

LITERATURE CITED

- Andres, K. H. 1966. Über die Feinstruktur der Rezeptoren an Sinushaaren, Z. Zellforsch. 75:339-365.
- Breathnach, A. S. and J. Robins, 1970. Ultrastructural observations on Merkel cells in human foetal skin. J. Anat., 106:411.
- Cauna, Nikolajs, 1969. The fine morphology of the sensory receptor organs in the auricle of the rat. J. Comp. Neur., 136:81-98.
- Dastur, D. K. 1955. Cutaneous nerves in leprosy. The relationship between histopathology and cutaneous sensibility. Brain, 78:615-633.
- Hashimoto, K. 1973a. Fine structure of perifollicular nerve endings in human hair. J. Invest. Dermatol. 59:432-441.
- . 1973b. Fine structure of the Meissner corpuscle in human palmar skin. J. Invest. Dermatol. 60:20-28.
- Humason, G. L. 1962. Animal Tissue Techniques. San Francisco, W. H. Freeman and Co.
- Kadanoff, Dimitri. 1928. Über der Nerven in der ausseren Wurzelscheide der Haare des Menschen. Z. Zellforsch. 6:631-636.
- Mann, S. J. 1968. The tylotrich (hair) follicle of the American opossum. Anat. Rec., 160:171-180.
- Mahrle, G. and C. E. Orfanos. 1974. Merkel cells as cutaneous neuroreceptor cells. Arch. Dermatol. Forsch., 251:19-26.
- Miller, M. R., H. J. Ralston, III and M. Kasahara. 1960. The pattern of cutaneous innervation of the human hand, foot and breast. In: Advances in Biology of Skin, V. 1, Cutaneous Innervation. W. Montagna, ed. Pergamon Press, Oxford.
- Montagna, W. and P. F. Parakkal. 1974. The Structure and Function of Skin. Academic Press, Inc. New York.
- Montagna, W., J. Yun and V. Formisano, 1964. Histology and cytochemistry of human skin, XXX. Cholinesterase-containing nerves in face. Arch. Dermatol., 90:526-529.
- Orfanos, C. 1967. Elektronenmikroskopischer Nachweis epithelioneuraler Verbindungen (Mechano-Rezeptoren) an Haarfollikelepithel des Menschen. Arch. Klin. Exp. Dermatol., 228: 421-429.
- . 1968. Elektronenmikroskopischer Befunde an den peritrichialen Nervenfasern des menschlichen Haarfollikels. XIII Int. Congr. Dermatol. Springer-Verlag, New York.
- Patrizi, G. and B. L. Munger. 1966. The ultrastructure and innervation of rat vibrissae. J. Comp. Neur. 126:423-436.
- Seto, H. 1963. Studies on the Sensory Innervation (Human Sensibility) 2nd ed. Charles C. Thomas, Springfield, Ill.
- Stephens, R. J., I. J. Beebe and T. C. Poulter. 1973. Innervation of the vibrissae of the California sea lion, Zalophus californianus. Anat. Rec., 176:421-442.
- Straile, W. E. 1960. Sensory hair follicles in mammalian skin: The tylotrich follicle. Am. J. Anat. 106:133-147.
- Szymonowicz, L. 1909. Über die Nervenendigungen in den Haaren des Menschen. Arch. Mikr. Anat., 74:622-634.
- Weddell, G., E. Palmer and W. Pallie. 1955. Nerve endings in mammalian skin. Biol. Rev., 30:159-195.
- Winkelmann, R. K. 1959. The innervation of a hair follicle. Ann. N.Y. Acad. Sci., 83:400-407.
- . 1968. New methods for the study of nerve endings. In: The Skin Senses. D. R. Kenshalo, ed. Charles C. Thomas, Springfield, Ill. pp. 38-60.
- Yamamoto, T. 1966. On the sensory innervation of the hair follicle in mice. VI Int. Congr. Elect. Micros., Tokyo, Maruzen, pp. 515-516.

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ABSTRACTS OF PAPERS PRESENTED AT THE SPRING COLLEGIATE MEETINGS

EASTERN REGION
KING COLLEGE

"Laboratory Preparations of Esters of Trichloroacetic Acid." Thomas Hatten, Bryan College. Esters of trichloroacetic acid were prepared using various alcohols and under various conditions. A good yield of the tertiary-Butyl trichloroacetate was obtained using Pyridine as a solvent. A 95% yield of the 1,2-Ethanediol bis (trichloroacetate) was obtained using no solvent. These reactions proceeded despite much mechanistic and steric difficulty.

"Kinetics of cis-trans Isomerization of Diethylmaleate to Diethylfumarate." Lois Day and Irving T. Glover, Roane State Community College. The isomerization of diethylmaleate to diethylfumarate catalyzed by primary and secondary amines provides an experiment which can be performed in courses of organic or physical chemistry to introduce the student to components of kinetics, catalysis and reaction mechanisms. The reaction rate can be conveniently followed by gas-liquid-chromatography or nuclear magnetic resonance. The half-time of the reaction is controlled by the concentration of the catalyst and the diethylmaleate and can easily be adjusted to meet the scheduled laboratory time.

"Determination of the Energy of Activation for the cis-trans Isomerization of Diethylmaleate to Diethylfumarate." Chris Windsor and Irving T. Glover, Roane State Community College. The isomerization of diethylmaleate to diethylfumarate is a convenient system for kinetic studies because the half-time of the reaction is easily regulated by controlling the concentration of diethylmaleate and the amine catalyst. Determination of the

rate of concentration at different temperatures and an arrhenius plot of these data yields the activation energy for the reaction from the slope of the line.

"Search for Brightness Variations in Type A Peculiar Stars." Susan Lady, King College. Since many type A peculiar stars are known to vary, this program was initiated to find new variables and determine their periods. The method used to detect variability was differential photometry in three broad spectral regions: visual (yellow), blue, and ultraviolet. The magnitude differences were transformed onto the standard UBV system and corrected for intensity extinction by the earth's atmosphere. Of eight type A peculiar stars studied in the summer of 1976, results of four are reported here. One star, HD 184905, was found to vary periodically in all colors with a period less than two days. Another star, HD 86069, exhibited detectable variability only in the ultraviolet region. Two stars appeared constant. One type O comparison star, HD 164615, was found to vary periodically in all colors, and the period of 4.4 days was determined.

"A Photoelectric Study of Eclipsing Binary Stars." Jeffery L. Mullins, King College. Three eclipsing binary star systems were studied photoelectrically in the summer of 1976 at Lowell Observatory and Kitt Peak National Observatory. Light curves for each variable star system were plotted in three colors: ultraviolet, blue, and visual. From such curves, information about period, relative masses, sizes and brightnesses of the stars can be determined.

One eclipsing binary, DL Virginis, is well suited for a solution to determine those parameters of the system, since the two stars seem to be non-distorted and to have circular disks and orbits. A problem with this binary is an apparently variable period of

revolution, caused by the revolution of the binary system around a massive third star.

The light curve of the binary system, V382 Cygni, is distorted by tidal effects between the two stars. This system is the most massive binary system known. One component has a mass of 33 and the other a mass of 37 solar masses.

The light curve of the binary system, MM Herculis, is distorted by a sinusoidal wave superimposed on the non-eclipsed part of the light curve. The presence of sunspots on one of the stars of the system could be responsible. The amplitude of the sine wave is 0.04 magnitude, (which is deemed significant by Dr. Douglas S. Hall of Dyer Observatory, Vanderbilt University, who predicted that the sine wave should be present).

"Preliminary Investigations of the Effect of Vitamin E on Reproduction in White Rats." Carolyn Maxwell, Bryan College. Previous investigation of the effects of vitamin E on the offspring of white rats has indicated a tendency to produce litters of vastly skewed sex distribution. In an effort to study this influence further and to determine the minimum dosage at which this occurred, four female rats were placed on 6 IU/Kg. body weight and four females were placed on 12 IU/Kg. of vitamin E. Due to the poor health of the test animals, only one litter from vitamin E-fed mothers survived over the test period. While there was too little data to draw any strict conclusions, the one surviving litter born to a mother on 12 IU/Kg. body weight of vitamin E consisted of four females and only one male. The males this year, as in previous research, exhibited hyperactivity and extremely large scrotal sacs. It is hoped that the litter can be maintained and tested for fertility, and that chromosomal examination can be performed.

"Mechanical Desensitization: A New Method of Systematic Desensitization." Steven D. Peters, Carson-Newman College. The purpose of this study was to investigate mechanical desensitization and to determine its effectiveness as a therapeutic technique in the treatment of phobias. Mechanical desensitization consists of a conveyor belt, controlled automatically by biofeedback instrumentation, on which specific object stimuli are systematically brought closer to the subject. By eliminating visual imagery and relaxation training, this procedure may be more desirable than conventional systematic desensitization.

One male and four female subjects, all of whom reported intense object phobias, volunteered to participate in this study. Four of the subjects reported an intense fear of snakes, while the other subject reported an extreme fear of sharp objects. Prior to treatment, four anxiety scales (The Taylor Manifest Anxiety Scale, the Institute for Personality and Ability Testing Anxiety Scale, and the State-Trait Anxiety Scale forms X1 and X2) were administered to the subjects. After four one-hour treatment sessions, the four scales were re-administered as a means to measure treatment effect.

A T-test for correlated pairs (with 4 d.f.) indicates a significant reduction of anxiety directly associated with the fear stimuli as measured by the STAI form X1. General anxiety, which was measured by the other three scales, did not change significantly.

The results of this study show that mechanical desensitization is an effective therapeutic treatment for object phobias.

MIDDLE REGION VANDERBILT UNIVERSITY

"New Distribution Records for Three Species of Clam Shrimps (Crustacea: Conchostraca) in Tennessee." Candy Proctor, Middle Tennessee State University. *Eulimnadia diversa* (Limnadiidae) and *Caenestheriella* sp. (Cyzyidae) are reported for the first time for Tennessee, and a new site for *Cyzyx mexicanus* (Cyzyidae) is described. Many specimens of *E. diversa* were found in temporary, alkaline pools of Rutherford County in June 1976. *Caenestheriella* sp. was collected in Rutherford County from October through November 1976; although morphologically similar to *C. setosa* when compared to paratypes of the latter from Winslow, Arizona, some striking differences in the two species were observed. *Cyzyx mexicanus* occurred in a temporary pool with mud and leaves approximately 2.5 mi. (4.02 km) north of the Tech Aqua Biological Station, DeKalb

County; the pool had a pH range of 7.2 to 7.8 and a dissolved oxygen range of 2 to 10 ppm.

"Isolation of a Stable, Asporogenous, Pigmented Mutant from Sporulating, Non-pigmented Soil Bacillus Isolates." Steve Head, University of Tennessee-Nashville. An asporogenous pigmented mutant was isolated from a spore-forming non-pigmented *Bacillus* found in the estuarine sediment at the Gulf Coast Research Laboratory in Ocean Springs, Mississippi. Twenty-five soil samples were taken from the Nashville area to determine if the parent organism was present here. They were subjected to heat shock and plated on marine agar. One non-pigmented spore-forming parent was found that gave rise to a pigmented, asporogenous mutant.

"A Study of the In Vitro Hatching of Macracanthorhynchus hirudinaceus Eggs." Barry Campbell, University of Tennessee-Knoxville. Three methods used to hatch eggs of *M. hirudinaceus* in vitro were tested and compared used a number of various conditions for yields of stage I acanthors. A new method, developed for an in vitro growth attempt involving *M. hirudinaceus* larvae, was introduced and compared to the three existing methods. The study revealed some gross misconceptions concerning eggs of this species and their hatching in vitro. Results showed that, although the new method was superior to the current methods, more work is needed for a means of obtaining stage I acanthors.

"Age and Rate of Growth of the Sea Catfish, *Arius felis*, in Mississippi Coastal Waters." J. Ellen Doermann, Dawn J. Huddleston, David Lipsey, and Steven H. Thompson, University of Tennessee-Nashville. One hundred and seventy-seven sea catfish, *Arius felis*, were collected from the Gulf Coast waters near Ocean Springs, Mississippi. Measurements of weight and total length were recorded. The ages of the specimens, determined by observing prepared sections of the pectoral spine, ranged from 3-8 growth seasons. Length intervals fell within a range of 17.1 centimeters to 35.5 centimeters, while weight intervals ranged from 40 grams to 439 grams. Growth rates and coefficients of condition were computed from these data.

"A Photographic Survey of Bright Galactic Nuclei." William C. Keel, Vanderbilt University. Homogeneous short exposures of 450 galaxies, identified by de Vaucouleurs or in the Byurakan system as having unusually bright nuclei, were made with the 61-cm Baker-Schmidt telescope, and the nuclear images examined. Results include rankings of maximum nuclear and spiral arm surface brightness and identification of those galaxies having unusual structures of high surface brightness.

Some types of nuclei identified (typical galaxies are denoted by NGC numbers) include: non-Seyfert galaxies with very bright stellar nuclei (4800); large discrete nuclei in spirals, crossed by prominent absorption lanes (3351); multiple bright nuclei (2903); and objects with enhanced surface brightness across the whole galaxy (4254). Some photoelectric brightness measures of selected nuclei have been obtained for calibration.

The results of this survey will help concentrate future work on the nuclei of greatest interest, and some work in infrared wavelengths has already been done.

"Extraction and Characterization of Pigment from a Stable, Asporogenous, Pigmented Soil Bacillus Mutant." John Flanagan, University of Tennessee-Nashville. An Asporogenous orange pigmented organism of the *Bacillus* species was subjected to extraction using 1:1 chloroform and methanol. The extract was purified using high pressure liquid chromatography and open column techniques. The pigmented fractions were characterized by ultraviolet and infrared spectrophotometry.

The purpose of this study was to determine whether the pigmentation could be caused by compounds of the quinone family. The preliminary data indicate that this is the case.

"The Effects of Recent Aggression on Male-Female Interactions in *Betta splendens*." Griffin Coates, Gina Ellington, Cheryl Renee, and Terry Frost, Tennessee Technological University. *Betta splendens* is a popular aquarium fish that exhibits aggressive displays between males of the species. Using a partitioned aquarium, we observed the effect of recent aggression between two males on subsequent interactions between one of the males and a female *B. splendens*. Our results indicate a pronounced habituation to aggression in the males when male-female inter-

actions were possible and a lessened tendency for inter-sexual interaction. The males tended to remain in the area of recent aggression and perhaps attempted to establish a territory. The effect of these observations on the reproductive potential of *B. splendens* remains to be evaluated.

"Bluegill Sunfish (*Lepomis macrochirus Rafinesque*): Morphological Features and Physical Behavior Affecting Dominance Order." Terry E. Check, Keron Chew, Linda Garrett, and Ivy Miller, Tennessee Technological University. The purpose of this study was to examine the aggressive behavior of bluegill sunfish (*L. macrochirus*) in establishment of a dominance order. Correlations between morphological features and physical behavior and dominance order were also to be determined.

Four bluegill sunfish were observed for 15 days in a 25 gallon aquarium. On the tenth day of the study, a screen was erected dividing the tank into two equal parts to observe the behavior this might provoke. Food intake and aggressive encounters were tabulated for each observation period of 15-20 minutes before and after separation. A positive correlation was found between size of individual (larger-dominant) and aggressive behavior. For the two most subordinate fish in the rear sector, there were negative correlations between age, sex, and food intake and aggressive behavior after separation. The alpha animal, female, did not consume the most food, but was most dominant in aggressive encounters. A subordinate male was second in rank order. The two most subordinate fish, once placed in the rear sector separating them from the most dominant fish, failed to establish any territory for themselves and never encountered aggressively.

"Territoriality of Fruitflies." Lynetta French, Tom Gothard, David Pitts, and Katye Ross, Tennessee Technological University. The objective of this study was to establish possible territorial behavior of *Drosophila melanogaster*. The flies were observed for six days. Individuals found in each quadrant of the container were identified by color markings. This data was collected four times daily. It was concluded that *D. melanogaster* exhibited no territorial preferences.

"Attribution of Friendship Based on Pictures and Descriptions as a Function of Sex." Tegwyn H. Leath and Barbara Farmer Thompson, Tennessee Technological University. Thirty-nine males and thirty-nine females rated twenty-four pictures with descriptions on a six point Likert scale. The pictures consisted of pictures of six males and six females with two pictures of each person, in different poses and dressed differently. Below each picture was also a mathematically constructed verbal description consisting of four bipolar traits—1) intelligent versus non-intelligent, 2) sexy versus non-sexy, 3) cheerful versus moody and 4) open versus shy—in which two traits were positive attributes and the other two were negative attributes. The sex factor was highly significant in that difference scores of female subjects for the duplicate pictures were greater than those for males, indicating that females are more concerned about social attributes than physical attributes. The only other significant finding was an interaction between sex of subject, sex of picture, and type of verbal comparison; when subjects rated individuals of the opposite sex, they seemed to be more concerned with social attributes, whereas with individuals of the same sex, they seemed to be more concerned with physical attributes. In pictures of persons of the same sex, intelligence was considered important but rather negative, but in pictures of the opposite sex, intelligence was considered less important but positive. Generally, the trait considered to be the most positive and important was cheerfulness.

"Homeostatic vs. Addiction Behavior in Sodium Phenobarbital Ingestion in Mice." Cindy Dennis, Tennessee Technological University. Seven mice served as subjects, six in the experimental group, one as a control. Baseline drinking of water was monitored from two bottles on each cage for eight days. Beginning on the ninth day, the experimental subjects were given injections of 40 mg/KG of sodium phenobarbital every fourth day and the control subject received placebo injection of bacteriostatic water every fourth day. During the experimental phase, the preferred bottle contained diluted sodium phenobarbital so that normal daily drinking from this bottle would equal the amount of the injected dose of sodium phenobarbital. Consump-

tion of diluted sodium pentobarbital was monitored daily over three replications of injections.

The experimental groups ingested two to three times the amount of sodium pentobarbital as the control. The amount of sodium pentobarbital did not increase over days or over replication for both groups. The data were interpreted as supporting an addiction theory in that the drug injected group drank more drug than the placebo injected group.

"Consumption Patterns of Beers and Predictions of Preference for and Identification of Brands." Richard Easley, Tennessee Technological University. Sixteen male and sixteen female undergraduate students rated by taste test six brands of beer: Budweiser, Miller, Miller Lite, Pabst, Schlitz and Stroh's on a six point Likert scale. After the double blind taste test, they were asked to rate twelve brands of beer which included the six brands in the taste test. Analysis of variance indicated no significant differences on the taste test between sexes, the brand of beer, or the interaction between these two factors. No significant differences were found for the brand preference ratings in a separate analysis for these three comparisons. The main analysis comparison differences between brand preference and the taste test preference had factors of 1) sex of subject, 2) high and low beer consumers and 3) brand of beer. Sex of subject, high vs. low consumer and the interaction was not significant. There was a significant difference on brand of beers. Three brands produced this effect: 1) Pabst was rated low but was judged to taste relatively good, 2) Budweiser and Schlitz were rated high but were judged to taste relatively poor. There was a significant sex by beer interaction with males rating the taste of Stroh's much higher than females and females rating the taste of Miller Lite much higher than males.

"Comparison of Movement Scores and Test Difficulty for Children with the Peabody Picture Vocabulary Test." Wendy Stooksbury, Tennessee Technological University. Fourteen normal children, eight males and six females, were divided into three age groups: 4½-6 years, 7-8 years, and 9-11 years. Each subject was given 15 items from the Peabody Picture Vocabulary Test (PPVT) divided into groups of five of increasing difficulty of identification. During the presentation of each picture task, subject activity was monitored by a Lehigh Valley Activity Platform.

Activity counts were transformed by natural logarithms and analyzed by analysis of variance. There was a significant decrease in activity scores with the oldest group of subjects and a significant decrease in errors with the older groups. In addition, as the difficulty of the items on the test increased there was a corresponding increase in activity. The results were interpreted in terms of a motor inhibition theory of intelligence and academic performance.

"Sex and Age as Predictors of Attitude on Abortion in a Rural Tennessee Town." Annie Heady and Diane Daugherty, Tennessee Technological University. Eighty subjects were interviewed in Gainesboro, Tennessee. Half of the subjects were male, half female. These were further subdivided into four age groups, with ranges of 16-22 years, 23-34 years, 35-54 years, and 55 and up. Ten subjects of each sex were in each group.

Each subject was approached by the experimenter and asked to evaluate four scenarios concerning an abortion decision. The scenarios involved: 1) a young unmarried mother, 2) a young married mother, 3) an older unmarried mother and 4) an older married mother. For half of the sample, the experimenter wore "hippy" clothes, for the other half, she wore church clothes.

The data was analyzed by analysis of variance. Neither the dress of the experimenter nor the sex of the subject had significant effects on the responses. Age of subject was a highly significant factor in that the older the subject, the more anti-abortion the responses.

There was an interaction between sex of subject and age of mother. Males were more pro-abortion for a young mother and female subjects were more pro-abortion for an older mother. A second significant interaction was between age of mother and her marital state. Subjects were more pro-abortion for a young unmarried mother and an older married mother and relatively anti-abortion for a married young mother and an older unmarried mother.

A second analysis found that church attenders were more anti-abortion than non- or poor church attenders.

"Attitudes toward ESP and Their Effect on Clairvoyance." Randall Barger, Tennessee Technological University. The 40 subjects were college students tested in two general psychology classes ranging in age from 18 to 32 years. The twenty-seven females and thirteen males filled out a ten-item questionnaire that assessed attitudes about the existence of extrasensory phenomena (ESP).

The clairvoyance test consisted of the subject trying to guess the letters in 50 sealed cards. Five sets of ten cards lettered A through J were shuffled and presented for 15 seconds per card. The controls were such that the subjects, the experimenter, and the scorer did not know the letter in the sealed card.

The questionnaire was used to divide the subjects into three groups: 1) those that believe in ESP, 2) those that have ambivalent beliefs about ESP, and 3) those that do not believe in ESP. Essentially, a u-shaped function was noted in that high believers and high disbelievers had a significantly higher detection level of letters (clairvoyance) than did subjects with moderate belief in extrasensory phenomena.

"Effects of Nicotine on Hand Steadiness in a Maze Task." Yvonne Crisp, Tennessee Technological University. Twenty-four students, twelve males and twelve females, were used to test the effects of nicotine on hand steadiness in a wire maze task. Each subject ran through the maze twice, inhaling a regular Winston cigarette immediately before one of the trials.

Analysis of variance revealed that the inhalation of cigarette smoke containing nicotine did have a significant effect on hand steadiness as measured by the number of errors in the maze task. Subjects made more errors when they smoked immediately before running the maze than they did when they had not smoked just before the maze task.

Order of smoking also proved to be significant. Subjects who smoked before the first trial made fewer total errors than subjects who smoked before the second trial.

An interaction effect was found between the sex of the subject, the order of smoking, and the smoking variables. Females made fewer errors than males in all trials (for both orders) except in the first trial when they had not smoked before the trial. In other words, males performed better before smoking, but smoking seemed to have a greater negative effect on their performance.

"The Effects of Music Tempos on a Motor Skill." Lisa Falk, Tennessee Technological University. Eighteen male and eighteen female college students were tested on the assembly subsection of the Purdue Pegboard Test while listening to six different musical selections with contrasting tempos. The tempos were slow with a steady tempo, slow with increasing tempo, slow with decreasing tempo, fast with a steady tempo, fast with an increasing tempo, and fast with a decreasing tempo. The order that the music was played was determined by a 6 x 6 balanced Latin Square. It was found that females performed better on the motor skills than males. The important factor in the music was found to be the selection directly preceding rather than the overall order. It was concluded that males perform best with upward tempos when learning a skill and then prefer slow steady tempos. Females perform best when they have slow or downward tempos when learning a skill and upward tempos after they learn. A semantic differential filled out after each selection showed that performance scores were better when the subject liked the music.

"The Effects of Background Shading and Illumination on Visual Depth Perception." Karen F. Keith, Tennessee Technological University. Twelve male and eighteen female undergraduates served as subjects in a depth perception task. The subjects were dark adapted for ten minutes to the test room ambient illumination level of .02 foot candles (fc). Subjects were seated 20 feet from a Stoelting Depth Perception Apparatus. The viewing slot subtended a visual angle of 1°3' vertically and 1°41' horizontally. The task involved lining up a movable rod with a stationary rod under six levels of illumination: 32 fc, 16 fc, 8 fc, 4 fc, 2 fc and 1 fc. At each illumination level there were six trials with the following background panels of reflectance values of: 94%, 38%, 24%, 17%, 9% and 4%. Each

subject was given 36 trials using a 6 x 6 Latin square to distribute illumination levels and shading values.

Analysis of variance revealed a significant illumination effect with best performance occurring at moderate illumination levels, indicating a possible glare effect at high levels and black-out effect with low levels. There was not a significant shade effect or shade x illumination interaction. The lack of these differences was due to an unexplained sex by shade interaction.

WESTERN REGION LAMBUTH COLLEGE

"Effect of Alcohol Deprivation on Mice Accustomed to Alcohol Consumption." Ted Brandon, Christian Brothers College. Access to a 7% (v/v) ethanol solution for 18 days and subsequent deprivation for 6 days produced an increase of 42.2% in consumption of alcohol by male mice. Daily consumption increased from a mean of 4.5 ml per day immediately before deprivation to 6.4 ml on the first post-deprivation day.

A second experiment was performed to examine the consequences of varying the deprivation period. Group I underwent a 6-day deprivation period after having had access to the alcohol solution for 20 days. Group II underwent a 12-day deprivation period.

"Effect of Removal of Amyloplasts in Corn Embryos and the Geotropic Response of Primary Roots." Leo D. Savare, Jr., Lemoine-Owen College. Primary roots from endo-permectomized corn seeds (seeds with endosperms removed), after being incubated in kinetin, gibberellic acid, and penicillin at 5x10⁻⁸ M concentration, irradiated for 60 sec under a red light (660 nm), and given 24 hr to react, demonstrate the possibility of amyloplasts not being necessary for geotropic response in the root tips. Also noticed was a reduced growth rate in the treated roots as compared to the controls.

"A Preliminary Report on the Ascorbic Acid Content in Chick." M. K. Mohanty, Susie Donelson, Artillian Jones, Brinders Jones and Carolyn Batts, Lemoine-Owen College. The phylogenetic trend in some higher forms of Aves to synthesize ascorbic acid has disappeared. However, a preliminary investigation on the ascorbic acid content in various organs, such as the liver, kidney and heart, shows a gradual increase up to the fifth week of their development and a gradual decline afterwards.

This increase in ascorbic acid may be related to a low collagen content, whereas the decline in the amount can be related to the higher collagen content in the tissue.

"An Investigation into the Mechanism of Oxidative Coupling of 2,6-Di-*t*-butyl-4-methylphenol." Marc Nagel and Lyle D. Wescott, Jr., Christian Brothers College. The mechanisms of oxidative coupling of 2,6-Di-*t*-butyl-4-methylphenol with concomitant loss of a carbon residue as formaldehyde, proposed by Brieskorn and Ullmann, has been questioned. It has been shown that formaldehyde is not a by-product of this reaction. Investigation was made into the role of water in this reaction via deuterium isotope studies of reaction rates.

"Chemotaxis and Anemotaxis in the Slug, *Limax maximus*." Robert Steven Matthews, Christian Brothers College. The slug, *Limax maximus*, has been found to locate and travel towards the source of the odor of flat beer when starved for one and two days. Odor-permeated air was drawn past the slugs at a velocity of about 33 cm/sec in a trapezoidal plastic tunnel roofed with plexiglass and bound with adhesive tape. Air was drawn through a beer-soaked nylon cloth covering the 4-square-inch open of the tunnel. Slugs were placed singly, heading into the wind, in the middle of the tunnel floor about ¾ from the open end. There were more positive responses to the beer than to the distilled water (control); however, negative or indeterminate responses to the beer outnumbered the positive. Results suggest that slugs require little odor gradient to locate a source, and that they are both chemo- and anemotactic.

"A Search for New Thermoluminescence Applications." Robert B. Randall, Charles E. Bauman III, Randy B. Linn, and David E. Fields, Murray State University. We have designed an apparatus for studying solid materials using the thermoluminescence (TL) effect. Quantitative observations have been made of sample temperature and light emission (glow curves) in the

range of 30°C to 450°C. We use a 1 mm thick aluminum filter and a fused quartz cover plate to avoid a depth dependence dosage. Calibrations of our x-ray source, accomplished using survey meters and lithium fluoride TLD-100 dosimetry grade crystals, indicate an exposure rate of 10 R/min at 50 Kv and 36 mA. We are searching for a TL effect in insect exoskeletons and are investigating applications in geology, such as the possibility of dating "recently" deposited gravel beds.

"Some Gamma-Irradiation Effects on Mouse Spleen." Timothy Peterson, Christian Brothers College. Past research has shown significant loss of spleen weight after whole body irradiation. Four groups of male c57 B1/6 cum mice were used. Groups 1, 2 and 3 were completely gamma-irradiated with 200, 400 and 600 rads, respectively. Group 4 was the control. Half of each group were sacrificed and their spleens removed on the fifth post-irradiation day, when the greatest spleen weight loss was expected. The remaining mice received the same fate on the eleventh day, when the spleens should have recovered. Each spleen was then histologically prepared and stained with hematoxylin and eosin for comparison of the radiation effects at the two post-irradiation periods.

"Elemental Analysis of West Tennessee Soil." John Oakley, Phillip Smith, and June B. White, Christian Brothers College. Though the importance of trace elements in the soil has been recognized for a number of years, little has been done to make farmers on a local level aware of the importance of elemental analysis or to provide them with information on the subject.

By trace elements, we mean those normally found in quantities less than 1000 ppm. Of these, V, Co, Cu, Mn, and Zn have been found to play a necessary role in plant and animal growth. Nickel, copper and molybdenum are toxic to plant growth above specific levels.

Samples of soil taken from four counties in West Tennessee have been analyzed for four of these elements—Cu, Ni, Co, and Zn—and the results are shown. Zinc and cobalt levels seem to be sufficiently high for crop growth. Copper is low, but nickel in some areas is high enough to have a toxic effect.

"Effects of Wavelength of Light upon White Leghorn Pullets." Chris Baker, Christian Brothers College. It has been found that light intensity affects hemopoiesis and the rate of metabolism in broilers. A combination of incandescent and infrared light has been found to produce a peculiar "slanteyed" condition in chicks within four weeks of hatching. In this experiment, five groups of white leghorn chicks were raised under different wavelengths of light. The wavelengths used were in the red, yellow, green, and blue regions of the spectrum, and were provided by shining sixty watt incandescent bulbs through gelatin filters for twelve hours a day. The fifth group was a control group, and received the same lighting, only without a filter. The effects of the various wavelengths were measured by comparing weight gain and by making other observations.

"A Numerical Model of the Minto Wheel." Jeff B. Cates and David E. Fields, Murray State University. We have numerically modeled the time-distributed power output that can be expected from a Minto Wheel over the period of a year. The Minto Wheel is a relatively simple "gravity machine" driven by vaporizing some high-density, low-vaporization working fluid from the bottom of the wheel to the top, causing the wheel to turn. The temperature difference between the top and bottom of the wheel is the primary input to the device. This is achieved, for our model, by (1) a water bath heated from solar radiation applied to the bottom of the wheel, and (2) the cooler air around the top. The solar radiation and air temperature figures are in one-hour increments for each month throughout the year. Calculations are performed on an IBM System 360/50. We believe the figures obtained give reasonable approximations of the actual power output that can be expected from a sample Minto Wheel.

"Computer Assisted Fourier Analysis of Seismograph Data." Randall Winchester and David E. Fields, Murray State University. We have written a code for analysis and deconvolution of velocity seismograph data. This code incorporates several

IBM subroutines to perform analysis of the digitized data. By separation and comparison of the P, S and L components, this analysis provides information about distance, energy and relative magnitude of the seismic disturbance under study, while enabling us to remove "noise" due to building resonances and major construction projects going on nearby.

"A User's Guide to the IBM 1130 Computer System." William J. Weaver, Jr., and David E. Fields, Murray State University. Physical components of the IBM 1130 computing system are discussed. Further clarification of the system and its uses is given by description of several of the current projects that make heavy use of the computing facility at Murray State University. A user's guide has been written to provide users with basic information on the 1130 Computing System. This manual and its motivation are discussed and the guide itself (in outline form) is presented. Finally, other computing facilities at Murray State University are discussed briefly.

"A Numerical Model of the Insulin-Sugar Balance in a Diabetic." Michael S. Guthrie and David E. Fields, Murray State University. We have formulated a mathematical model of insulin and sugar budgets in a human diabetic. An IBM Runge-Kutta subroutine is coupled with driver and plotter algorithms to simulate hyperglycemic and hypoglycemic (insulin shock) conditions using an IBM System 360/50 computer. Knowledge of the time dependence of insulin and sugar concentrations in the blood allows various medication schedules to be compared to determine optimal treatment strategies.

"Chemical Analysis of a Hematitic Petrified Tree Trunk." Ronnie Fullwood, Anthony Parham, and George Edwards, Lambuth College. In studying the structure of two very large petrified trees, we found one to be of the silica type and the other of the hematite type. These trees did not grow in this area, but washed down a prehistoric river from upper Appalachia.

The petrified tree of the hematite type was found, using the Zimmerman-Reinhardt method, to be 57.6% iron or 82.4% hematite. Ignition of the hydrated oxide at the full temperature of a Terril burner for one hour gave 80% hematite. The acid-insoluble fraction was 5% of the sample. The sample contained siderite (ferrous carbonate), phosphate, and water of hydration. The crystals of hematite were so large that it was difficult to identify the species of the tree.

The Smithsonian Institute is making cross sections to determine the species of the silica specimen.

"Thyroid Gland Function of Mice." John Thomas Walsh, Christian Brothers College. The thyroid gland secretes two major hormones: L-thyroxine (T₄) and L-3,5,3'-triiodothyronine (T₃). In warm-blooded vertebrates, thyroxine's major function is overall metabolic regulation—as measured, for example, by oxygen consumption or Basal Metabolic Rate (BMR). This experiment compared normal thyroid function with induced hyperthyroid and hypothyroid conditions among mouse littermates. Hyperthyroid conditions (Group 1) were induced by daily subcutaneous injections of T₄ solution. Hypothyroid conditions were induced by thyroidectomy (Group 3) and by supplying a thiouracil-treated water supply (Group 4). The untreated mice (Group 2) were the control. Individual body weights were measured daily during the experiment, as were the BMR's (through O₂ consumption calculations). Comparisons of these parameters for the experimental groups provided interesting insights into the thyroid gland function of mice.

"UV Light Induction of Biochemical Mutants in Bacteria." Phyllis Burns, Christian Brothers College. *Serratia marcescens* (gram negative) and *Lactobacillus bulgaricus* (gram positive) were grown on minimal agar, then exposed to 2537 or 3200 Å ultraviolet for 10-25 minutes, plated onto nutrient agar, and replica-plated back onto minimal agar. Colonies that grew on nutrient agar but not on minimal agar were tested for single amino acid mutations. Comparisons of results were made from the two wavelengths and from both bacilli. Results showed that 2537 light caused more nutritionally mutant colonies than 3200. Results from the amino acid tests were inconclusive.