. Cholesterol is the essential precursor for the biosynthesis of steroid hormones, particularly sex hormones and the adrenal corticoids. Therefore, it seems very likely that a radioiodinated cholesterol ether could be used in nuclear medicine to diagnose disease involving this class of hormones. Presently, an attempt to synthesize cholesterol ethers via Williamson synthesis is in progress. Once the cholesterol ether is formed, it can be labeled with a radioisotope.

*Synthesis And Characterization Of A Seven Coordinate Pentagonal Bipyramidal Ni(III).* Scott Reid and Jimmy Davis, Union University. Much recent work has involved the synthesis of seven coordinate transition metal complexes having pentagonal bipyramidal (PBP) geometry. Use of the planar five coordinate ligand 2,6-diacetylpyridine (bis) semi-carbazone have led to structurally confirmed seven coordinate PBP complexes of several transition metals, including Ni(II), Mn(II), Co(II), and Fe(II). In our research, we attempt to oxidize two Ni(II) seven coordinate PBP complexes, using both chemical and electrochemical methods. These two complexes are: (1)  $[\text{Ni}(\text{DAPSC})(\text{H}_2\text{O})_2](\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ , and the second complex is  $[\text{Ni}(\text{DAPSC})(\text{H}_2\text{O})\text{Cl}]\text{Cl} \cdot \text{H}_2\text{O}$ . The oxidized species will be characterized by half-wave potentials, magnetic moments, elemental analysis, and electron spin resonance (ESR) spectra.

*Free Radical Ring Opening Polymerization And Dilatometric Measurements Of 2-Methylene-4-Phenyl-1,3-Dioxolane.* Arletta R. Nightingale, Christian Brothers College. Many monomers have practical applications as adhesives and coating due to near zero shrinkage or expansion. Ionic ring opening polymerization of heterocyclic compounds are well known but free radical ring opening polymerizations are rare. If a monomer could be developed in which, for every bond that goes from a Van der Waal's to a covalent to a near Van der Waal's distance, then zero shrinkage or expansion would be anticipated. The cyclic compound, 2-methylene-4-phenyl-1,3-dioxolane was synthesized by an acetal exchange reaction of ( $\pm$ )-1-phenyl-1,2-ethanediol and chloroacetaldehyde dimethyl acetal, followed by dehydrochlorination of cis- and trans-2-chloromethyl-4-phenyl-1,3-dioxolane with KO-tert-Bu in tert-BuOH. 2-methylene-4-phenyl-1,3-dioxolane was shown to undergo free radical ring opening polymerization to produce poly[ $\gamma$ -( $\beta$ -phenyl)-butyrolactone] and it has a 1% shrinkage.

*The Synthesis And Electrophilic Substitution Of 1-Trifluoromethylsulfonfylpyrrole.* Paula L. Millirons, Rhodes College. The synthesis and reactions of 1-trifluoromethylsulfonfylpyrrole were investigated for their usefulness as a synthetic route to 3-substituted pyrroles and for what they might reveal about the mechanistic control of 3-substitution. Increases in the percent of 3-isomer formed during reactions of deactivated pyrroles with "hard electrophiles" have been postulated to result from increased charge control of the reaction, for example in the  $\text{AlCl}_3$  catalyzed acylation of 1-phenylsulfonfylpyrrole. While there does seem to be greater charge control in the reactions of the 1-sulfonfylpyrroles, we believe that this increase does not alone account for the rise in 3-acylation. It is proposed that a previously uncharacterized complex between the 1-sulfonfylpyrroles and  $\text{AlCl}_3$  may account for the increased stereospecificity beyond that expected by the hardness of the electrophile in these acylation reactions.

*The Copolymerization Of Vinyl Chloride With Benzene And Chlorobenzene.* James F. Benson, Jr., and Lyle D. Wescott, Jr., Christian Brothers College. In the solution polymerization of vinyl chloride in either benzene or chlorobenzene, the vinyl chloride has been shown to copolymerize with the solvent. Carbon-13 nuclear magnetic resonance spectroscopy of the reduced polyvinyl chloride (PVC) has given evidence for the addition of benzene to the growing polymer chain, and this effect is strongly suggested for chlorobenzene.