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ABSTRACTS OF PAPERS PRESENTED AT THE SPRING COLLEGIATE MEETINGS

EASTERN REGION
CARSON-NEWMAN COLLEGE

"Short Term Effects of Living in a Group Home on the Self-Concept of Adolescent Girls," Rose McConnell, Maryville College. Five adolescent girls ranging in age from 13 to 17 were administered the Tennessee Self-Concept Scale within two weeks of their arrival at a group home. General improvement in behavior as well as self-concept was observed in three of the subjects. The other two girls showed little change in behavior or self-concept. Behavior of the subjects appeared to be related to their self-concept. It was concluded that the group home provided adequate care, and met the needs of the girls it served.

"A Search for Brightness Variation of Peculiar A Stars: Results of a Two-Year Study," Susan C. Lady, King College. (No abstract provided.)

"Photoelectric Study of Eclipsing Binary Stars," Jeffery L. Mullins, King College. (No abstract provided.)

"Isomerization of Diethylmaleate to Diethylfumarate: Part 1, Kinetics of Amine Catalysis and Steric Effects," Andy Pickard and Irving T. Glover, Roane State Community College. The cis-trans isomerization of maleate esters to fumarate esters is catalyzed by primary and secondary amines but not by tertiary amines. The reaction is first order in ester and first order in amine catalyst. Comparison of the relative rates of the reaction when catalyzed by amines with varying degrees of steric hindrance indicates that steric requirements are important in the transition state.

"Isomerization of Diethylmaleate to Diethylfumarate: Part 2, Etrathermodynamic Properties—Energy of Activation," Claude Buttram and Irving T. Glover, Roane State Community College. Primary and secondary amines catalyze the cis-trans isomerization of maleate esters to fumarate esters, whereas tertiary amines are ineffective as catalysts. This suggests a particular role for hydrogen bonded to nitrogen in the catalytic action of the amine. The entropy of activation for the reaction is in accord with a cyclic transition state where hydrogen bridging may be a significant factor.

"Photoreduction of Substituted Nitrobenzenes in 2-Propanol," Dale O'Dell, King College. (No abstract provided.)

"Effects of Vitamin E on Reproduction in White Rats," Eric Clarke, Bryan College. Students in Cell Biology investigated the effects of Vitamin E on the offspring of eight Sprague-Dawley female rats. Previous studies with the vitamin at levels of 24 to 96 I.U./Kg. body weight had resulted in a high percentage of male offspring that developed enlarged sex organs and were apparently sterile. Females born to these mothers died before reaching maturity. A sample of D-alpha-tocopherol acetate was used in these studies. It was liquid and contained 1000 I.U./g. The previous studies were carried out with a solid form of the vitamin, containing 250 I.U./g.

Only two surviving litters were obtained from six rats dosed. One did not breed and the others had small litters which did not survive. Two rats were used for controls. Offspring from the controls were normal and had an average distribution of male and female offspring.

One female on 72 I.U./Kg. gave birth to 10 offspring; but shortly after birth, their tails began to atrophy. After the mother was placed on a normal diet, the tails of the offspring resumed normal growth; but the tails remained truncated or constricted at the point of change in diet. Of the four surviving pups of the other female, given 48 I.U./Kg., three had abnormal hind feet. The sex distribution in all cases was about average. The males from the Vitamin E dosed mothers, however, again appear to be developing abnormal sex organs. The tissues of the offspring will be examined to determine whether they appear different from controls and the remainder of the litters will be

kept in an effort to determine whether these also are sterile.

"A Study of Esters of Polyhydroxy Compounds and the Mono-, Di-, and Trichloroacetic Acids," Tim Eggert, Chris Armstrong, Steve Hine, Erkki Lahdeaho, and Steve Marlow, Bryan College. Organic chemistry students attempted the synthesis of esters of ethylene glycol, glycerol, and triethylene glycol with the alpha substituted chloroacetic acids in an effort to determine whether the stronger acids would catalyze the reaction. A yield of 95% of the ethylene glycol trichloroacetate was obtained last year and again this year. The substance was obtained in pure form, melting at 41°C. The mono- and dichloroacetic acids gave much lower yields of liquids that exhibited infra red absorption spectra in the expected regions; but with a slight absorption in the -C-OH region. Gas chromatogram exhibited two peaks indicating that there may have been only partial esterification or possibly two isomers. Without pure samples of these compounds, it was not possible to determine the composition of the products. Glycerol and triethylene glycol gave compounds with the three acids that were all liquids, but were very difficult to purify. Some were hygroscopic and attempts to obtain reproducible spectra were generally unsuccessful. Further syntheses and purification of products will be required before approximate yields can be evaluated.

"Studies in Synthesis of Analogues of Dibenzo (a, 1) Pyrene," Allen R. Craig, King College. (No abstract provided.)

"Some Ways Chemistry Is Involved in the Utilization of Solar Energy," Ruth Ziegler, Carson-Newman College. (No abstract provided.)

MIDDLE REGION
DAVID LIPSCOMB COLLEGE

"Effects of Acetone on the Extraction of Lindane and Dieldrin into Hexane," Mike Dunn, Middle Tennessee State University. (No abstract provided.)

"Life History, Production and Feeding Habits of the Winter Stonefly *Taeniopteryx burksi* Ricker and Ross (Plecoptera: Taeniopterygidae) of Spring Creek, Overton County, Tennessee," John G. Smith and Parley V. Winter, Tennessee Technological University. (No abstract provided.)

"A Study of the Coliform Population at Selected Sampling Sites on the West Prong of the Little Pigeon River," J. Greg Johnson and Julia Bryant, Tennessee Technological University. This study was undertaken with the objective to determine the effect of human population density on the coliform population of the West Prong of the Little Pigeon River. Using the multiple tube fermentation technique, as detailed in **Standard Methods for the Examination of Water and Wastewater**, samples from four points along this river which differ greatly in the density of human population were tested. The most probable number of coliforms present in the water increases dramatically once exposed to human habitation, according to the results of this study. This finding correlates with the theory that the coliform population increases with rises in the human population along the area adjacent to the West Prong of the Little Pigeon River.

"Photometry of Three Very Bright RS Canum Venaticorum Binaries: λ Andromedae, σ Geminorum, and V711 Tauri = HR 1099," Alan F. Brooke II, Vanderbilt University. New UVB photoelectric photometry of the RS CVn-type binaries λ And, σ Gem, and V711 Tauri, obtained during late 1977 at Dyer Observatory, indicates some variability in the amplitude and form of the sinusoidal wave distortion found in all three light curves.

During the interval 27 September to 17 November 1977 there were six observations in the V band made for λ and six observations for σ Gem, and 16 observations for V711 Tauri. It is indicated that the wave amplitude for λ And is approximately

0.12 magnitude with wave minimum occurring at J.D. 2443395 \pm 5. Sigma Gem displays a wave of amplitude 0.10 magnitude with its minimum at phase 0.10 \pm 0.05. V711 Tau shows a wave of amplitude 0.085 magnitude with its minimum at phase 0.58 \pm 0.05.

"Photometry of the Faint RS Canum Venaticorum Binary SS Camelopardi," J. Fred Nixon, Vanderbilt University. New UVB photoelectric photometry of the RS CVn-type eclipsing binary SS Cam, obtained during 1977-78 at Dyer Observatory, has led to preliminary results that indicate the sinusoidal wave distortion has decreased markedly in amplitude. No observations were obtained within either eclipse, but the light curve outside eclipse was covered fairly well. There was some evidence of the ellipticity effect, in rough agreement with the amount seen in the 1972 light curve obtained earlier at Dyer Observatory. But there was no evidence of any asymmetry; specifically, there was no evidence of the 0.05 magnitude distortion wave seen in 1972. If a wave was present in 1977-78, its amplitude was less than about 0.02 magnitude.

"Investigation of Nuclear Energy Levels of ^{70}Br Using a Gamma-Ray Coincidence Technique," Richard W. Eastes, Mark E. Barclay and John C. Wells, Tennessee Technological University. The nuclide ^{70}Br was produced via the $^{60}\text{Zn}(^{12}\text{C}, p\text{n})^{70}\text{Br}$ reaction by bombarding an enriched ^{60}Zn target with 38-MeV ^{12}C ions from the Oak Ridge National Laboratory EN tandem accelerator. A gamma-gamma coincidence technique was used to identify the gamma rays originating in ^{70}Br , and to determine which of those gamma rays were in cascades. Fourteen gamma rays were identified as coming from ^{70}Br , and were incorporated into an energy level scheme containing eight energy levels. This scheme included all of the levels reported by Behar et al., plus two additional levels at 1409 and 1890 keV. Except for the ground state, the levels reported here are entirely different from those deduced from ^{70}Br beta decay.

"Measurement of Nuclear Lifetimes Using Inverse Heavy Ion Reactions," Linda Stuk, Tennessee Technological University. A thin ^7Li target on a thick tantalum backing was bombarded with 32.5 MeV ^{24}Mg and 25 MeV ^{16}O ions from the Oak Ridge National Laboratory EN tandem accelerator in a feasibility study for measuring lifetimes of neutron-rich nuclei by the Doppler shift attenuation method. Reaction products included ^{20}Mg , ^{28}Si , ^{23}Na , and ^{20}Al from the ^{24}Mg beam and ^{18}O , ^{18}F , ^{19}F and ^{20}F from the ^{16}O beam. These nuclides recoiled into the tantalum backing and were stopped. A detector was placed at 0° with respect to the beam. Gamma rays emitted by moving nuclei showed a Doppler shift to a higher energy than those emitted by nuclei which had already stopped. Examination of the gamma ray spectra reveals several pairs of shifted and unshifted peaks which indicate lifetimes consistent with reported values. The experiment suggests the feasibility of measuring lifetimes of energy levels at high recoil velocities in ^{28}Mg , ^{28}Si , ^{23}Na , and ^{20}Al by using a ^{20}Mg beam on ^7Li , and of measuring ^{20}O lifetimes by using an ^{18}O beam on ^7Li .

"Identities of the Higher Order Hyperbolic and Trigonometric Functions," F. C. Stevens, Tennessee Technological University. (No abstract provided.)

"Sexual Involvement vs. Friendship—A Semantic Differential Approach," Rick D. Cumby and Michael Weaver, Tennessee Technological University. (No abstract provided.)

"Attitudes on Interracial Marriage as a Function of Sex of Subject and Race of Experimenter," Janet Donaldson and Tracy Fleming, Tennessee Technological University. (No abstract provided.)

"Reinforcement of Verbalization in a Simulated Counseling Session," Andrea Hall, Tennessee Technological University. (No abstract provided.)

"Effects of Oxygen Inhalation on Digit Span," Debbie K. Herron, Tennessee Technological University. (No abstract provided.)

"Adaptability and Sensitivity of the Upper Extremities to Cold," Marie T. Holehouse, Tennessee Technological University. (No abstract provided.)

"The Effect of Sodium Pentobarbital on Social Behavior in Mice," Anthony Price and Barbara Farmer Thompson, Tennessee Technological University. (No abstract provided.)

WESTERN REGION
CHRISTIAN BROTHERS COLLEGE

"Study of Effects of Certain Ammonium Test Solutions on *Lemna minor*, Duckweed," Michael Sharp, Christian Brothers College. This experiment indicates that ammonia is readily absorbed into the tissues of *Lemna minor* from ammonium nitrate, ammonium chloride, and ammonium chloride with succinic acid solutions, probably for use in nitrogen metabolism. Due to mold overgrowth in the test solution there is no substantial evidence to support this, though there is some evidence from pH data. Duckweed survived in deionized water for 23 days, growing much like duckweed in an aquarium.

"A Study of Lead Ingestion in Waterfowl in West Tennessee," Tom K. Ballard and John Meriwether, Lambuth College. This project was designed to obtain information pertinent to the research currently being undertaken concerning the effects of the use of lead versus steel pellets in shotgun loads. Since iron and other elements or alloys are ballistically inferior to lead shot, the extent of lead poisoning must be known to enable a comparison of its effects with those of crippling losses due to the use of less suitable shot-shell projectiles. The results showed no immediate threat to waterfowl due to lead ingestion in the area sampled (middle fork of Forked Deer River near Eaton, Tennessee). Therefore, the use of steel shot in the area sampled seems unwarranted.

"Attempted Adaptation and Mutation of Gram-Negative Bacteria to High Temperature," Roger S. Cicala, Christian Brothers College. The upper temperature limit for growth over a twenty-four hour period was determined for five gram-negative bacteria, *Escherichia coli*, *Pseudomonas fluorescens*, *Alcaligenes faecacalis*, *Neisseria perflava*, and *Proteus vulgaris*. The bacteria were transferred from stock agar plants at 24°C to brain-heart infusion broth at temperatures increased by two degree increments until the upper limit for visible growth was reached.

This process was repeated, but with stock cultures kept 5°C of the upper lethal limiting temperature. No significant change in the results occurred, with the exception of a 3°C increase in the upper limit of *N. perflava*. Since this strain was not very hardy, the increase may be attributed to reduced transfer shock.

Streak plates of each bacteria were exposed to 3, 5, 7, and 10 second illumination 10 cm. from a 317 amp ultraviolet lamp. These plates were then incubated 2 below their lethal limiting temperature, restreaked, and subsequent lethal upper temperatures determined as before. All bacterial cultures surviving exposure showed no increase in upper limiting temperatures.

"Some Light Effects on Pea and Radish Plants," Sandra Y. Ford, Christian Brothers College. Incandescent, fluorescent, ultraviolet and sun light on pea and radish plants caused variations in germination and growth. Continuous fluorescent lighting produced plants with the highest flower yields, but had the shortest stems; those under incandescent lighting produced plants with the longest stems and also the greatest number of individual plants. Plants under ultraviolet light received an insufficient amount of usable light energy; therefore, those seedlings which germinated eventually died. Seedlings irradiated by the sun produced plants with the sturdiest (thickest) stems along with the greatest number of nodes. Flowers and fruits were produced from all sources other than ultraviolet light; and those exposed to sunlight produced a larger and healthier looking fruit while those under the supplementary lighting produced stunted fruit.

"Alpha Wave Production," James Irving, Nanette Fehrmann, and Winifred Brodie, Christian Brothers College. The purpose of these experiments was to determine whether individuals without previous alpha training could learn to increase alpha wave production and amplitude through biofeedback.

One phase of these experiments entailed monitoring and individual's ability to increase alpha wave amplitude. A second test dealt with increases of both amplitude and incidences per minute of the alpha waves of an individual. A third area involved measuring alpha amplitude and incidence per minute on a group of three volunteers.

"The Reaction of Metal Vapors with Cycloheptanone," Steve Nagy, Christian Brothers College. (No abstract provided.)

"Electrophoretic Separation of Dansyl Amino Acid Derivatives," Gregory E. Stablein, Christian Brothers College. An attempt was made to find an electrophoretic method of separa-

tion of dimethylaminonaphthalene-5-sulphonyl (DNS) amino acids. Preliminary work was done with Whatman papers number 1 and 2. On cellulose acetate the samples moved as compact spots, allowing the use of smaller samples, and better separation was obtained than with paper. Three buffers were used: 0.8% pyridine, 0.4% acetic acid in H₂O (pH 4.4); 0.1 M Na₃PO₄-NaOH (pH 12.7); and 0.025 M Na₂CO₃ (pH 10.3) which proved most satisfactory. Using a cooled plate apparatus, the paper drew 20-35 mA at 500 volts DC whereas the cellulose acetate drew only 3-7 mA. Optimum sample sizes were 0.5 μ l and 0.05 μ l, respectively, for the paper and cellulose acetate. Good separation of glycine, alanine, valine, leucine, isoleucine, proline and methionine was obtained on cellulose acetate in one hour.

"Equilibration of Lithium in Dog Blood," Bernard E. Gant, Christian Brothers College. This experiment was done to determine the rate and amount of lithium that could be absorbed by the erythrocytes of dog blood, as well as determine the point at which the lithium concentration equilibrates in the blood. This was accomplished by extracting a measured amount of blood, 8-10 ml, and adding a certain concentration of lithium, approximately .13 milliequivalents per liter with the blood being maintained at 37°C in a water bath. Samples were taken at a set interval, 20 minutes after the addition of lithium and one sample every hour thereafter. At this concentration, an equilibration point could not be reached. However, when the concentration was doubled, to .26 meg per liter, it was found that an equilibration point was reached after .4 hours from time zero.

"The Experimental Determination of the Dufour Effect in Liquids," Marshall H. Crenshaw, Southwestern at Memphis. The Dufour effect is a so-called "cross-phenomenon," due to the interference of two simultaneously occurring irreversible processes. It is the flow of heat produced by a concentration gradient, and is said to be reciprocal to the diffusion produced by a temperature gradient.

An introduction to reciprocal phenomena will be followed by a brief development of phenomenological equations describing the Dufour effect. Measurements of Dufour coefficients carried out at Southwestern will be described. The results will be compared to thermal diffusion data, as a test of the Onsager reciprocal relations.

"Effects of Plasma Proteins on Red Blood Cell Morphology," Steven Nokes, Christian Brothers College. Human red blood cells exist normally in the biconcave disc shape. Discocytes will become crenated (echinocytes) when ATP and plasma proteins are removed. The transformation is reversible and shows a great specificity for albumin. The reversion rate for echinocytes receiving albumin coincides almost exactly with autologous echinocytes receiving plasma, suggesting that albumin is the component

of plasma responsible for modulating the morphology. IgG and plasma proteins lacking IgG and albumin were not effective in reversing the disc to echinocyte shift. Bovine albumin is more effective than human albumin in reversing echinocytes to discocytes using human red blood cells.

"The Reactions of Metal Vapors with Cycloheptanone," Stephen G. Nagy and Dr. Lyle D. Wescott, Jr., Christian Brothers College. The reactions of metal vapors with cycloheptanone co-condensed at 77°K produced cycloheptene, cycloheptone, norcarane and the reductive coupling produced 1,1'-dihydroxy-dicycloheptyl in addition to some aldol condensation products. In every case except Ni, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, and Zn all produced the same products though in different ratios, and also a new product (m/e=96) having a mass spectrum strikingly similar to cycloheptene and norcarane was observed. This new product is believed to be bicyclo (3.2.0) heptane resulting from a 1-5 transannular C-H insertion of a proposed carbenoid intermediate. The reactions of Ni with cycloheptanone are unique and yield a group of compounds (m/e=98) believed to be heptenes.

"An Investigation into Glutathione Deficiency Anemia," Michael W. Thomas, Christian Brothers College. The reported cases of glutathione deficiency anemia were examined. A comparison of the hematological data and symptoms of these cases suggested the possibility of glutathione deficiency in the primary subject.

A new method was developed for the qualitative determination of blood glutathione utilizing the reaction of 4-chloro-7-nitrobenzo-2-oxa-1, 3-diazole (NBD-chloride) with sulfhydryl groups, as an adaptation from other procedures.

The level of NBD-chloride reactive groups in the blood of the primary subject was the same as that of a healthy subject who had no history of anemia. It was concluded that the primary subject did not have an anemia attributable to glutathione deficiency.

"Diethanolamides as Surfactants in a Tertiary Oil Recovery Process," W. H. Wade, Tony Phillips, and Michael Hayes, Union University. The interfacial and surface tension behavior of several diethanolamides was investigated to determine whether or not they could be used as surfactants in a tertiary oil recovery process. The interfacial tensions of several mixtures involving the diethanolamides versus hydrocarbons were measured using the spinning drop technique. The influence of surfactant structure, molecular weight, and salinity on the low tension behavior was examined. The critical micelle concentration of several of the synthetic diethanolamides was determined. The effect of surfactant structure, hydrophobic character of the surfactant, and salinity on the critical micelle concentration is discussed.