

# ABSTRACTS OF PAPERS PRESENTED AT THE SPRING COLLEGIATE MEETINGS

## EASTERN REGION ROANE STATE COMMUNITY COLLEGE HARRIMAN

*"An Analysis of Hematological Factors Among Administration, Faculty, and Staff of Roane State Community College"*. Pamela Brown, Linda Culpepper, Marilyn Mason, and Myrian Works. Roane State Community College.

An analysis of hematological factors was conducted on volunteer members of Roane State Community College, Harriman, Tennessee. The study of 56 individuals was implemented by four members of Anatomy and Physiology 2320 class from March 5 through March 8, 1974. Two students, one a medical technologist and the other a practical nurse, extracted blood from each participant by the simple finger-prick method. The remaining two students assisted in the clerical work and examination of the data. A total of four blood tests was performed on each individual. These include blood glucose level (Dextrostix), blood pH (Nitrozone), and ABO-Rh typing (Landsteiner). In addition, blood pressure was also recorded. In an interview with each participant such factors as age, race, sex, height, weight, current prescribed medications, hereditary circulatory problems, temperament, and occupational specialty were noted.

Though the test methods used were not of a high clinical certainty but rather those commonly used in the educational laboratory, a diversity of blood factors was noted among the individuals sampled and the testing provided invaluable experience for the student clinicians. Two accounts of a high blood glucose level were recorded, blood pH levels were all normal, and ABO-Rh types closely resembled the national scale. Four incidences of high blood pressure were suspected on evaluations of the recordings.

As a conclusion of the experiment students will prepare an evaluation with proper written explanation of the findings on each test performed and report the results to the participants. In the case of any abnormality, proper referral to local medical specialists will be advised. The college infirmary will receive a comprehensive report of the findings.

*"A Study of Some Chemical and Physical Properties of Center Hill Reservoir in Tennessee in a Year of Heavy Spring Rains"*. David Robertson. Tennessee Technological University. A study was made during June-August 1973 of several parameters (pH, temperature, hardness, alkalinity, and light transmission at depth) in Center Hill Reservoir and possible relationships to the heavy spring and summer rains in 1973 (40.83 inches from January-June). Data was compared to that amassed by Arnold Gnilka in 1966-7 (rainfall for the same period was 21.81 inches and 23.82 inches respectively).

The results of the study indicated little correlation between summer rainfall and the investigated parameters. No cause-effect relationship between the spring rains of two years and the resultant data was found. Comparisons with the 1966-7 study of Arnold Gnilka showed the concentration of total hardness, calcium hardness, and total alkalinity to be higher in 1967 while the phenolphthalein alkalinity was of a higher concentration and the pH of a more alkaline range in 1973. Some unexplained inconsistencies accrued between the turbidity and apparent color, and the light transmission at depth near the middle of August with the latter remaining high while the two former rose. No unusual variations resulted from increased rainfall.

*"Sensitivity of Tobacco to Chromium from Cooling Tower Drift"*. Patricia Dreyer. Tennessee Wesleyan College. The practice of adding chromium, zinc, and phosphorous compounds to the recirculating water of cooling towers is widely used to inhibit corrosion and pitting. Elements from natural streams in make-up water and salts added for corrosion control are concentrated through evaporation. Quantities of these elements or

compounds are lost to the atmosphere through drift and transferred to terrestrial ecosystems.

In my study, I used tobacco plants, which are sensitive to chromium, to assess the impact of airborne contaminants—mainly chromium—on vegetation. A total of forty potted plants were placed a 15, 300, 600 and 1400 (control) meters from cooling towers. Four plants were harvested in a 1 week intervals for a total of 8 weeks and were examined for total plant biomass, leaf biomass, leaf area, and general vigor estimates. These parameters were correlated with concentrations of chromium to evaluate increased trace elements (in this case chromium) through airborne contamination to vegetation as the result of the cooling tower operation.

*"Oxidation of Polyethylene Microspheres"*. Lewis E. White and John M. Graves. Lincoln Memorial University. Heretofore, tests for oxidation in polyethylene have been an almost exclusive long term process, with testing times ranging from a few weeks to several years.

Through the use of microscopic samples, spheres ranging from 100 to 500 microns in diameter, we have now done considerable studies on the effects of short term oxidation in polyethylene.

Oxidation will add little to the overall sphere diameter but would add considerably to the density of the microsphere. For this reason studies revolved around the use of density gradient columns, set up and calibrated under precise ASTM standards.

Through this research we have been able to calculate percentage oxidation from knowing only density changes and sphere sizes. Accuracy of the formula versus microanalysis shows an average deviation of approximately .5% in our isolated cases. Further experiments are underway to determine if this holds true in a wide range of sphere sizes.

*"Analysis of Gap Creek During a Flood Time"*. Jerry Gray. Lincoln Memorial University. Samples of water were taken from three points in Gap Creek over a ten-day period. The water was analyzed for pH, acidity, alkalinity, hardness, total solids, total phosphate, chemical oxygen demand, and conductivity.

*"A Preliminary Search for the Distinguishing Characteristics Among Academic Restriction/Probation Students"*. James Sterling Fitzgerald, Bryan College. The major objective of this study was to determine in what areas of performance and ability the low-achiever significantly differs from the student who experiences no difficulty. The subjects were 44 students in academic restriction/probation during the 1973-74 academic year compared with a randomly sampled control group from the student body at large. A statistical analysis of thirteen different areas of performance and ability was conducted. Statistical significant differences were found at the following significant levels in the following areas of performance: .001(99.9%), American College Testing (ACT) program Social Science and Composite, Science Research Associates (SRA) test vocabulary, Otis Quick-Scoring Mental Ability test and High School Grade Point Average; .01(99%), ACT English, Math, and Natural Science, the Differential Aptitude Abstract Reasoning test, and SRA Total Reading; .05(95%), SRA Comprehension. Not statistically difference were the SRA Reading Rate and Reading Skills scores. As a group, the academic low-achievers read at a more rapid rate than the control group.

The results show a probably mental impairment compounded by weak comprehension and vocabulary. In addition, the low-achievers, as a group, also appear to have a inability to manipulate abstract concepts and principles. The combination of ACT scores and High School GPA into a well-designed measuring instrument could prove to provide the best prediction of possible college success.

"An Investigation of Effects of a Vitamin-E Deficient Diet on the White Rat." Bill Brewer and Jim Anderson. Bryan College. Studies on white rats on a Vitamin E deficient diet were begun approximately one month prior to breeding and were compared with controls over the same period of time. Weight gains were inferior in all cases to subjects on a Vitamin E diet and to those on a Vitamin E supplemented diet.

Breeding results indicated only one conception with resulting abortion of offspring and loss of the entire litter. No more pregnancies were obtained after over 100 days on the deficient diet. Males were sacrificed and their sperm were examined under the phase microscope. Sperm of all males (on Vitamin E supplemented diet, on the deficient diet, and controls) were motile and similar appearing in size and shape.

The females were then placed on a normal diet and exposed to control male. The one who had aborted did not breed again. The other female bred and delivered a normal appearing litter of seven males and five females. The mother and offspring grew well and appeared normal but at weaning showed an average weight gain below that of controls of almost 20 grams each.

Subjects were sacrificed and showed a difference in pigmentation of one lung in both sexes on a deficient diet.

Results show a Vitamin E deficiency does result in apparent irreversible sterility in males and temporary sterility in females.

"The Effects of Vitamin E on the White Rat." Colleen McCarty, Becky Ely and Tim Faugl. Bryan College. Vitamin E in quantities of 1.5 mg. per rat per day was fed to three females and two male mice for a period of one month prior to breeding. Controls from the same litter were studied simultaneously.

Body weight gains were comparable over this period of study, but both the females and males on Vitamin E gained weight during estrus and breeding, while with controls both sexes lost weight. Controls yielded normal litters of eleven rats with a reasonable distribution of sexes—seven females and four males. All females on Vitamin E yielded abnormal distribution of sexes. One had only four to survive; one produced eight females and only one male; and another which had previously devoured her first litter, produced seven males and two females when bred to a control male.

Body weight gains for all the offspring of Vitamin E mothers were below those of controls. These results appear to indicate that Vitamin E may play some role in the expression of genes in offspring.

"The Effects of Responses of Another Person in an Auditory Intensity Recognition Task." William D. McBrayer and Michael D. Biderman. University of Tennessee at Chattanooga. Five observers in an auditory intensity recognition task heard the response of another person before emitting their own response. The data were analyzed by application of a mathematical model for signal detection behavior. Three parameters of the model were estimated from the data; a parameter reflecting sensitivity to intensity of the tones being judged, a parameter reflecting sensitivity to responses of the other person, and a decision criterion parameter.

Estimates of the parameters were obtained from the data of two experimental sessions. In each session, 500 judgements were made. For the first 200 trials, responses of the other person corresponded perfectly to the tone intensities. For the last 300 trials, responses of the other person were emitted according to a random sequence, with a *a priori* probability of one of the responses equal to .75.

Of particular interest for the present study were estimates of the parameter reflecting sensitivity to responses of the other person. Estimates of this parameter were positive for all observers in both sessions, indicating compliance with the other persons' responses. In addition, estimates of this parameter were virtually invariant for individual observers across sessions, indicating that this aspect of the decision behavior of individual observers was quite consistent. No cumulative changes in the decision criterion parameter were obtained, indicating that the effect of the responses of the other persons were specific to each trial.

## MIDDLE REGION THE UNIVERSITY OF THE SOUTH

"Motion Picture Interferograms." Roger Farrow and William McGee. The University of the South. Studies of the effect of steady-state electric fields on the evaporation rate of water require knowledge of the interaction of the electric field with the liquid diffusion layer. Laser interferometer techniques allow a visual display of the diffusion layer during the application of intense uniform and non-uniform electric fields; results indicate a flattening of the diffusion layer when the electric field is strong enough to produce a corona discharge from the electrode above the water surface. For display purposes, motion pictures of the flattening effect were employed, since the dynamics of the effect are most easily seen by this method.

"Contour Plots of Hydrogen Like Atomic Orbitals." Gaylord T. Walker. The University of the South. It is possible to program a computer to perform the task of plotting contour functions of probability density for any one or two particle dynamical system. In the specific case of atomic orbitals, this is an electron density of a hydrogen-like orbital. The quantum mechanical aspects are relatively simple, and most of the effort is directed toward programming the computer to execute the necessary mathematical manipulations. Graphs are most conveniently displayed in a two-dimensional cartesian system. Wave functions, however, employ three-dimensional spherical polar coordinates, and a transformation must be made. The wave functions themselves are derived from general generating formulas. Three independent functions (radial, declinal, azimuthal) of one variable each are combined to yield the function  $\Psi$ . Probability densities are plotted as  $\Psi^2/\Psi^2(\max)$  which, by the postulates of quantum mechanics, is proportional to the probability of finding the electron in that interval. The computer then takes this probability, multiplies it by a factor of ten, and prints it as an integer in a contour plot.

"The Extinction Curves of Taste Avoidance Learning in Rats." Rick Osgood. The University of the South. A procedure which set learned taste avoidance against learned safety suggests that learned taste avoidance is the more powerful of the two in controlling behavior. Following extinction of the avoidance behavior through repeated presentation of the saccharine solution, *Ss* received an additional poisoning. The strong avoidance obtained suggests that the learned safety of the extinction trials was less powerful in controlling behavior than a single re-poisoning experience. The adaptive advantages of this mechanism were discussed.

"Similarity of Parabolas." Dan Stancil. Tennessee Technological University. The concept of two polygons being similar, or at least two triangles being similar, is well known but it is usually defined in terms of angles and/or sides of the geometric figures. Such a definition precludes any generalization which would apply to planar curves or other planar sets, but the concept of one set being a projection of another can be used to define what is meant by two planar figures being similar.

The term projection ratio is also defined and the projection of an arbitrary bounded planar set is investigated in terms of the projection ratio.

Corresponding points are also defined for two planar figures and a computer program has been written which will give the coordinates of a point on any parabola if the distance from the focus to the vertex is known and if the coordinates for the corresponding point is known.

"Effect of Sodium Chloride, Sodium Dodecyl Sulfate, and Vinc Ions on the Denaturation of *B. Subtilis*  $\alpha$ -Amylase by Urea." Hugh P. McClannahan and J. M. Wakim. University of Tennessee at Martin. The effects of some reagents on the denaturation rate of  $\alpha$  amylase by 6M urea were investigated. NaCl up to 1.0M concentrations when used simultaneously with 6M urea did not effect the rate of denaturation. Sodium dodecyl sulfate ( $2.5 \times 10^{-2}M$ ) slightly enhanced by the urea denaturation. The effect of  $Zn^{++}$  depend on the concentration of the ion:  $10^{-2}M$  had no effect,  $10^{-3}M$  had slight protection, while  $10^{-4}M$  enhanced the rate of denaturation.

The effect of  $Zn^{++}$  alone on the activity of the enzyme was also investigated. The enzyme activity was lowered in the

presence of  $Zn^{++}$  falling to about 10 percent at  $10^{-2}M$   $Zn^{++}$ . The inhibition of the enzyme by  $Zn^{++}$  was 100 percent reversible when the  $Zn^{++}$  concentration was less than  $10^{-1}M$ . At  $10^{-2}M$  the inhibition was reversible but the amount of enzyme activity recovered depended upon the time of incubation of the enzyme with  $Zn^{++}$ . The denaturation of the enzyme by  $10^{-2}M$   $Zn^{++}$  was similar to the denaturation of the enzyme by 6M urea. Since  $Zn^{++}$  is known to cause dimerization and/or aggregation of *B. Subtilis*  $\alpha$ -Amylase, the results of the present study are consistent with our hypothesis that the irreversible denaturation of the enzyme by 6M urea is due to aggregation. Investigations pertaining to the molecular changes associated with the denaturation process are now in progress.

"Carbohydrate Content and Binding of Carbohydrates to  $\alpha$ -Amylase." Robert Thornburg and J. M. Wakim. University of Tennessee at Martin. Passage of *B. Subtilis*  $\alpha$ -amylase through Sephadex G-25 columns yields an enzyme with approximately 120 percent of the activity of the native enzyme. Attempts to detect and isolate an inhibitor from the enzyme have been unsuccessful.

This enzyme was found to contain 1.8 percent carbohydrate. From the carbohydrate content, the minimum molecular weight of 11,000 was calculated. Since the molecular weight is 48,000, it was estimated that the equivalent of 5 glucose residues were present per protein molecule. Besides, the carbohydrate moieties were tenaciously bound to the protein and could not be separated from it by 10 percent TCA treatment or gel filtration.

No binding of  $\alpha$  or  $\beta$  Schardinger-Dextrins, glucose or maltose to  $\alpha$ -amylase could be detected. The enzyme did not hydrolyze the Schardinger-Dextrins; neither was its activity on starch inhibited by the presence of these sugars in the medium.

"The Hydrolysis of Aromatic Anhydrides in the Presence of Cycloheptaamylose: Reaction Kinetics for *p*-tert-Butylbenzoic Anhydride in Buffered Aqueous Acetonitrile Solutions." T. E. Cupples and C. R. Wasmuth. The University of Tennessee at Martin. A probable reaction mechanism for the hydrolysis of *p*-tert-butylbenzoic anhydride in the presence of cycloheptaamylose in alkaline aqueous solution includes ester formation through the reaction of a cycloheptaamylose-anhydride inclusion complex as the rate-determining step. Comparisons of rates of reaction of *p*-tert-butylbenzoic anhydride in the presence of cycloheptaamylose with rates of reaction in the absence of cycloheptaamylose cannot easily be made because of the low solubility of the uncomplexed anhydride. Such comparisons can be made of the rates of reaction in an aqueous carbonate-bicarbonate buffer solution containing 25 percent by volume of acetonitrile. In this solution the hydrolysis of uncomplexed *p*-tert-butylbenzoic anhydride followed through absorbance measurements at 257 nm and 25° has been found to be first order with respect to anhydride.

## WESTERN REGION CHRISTIAN BROTHERS COLLEGE

"Electrical Potentials in *Dionaea muscipula*, (*Venus' Fly-Trap*)." R. Alan Jamison. Christian Brothers College. The plant, whose name is derived from its insectivorous habit, is described. Experimental results pertaining to the electromotive properties of the plant are summarized beginning with the first recorded account published by Dr. J. Burdon Sanderson. It is the purpose of the current experimentation to record the action potential produced in *Dionaea muscipula* and to record intracellular potentials prior to and during the occurrence of spontaneous action potentials. These potentials are compared to the electrical potentials found in mammalian muscle.

"A Study of Precision Measurement of Absolute Gravity with Kater's Reversible Pendulum." Danny W. Chandler. Bethel College. The use of a reversible physical pendulum for determination of the absolute value of the acceleration of gravity is discussed, including analysis of the various factors which affect the accuracy of the results.

"Touch—A Factor for Growth and Development." Nancy Mackley. Christian Brothers College. Five newborn mice (A) were each fondled for about three minutes daily for five days and again after weaning. Five control littermates (B) were handled only for routine cage cleaning. After fifty days, both groups were placed singly in the experimenter's hands. Group

A mice were placid whereas group B exhibited fear, anxiety, and excitability. In an open field test, mice were placed singly in a large box and behavior observed. Group A remained by the walls less than group B and went to food in the center of the box sooner than group B. Group B mice urinated and defecated while being tested, whereas group A did not. Group A mice exhibited calmness and were not disturbed at extraneous noises. Group B mice were readily excited, irritated and nervous when confronted with any stress. Thus, handled mice showed a significantly different emotional behavior than the controls, the difference being attributed to the amount of time and age at handling.

"Effects of Varying Levels of Vitamin B<sub>6</sub> on Mouse Growth." Gary Oberste. Christian Brothers College. The purpose of this experiment was to study the effective relationship between varying levels of Vitamin B<sub>6</sub> deficient diets. These mice were separated into five groups which were fed diets containing 0, 8.3, 41, 83, and 208 mg of pyridoxine hydrochloride per gm of diet food. Twenty-eight day old mice were started on a diet totally deficient in Vitamin B<sub>6</sub>. After two weeks the greatest growth and weight gain was attained by the group receiving 83 mg. The least growth increment was shown in the mice receiving 0 mg. These differences are not statistically significant for the two week period. Further measurements of body weight changes, tail length, and lesions on the eyes, feet, ears and mouth regions are in progress to note significant data.

"A Method for Measuring Reaction Rates for the Ruthenium Tetroxide of *p*-Chlorobenzhydrol in Carbon Tetrachloride Solution." Jimmy N. Williams and C. R. Wasmuth. University of Tennessee at Martin.

"A Comparative Microbiological Assay of Bacterial Populations in Marketable Milk." Susan M. Pacton. Christian Brothers College. Milk is an excellent medium for bacterial growth, which can increase rapidly. Allowed to stand for several days at 20 C, milk flora increase to astronomical figures, dependent on adaptability to pH changes, fermentation of lactose, and hydrolyzation of fat and casein. Bacterial infestation proceeds as the oxygen content is diminished by the ascendancy of anaerobes and subsequent prolonged decomposition by fungi and enzymes. To determine numbers and types of bacteria present, duplicate samples of Midwest, Sealtest, and Deans brands of milk, all stamped with the same date of pasteurization, underwent the Reductase test to determine the classification according to grade, and a Standard Plate Count for an estimation of bacterial populations to determine conformity to the regulations established by the U. S. Department of Health. Further biochemical tests were employed for species specific determinations of the bacteria present.

"Qualitative Analysis by the Process of 14-MeV Neutron Activation Analysis." Bill Langham. Christian Brothers College. The purpose of this experiment was to investigate Neutron Activation Analysis to determine whether or not it can be developed into a relatively quick and easy way to detect isotopes in trace amounts in an arbitrary sample of matter. The method is to bombard the sample with neutrons to make the trace isotopes radioactive and to count the gamma rays which are emitted from the decay of the radioactive isotopes. The radioactive isotopes are determined by noting the energy of the gamma rays most frequently emitted (gamma ray spectroscopy) and the stable isotopes originally present are determined from tables of nuclear reactions.

"L-Ascorbic Acid as a Possible Cancer Treatment." Frank D. Parks and John W. Ware III. Christian Brothers College. This investigation was designed to study the possible effects of L-ascorbic acid in the treatment of murine carcinomas. The carcinoma was a mammary tumor induced by the Bittner virus. All experimental animals received transplants from a previously infected mouse. The tumor was excised and injected subcutaneously, using a University of Illinois needle. Effects of treatment were proportional to the intraperitoneal dosage of the vitamin: 20 mg 3 times weekly was 100% fatal within five days; 10 mg 3 times weekly was 80% lethal within 10 days; 5 mg and 3 mg doses had no significant effect on tumor growth or survival. The physiological uptake of  $1-C^{14}$ -ascorbic acid in normal as well as carcinomic mice is currently under investigation.