

importance of correlating condition of shoot material from which metabolites are to be obtained and of seed to be assayed with the states in which they occur in the field at the normal time of seed germination cannot be overemphasized.

Species differed from each other in susceptibility to the extracts tested, indicating the probability of many complexities among interactions in the natural community.

Soil microorganisms were not generally implicated by these experiments, but presence of soil, *per se*, afforded protection against *Sedum* extract to *Leavenworthia stylosa*, one of its co-dominants in Zone I. Metabolites capable of inhibiting germination in associated species, in most cases, were heat-stable or were convertible during autoclaving to other inhibitory compounds. While autoclaved extracts for the most part remained inhibitory, the fact that species susceptibility, in some cases, was not the same to autoclaved and to non-autoclaved extracts suggests that the initial inhibitors had been altered by heat. Similar kinds of differences with respect to filtered sterile extracts suggest differing interactions of extracts and of species with microorganisms.

Investigation of allelochemic interactions in cedar glade communities is being continued, concentrating

upon interactions of a few species at a time and upon identification of inhibitory metabolites, so that studies on mechanisms of inhibition may be undertaken.

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ABSTRACTS OF PAPERS PRESENTED AT THE SPRING COLLEGIATE MEETINGS

EASTERN REGION CARSON-NEWMAN COLLEGE, JEFFERSON CITY

"A Preliminary Study of Factors Affecting Choice of Drinking Water." Patrick Stone, Bryan College. Six samples of drinking water were chosen from the following sources for analysis and taste preference: distilled water, spring water, well water, Chattanooga city water, Dayton City water, and a commercial, bottled water. Analyses showed the distilled water lowest in chemical content, the spring water next, the well water intermediate, the two city waters relatively high, and the bottled water the highest. A panel of 10 people tasted the water samples daily without knowledge of the source. It was found that most consistently chose the water they were accustomed to (Dayton water) and the Chattanooga city water most nearly like Dayton water. Well water was chosen very frequently also. The extremes in ion-content were generally avoided: i.e. spring water, distilled water, and the bottled water. When the people were told the source of the water, however, their preference changed dramatically and the spring water was chosen over the well water; but well water was a strong second preference. It was concluded that people generally, without knowledge, choose the water they normally drink; but that they reverse this choice, with knowledge, due to a strong identification of spring water with purity.

"A Comparison of the Physiological Effects of Lead Nitrate and Radioactive Lead Nitrate on the Male White Rat." Stephen Johansen and David Eldridge, Bryan College. Sixty-day old male rats were placed on a normal diet of pelleted food and fed 5 parts per million of lead nitrate and radioactive lead nitrate in their drinking water. (Two rats were placed on each type of lead, and two were tested as controls). Upon dissection and examination of subjects at 2 and 4 weeks intervals, the following results were obtained. The rats on ordinary lead nitrate showed basophilic stippling of the red blood cell,

previously reported by other investigators; those on radioactive lead showed less stippling, but an apparent destruction of the muscles in the stomach. The subjects on radioactive lead showed more shedding of hair than the other two groups; but there were no other gross differences observed. A count of the activity of the urine indicated that much of the radioactive lead was excreted, but due to difficulty in analyses of small samples, no check on the quantity of plain lead was possible. Other investigators have reported that possibly less than 1-10% of ingested lead is retained by humans.

"A Comparison of the Effects of Lead Nitrate and Radioactive Lead Nitrate on the Female White Rat." David Giesel and Phillip D. Swaffors, Bryan College. Female white rats were placed on a normal diet, with 5 parts per million of lead nitrate and radioactive lead (two of each) and two were tested as controls. After 2 weeks one from each group was dissected. The basophilic stippling and destruction of stomach muscles was observed, as with the male rats tested. The lead solutions seemed to affect the female adults more severely than the younger males, tested above. One of each of the subjects were exposed to males and the rat on radioactive lead produced a normal litter of 10 young. The subject on plain lead was dissected, when she failed to breed. A large growth was found on a lower lobe of the liver, penetrating the organ and appearing on the other side.

"A Preliminary Investigation of the Effects of Birth Control Pills on the Norway White Rat." Craig Kirkpatrick and Sandra Harris, Bryan College. Considerable research has been done on the effects of the androgens (male hormones) when administered to the female white rat. However, little information is available on the effects of female hormones when administered to mammals other than the primates. This study was not undertaken with the intent of determining the proper dosage or cycle of dosages necessary to render the female rat unable to breed. The purpose was to investigate the effects of these hormones on a mammal having an estrus cycle, and to see if

any of the side effects reported in humans could be observed. The pill used was *Ovral* (.5mg norgestrel, .05mg ethinyl estradiol) a widely used birth control pill. Each of the four rats under observation received a daily dosage comparable to a human consumption of 1.7 pills per day. Increased irritability was soon noticed during handling, as well as an unusual amount of hair loss. The rats ability to breed was not affected, neither was the size of the litters that they bore. After two months at this dosage we increased the amount of pill administered to each rat per day to a dosage comparable to a human consumption equaling 25.8 pills per day. This increase was for two reasons, first, rats can normally tolerate 15 times the dosage that humans can endure. The second, was that knowing this we wished to significantly and sufficiently increase the dosage above this tolerance level in hopes of enhancing any anatomical damage that might be observed during dissection. On the thirteenth day at this dosage one of the rats suffered a stroke resulting in severe impairment of the motor and optical functions on its left side. Two days later a second rat suffered a stroke, but this time resulting in impairment on the right side. Dissection of all four rats revealed that two of the rats had sustained massive blockage and hemorrhaging of the arteries in the lungs resulting in large sections of darkened and discolored tissue. Inspection of the brain cavities revealed that pooling at arterial intersections, clotting and blockage of the vessels, and diffusion around damaged and distended vessels had occurred in all four. Due to the small population of rats studied no conclusions can be drawn with finality. However, data gathered in this study indicates that large dosages of birth control hormones are damaging to the lungs and brain. Until such a time as it is determined whether or not long term usage renders similar results, caution in the use of these hormones is indicated.

"Preliminary Survey of the Parasites of the Freshwater Clams of the Holston River." Robert John Cox, Carson-Newman College. Fifteen clams representing four species were collected from the Holston River in mid-October. These were maintained for several months in the laboratory and subsequently sacrificed and examined for protozoan and metazoan parasites. One specimen was found to harbor the trematode *Aspidogaster conchicola*. This was the only definite parasite found. Several other clams of various species were found to contain the symbiotic ciliate *Conchophthirus anodonae* in the brood pouches.

"Long Term Effects of Marijuana Smoking." Frank Hall, Maryville College. The purpose of this study was to investigate some long term effects of intermittent to moderate marijuana smoking on intellectual functioning and perceptual-motor skills. Forty college students were tested in two groups, an experimental group of smokers and a control group of non-smokers. These students were given the Digit Symbol Substitution Test, the Motivational Analysis Test and Goal Directed Serial Alternation Test which are related to intellectual functioning and a pursuit rotor test as well as a complex hand-eye reaction time test which are related to perceptual motor skills. An intermittent to moderate smoker for this study was an individual smoking two times monthly to once daily. The average user in this study smoked 6 or more times per month. The results failed to show significant adverse effects from long term marijuana smoking.

"Application of the Geologic Scale Model Theory to the Lander-Hudson Oil Field Anticline, Wyoming." David R. McQueen, University of Tennessee, Knoxville. Consideration of the stratigraphy, structure, and regional tectonics of the Lander-Hudson Oil Field anticline has made possible the development of a geologic scale model of this structure. The theoretical model properties have been derived through use of mathematical expressions which relate scale models directly to geologic structures. The derivation of the model ratios of length, density, and strength are treated in detail showing the use of comparative petrophysical data in the absence of sufficient equipment for individual specific determinations. The commercial modeling compound, "Play-Doh," is shown to be superior in physical properties to compounds used by early workers and is described in its application to sedimentary rock scale models. The design of the device which simulated the tectonics of the anticline

is discussed and arguments for the accuracy of the model are presented, including subsequent research using an IBM 1130 computer system.

"The Occurrence of *Ambystoma talpoideum* (neotenic form) in Polk County, Tennessee." Patricia Dreyer and Larry Norwood, Tennessee Wesleyan College. The salamander *Ambystoma talpoideum* was found in the neotenic form in Polk County, Tennessee on February 28, 1973. The neotenic form found had previously been reported only from Florida by Carr and Goin in 1943, and from Mississippi by Boyd and Vickers in 1963.

Neoteny may be defined as an existing state of sexual maturity although the organism has not yet passed through metamorphosis to the adult stage. The organism may still retain outer gills, remaining in a state of lunglessness while concurrently maintaining other features which exist in the larval stage.

The specimens observed were proven to be sexually mature while retaining gills through dissection and observation of mature eggs within the females.

Neoteny in *Ambystoma tigrinum* seems to be correlated with high altitudes, low temperatures, and possibly iodine deficiency in environmental waters. It is possible that it is an environmental influence similar to those described for neotenic *Ambystoma tigrinum* that is responsible for the neotenic state in *Ambystoma talpoideum*.

"Observations on Three Chlorophycean Isolates from McMinn County Soil." Rebekah Postelle and Edmond R. Cox, Tennessee Wesleyan College. Two *Chlamydomonas* (Chlorophyceae, Volvocales) isolates and one *Axiosphaera* (Chlorosarcinales) isolate were obtained in unialgal culture from surface soil samples collected aseptically in McMinn County, Tennessee, using standard plating techniques.

Comparative morphological and cultural studies of these isolates with previously described species have thus far indicated that these forms are new to science and should be described as new taxa.

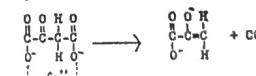
"A Study of a New *Heterochlamydomonas* (Chlorophyta) isolate from McMinn County, Tennessee, Soil." Robert A. Rogers and Edmond R. Cox, Tennessee Wesleyan College. A proposed new species of the chlorophycean genus *Heterochlamydomonas* was isolated into unialgal culture from soil collected aseptically within the city limits of Athens, McMinn County, Tennessee.

Comparative morphological and cultural investigation of this isolate with previously described *Heterochlamydomonas* species resulted in the designation of the new taxon, *Heterochlamydomonas tennesseensis*.

MIDDLE REGION DAVID LIPSCOMB COLLEGE, NASHVILLE

"The Effect of an Inorganic Salt on Vapor-Liquid Equilibrium." Tim K. Holder, Tennessee Technological University. A vacuum insulated vapor recirculating vapor-liquid equilibrium still was used to determine the shift in the methanol-water equilibrium constant due to presence of NaCl in the liquid phase. A previously established refractive index composition curve was used to determine liquid and vapor compositions. A significant shift in the methanol equilibrium constant was observed when the liquid phase was saturated with the salt.

"A Reinvestigation of the Decarboxylation of Oxaloacetate." Linda Carol Mayes, University of the South. Heavy metal ions such as Cu²⁺, Fe²⁺, Al³⁺ are known to catalyze the decarboxylation of β keto acids by forming a metal ion to carbonyl and carboxylate complex.



Early work has also demonstrated that decarboxylation of β keto acids may follow a cyclic mechanism in which the carboxyl

donates a proton to the carbonyl group and by doing so increases the rate of reaction.



The question we proposed to investigate was a combination of this cyclic proton donating mechanism and metal ion catalysis. The method of approach was to measure the variation in rate over a pH range of 5.80 to 1.50. Two experimental techniques were used: 1) following the disappearance of the oxaloacetic acid by measuring the decrease in the ultraviolet absorption peak at 270 m μ ; 2) measuring the volume of carbon dioxide as it was generated. Both sets of data revealed the same trends. The rate increased from a pH of 5.80 to a maximum at pH 3.5-3.0. After this the rate decreased with decreasing pH. A maximum rate at around pH 3.0 coincides with the pH range where one carboxyl group of oxaloacetate should be protonated (pK's 2.72 and 3.70).



Below a pH of 3.0 both carboxyl groups are protonated, metal ion complexing is blocked, metal ion catalysis is lost, and the rate decreases. We concluded that in the pH range where one carboxyl group is protonated, both catalytic effects, the cyclic mechanism and the metal ion complexing, are operating. This doubly catalytic pathway might also be utilized in the enzymatic decarboxylation.

"Investigations into the Use of Glassy Carbon as a Possible Material for Low Temperature Thermometers." Stephen Brown, Fisk University. It has been shown that glassy carbon has definite possibilities for use as a cryogenic thermometer. This is due to its resistance to thermal shock, its high resistance to corrosion and other inherent properties of glassy carbon.

The purpose of these investigations is to determine the glassy carbon which would be most useful as a thermometer in the region below 4 K.

"A Key to the Algae of the Belmont Greenhouse." Kennard Grimes, Belmont College. Algae was collected in the Belmont College Greenhouse between January 22 and April 19, 1973. Samples were studied immediately and classified according to standard keys. Three environments were studied: the water-filled cans used as flower pots, the liquid mud on the tabletops and the soil which makes up the floor of the greenhouse. All species in the key were found in the cans except *Rhizoclonium hieroglyphicum*, which was present only in the soil. The mud was the poorest source of algae but the most abundant in animal life. *Chlamydomonas* was the genus seen most often in all three environments and in culture. The most common diatom was *Navicula radiosa*.

Culturing was done in Bold's Basal Media. Attempts to mount the cultured diatoms were unsuccessful, possibly due to the lack of silica in the media. Diatoms taken directly from the greenhouse were mounted using Kleormount Xylene Solution as a substitute for Hyrax Mounting Solution.

The following algae were included in the key: *Anabaena scheremetievi*, *Oscillatoria angustissima*, *Microcoleis lyngbyaceus*, *Rhizoclonium hieroglyphicum*, *Ulothrix subtilissima*, *Hormidium rivulare*, *Eudorina elegans*, *Scenedesmus quadricauda*, *Chlamydomonas* spp., *Euglena* spp., *Nitzschia amphibia*, *Eunotia pectinatis*, *Pinnularia macilenta*, *Navicula radiosa*, *N. canalis*, *Characium rostratum*, *Closterium* spp., *Cylindrocapsa brevissonii*, *Chlorococcum humicola*.

Credit for this project must also go to Mr. David R. Hill of the Belmont College Biology Department without whose help the key could not have been completed.

"Computer Investigation of a Conjecture on Sum Free Sets." Haroldine A. Moten, Fisk University. The computer is a useful device for quickly generating sum free sets, where a set S of positive integers is sum free, if $a+b \notin S$. Necessary definitions and certain conjectures are stated. The first conjecture, that every generated sum free set is periodic, is contradicted after computer investigations. A second conjecture,

that every generated sum free set is eventually periodic, has not been proved, but no contradiction has been found. It is proved that every generated sum free set with a pattern repeating several times is eventually periodic.

"Base Negative Five—A Challenge To Discovery." Kathy S. Powell, Fisk University. To begin the study of base negative five one first looks at place value and the basic operations. The first place is the ones place, the second is the negative fives place, the third is the twenty-fives place, and so on. Thus the signs of the places alternate, and no negative sign is necessary to indicate a negative number. Addition in base negative five is identical to addition in base five except that the number to be regrouped is subtracted instead of added. Similarly for subtraction, if regrouping is necessary, one is added instead of subtracted. Multiplication and division can be performed by the usual algorithms with a slight modification for division.

A base ten decimal represented in base negative five is called a pentecimal. It was found that an infinite repeating pentecimal expansion could be evaluated by finding the sum of an infinite series.

Rules for changing from base five to base negative five and vice-versa were discovered. Rules for divisibility were discovered and proven, some parallel to those in base 10.

Other concepts, such as logarithms and scientific notation, were also investigated. The study of a negative base can help one to distinguish between properties of numbers and properties of numeration systems.

WESTERN REGION UNION UNIVERSITY, JACKSON

"An Electrophoretic Study of the Venom Proteins of *Bufo woodhousei*." Robert E. Wright and Charles J. Biggers, Memphis State University.—The venom of *Bufo woodhousei* has been shown to exhibit five protein bands upon vertical polyacrylamide gel electrophoresis. This investigation was directed to the specific identification of the individual proteins. The following stains were used: Coomassie Blue, Amido Black 10B, Esterase (both alpha and beta), Peroxidase, and three Dehydrogenase stains (MDH, LDH, and alpha-GDH). Disc and slab polyacrylamide gels were used for electrophoresis.

"Toxicity Levels of Inorganic Ions on an Indicator Organism." Edward Doody, Robert Dorough, and Adele McCall, Christian Brothers College. The green algae *Scenedesmus* was exposed to various concentrations of chromium, mercury, manganese, copper, iron, lead, and fluoride ions. These ions are often found in industrial pollutants.

Growth of the algae was evaluated after one week, two weeks, and four weeks.

"A Biology Student Looks at Acupuncture." William G. Bender, Bethel College. Ancient Chinese theories of Yin and Yang points of acupuncture were reviewed, included was a critical analysis of the modern theory, concentrating on procedure and location of main meridians in correlation with physiological principles.

"Kinetics and Mechanism of the Reduction of 1-Nitroso-2-naphthol by Sodium Dithionite in Alkaline Solution." Carolyn P. Hardaway and C. R. Wasmuth, Christian Brothers College. The reaction of 1-nitroso-2-naphthol with sodium dithionite in aqueous 0.100 N sodium hydroxide solution was found to be first order in 1-nitroso-2-naphthol and half order in dithionite ion. Reaction rate measurements required for the determination of kinetic orders were made by following absorbance changes with time at 377 nm. The results are interpreted in terms of a mechanism involving the SO_2^- radical ion as a reaction intermediate.

"A Method for Isolating Murine Serum Transferrin." William K. Phillips and Charles J. Biggers, Memphis State University. In an effort to study multiple forms of murine serum transferrin and their bacteriostatic effects, a simple method for isolation was devised. This technique incorporated rivanol precipitation of all protein, with the exception of transferrin. The rivanol was removed by dialysis and the transferrin solution was then concentrated by polyacrylamide gel. Purification

of the sample was demonstrated by polyacrylamide gel electrophoresis. Comparisons of undialyzed and untreated samples were made.

"Germination and Early Growth Effects of Various Wavelengths of Light on *Phaseolus vulgaris*." Bill Herbert, Christian Brothers College. Kidney bean seeds exposed on moist paper toweling in 100mm petri dishes were tested for germination under five incandescent lights: white, red, yellow, green, and blue. After 10 days, all 20 seeds under the green light had germinated, compared to 16 each under the blue and yellow, 13 under the red, and 11 under the white. Fresh seeds were then planted in thirty waxed carton containers of loamy soil. Six containers, thinned to one vigorous seedling each, were placed under each of the same five light sources. Plants reached their maximum height under the green light after 13 days, blue light after 15 days, yellow after 22 days, white after 23 days, and red after 24 days, but the first two sets gradually died, whereas the others continued to mature and flower.

"A Behavioral Study of Hamsters and Mice." Bobby Boyce, Christian Brothers College. This present experiment was designed to examine a variety of behavior and activities in laboratory rodents: two male mice and two male hamsters. Observations of various movements showed species effects in several categories of behavior. These categories were centered around preference for novelty, nutrition (which included routine feeding and the effects of prepared principal foodstuffs), and exploration, which examined marked impairments between those animals which were kept on a regular diet and those that were kept on a beefed-up diet of increased protein, milk, lipids, and carbohydrates. These explorations were observed by the construction of a series of mazes and data was collected in relation to time of completion and the direction taken by the rodent. The experiments relating to the animals' preference for novelty were geared around observations of the animals' daily activities which confirmed the initial idea that an increased or beefed-up diet increases drive and incentive levels across species.

"Sickle Cell Disease: A Threat to our Survival." Altha Jeanne Stewart, Christian Brothers College. There are many misconceptions circulating in the community today concerning sickle cell disease. This project was designed to raise the level of awareness concerning sickle cell disease on the Christian Brothers College campus. The project was divided into two parts: 1) an educational program and 2) actual testing of blood for sickle cells, as well as other hemoglobinopathies. The first part was conducted under the supervision of the Sickle Cell Center and Memphis Regional Sickle Cell Council. With their help a speaker was presented and a Sickle Cell Educational Workshop is scheduled for April 21, 1973. A nurse from the Sickle Cell Center came to the campus to collect venous blood samples (See). This was tested at the Center and each individual received the results of his test and was told of the counseling services available at the center if there was evidence of sickled hemoglobin in his blood.

"Effects of Testosterone and Activity Schedule on Beard Growth." Charles M. Stroupe, Christian Brothers College. Five males volunteered to participate in this experiment. First, a control was established by allowing the beard to grow for a week, shaving it dry, and weighing the shavings on an analytical balance. Each then applied testosterone (aquaphor gs. 60.0) cream to the beard area each morning for seven days, allowing the beard to grow for those seven days. It was then shaved and the beard to grow for those seven days. It was then shaved and weighed. Four males (B, C, D, E) applied testosterone during a second week, without shaving, then cut and weighed the growth, while subject A grew and weighed the shavings without the hormone application. Males (C, D, E) repeated the process during week (4) and subject E continued application through week (5). It was found that the rate of beard growth increased each additional week of testosterone application. Activities, such as sexual activity, physical and mental activity, amount of rest, and consumption of alcohol are known to affect beard growth. It was found that all of these enhance beard growth with the exception of excessive amounts of rest and physical exercise.

"Life in the Future Time." Archie Bates, Lane College. Man realizes that he can't live on the moon before a great length of time. Man's attempt of the survival on the moon has been progressive, but not completely successful. Some people tend to believe that man's attempt for life on the moon is for Nuclear War Defense and the balance of Economy. Man realizes that there is a possibility to live and build cities and habitats on the floor of the ocean. Since the war has ended, population will almost double. An increase in population and a decrease in jobs for the population. Oceanography is then the answer. A man can live on the floor of the ocean and depend on it for his life needs (food, water, defense, and shelter). In the future there will be a great demand for one who has studied in the field of Marine Biology. Oceanography is the answer.

"Reactions of Atomic Aluminum with Cyclic Ketones." Lyle D. Wescott, Jr., Susan F. Sublett and Clint Williford, Christian Brothers College. Aluminum vaporized in high vacuum and co-condensed at 77°K with a cyclic ketone yields the corresponding cycloalkene as the major volatile product. Hydrolysis of the nonvolatile residue yields the corresponding 1,1'-dihydroxy-1,1'-dicycloalkyl. Examples and a mechanistic interpretation will be presented.

"Effects of Abnormalities of Size and Shape of Red Blood Cells." Barbara Pastuszak, Christian Brothers College. The size and shape of human red blood cells are remarkable consistent from individual to individual. However, it has been shown that when great variances occur, as in Sickle Cell anemia, the effect on the individual's health is also great. If this is true for extreme deformations, then possibly there are slighter changes in health due to lesser deformations of red blood cells. To test this hypothesis, approximately one hundred human blood samples were taken and measured. The volunteers from whom blood was taken each filled out a simple health questionnaire, related to red blood cell performance in areas such as supplying oxygen to the brain. The results were then compared to see what effect, if any, each type of deformation had on the individual's health pattern.

"Systemic Lupus Erythematosus." Loretta Oliver, Christian Brothers College. Systemic lupus erythematosus is a collagen-damaging disease in which binding matrix for capillaries and other vessels are affected. It is usually chronic, with remissions and exacerbations. About 80-85% of reported cases are in females, generally between ages fifteen and forty-five. Clinical findings vary. Typically, there may be intermittent fever, arthritis, a skin eruption, proteinuria, leukopenia, hyperglobulinemia, and a positive test for L. E. cells. A simple test for the L. E. cells is used for detection. Further testing—urinalysis, electrolyte balance, total hemolytic complement, creatinine clearance, etc. . . . is done to determine the extent of damage to the collagen tissues. Urinalysis can be done at home by the patient with little inconvenience. Persons with the disease were compared to some supposedly normal and healthy and proved interesting. Psychological testing was correlated using urinalysis and blood samples for criteria.

"An Investigation of Plasma Proteins of *Peromyscus leucopus*-*Peromyscus gossypinus* hybrids." Tom W. Priddy and Charles J. Biggers, Memphis State University. Seven hybrid mice produced from a female *P. leucopus* and a male *P. gossypinus* mating appeared to exhibit the presence of proteins from both parent species. Vertical polyacrylamide gel electrophoresis was used to separate the plasma proteins. The gel was sliced horizontally and each half was stained separately. One-half was stained for general proteins. Comparisons were made between the hybrids as well as between the parent species.

"Biochemical Warfare and the Battle of the Bulge." Charles Gallina, Christian Brothers College. The purpose of this study is to establish an effective means to eliminate excessive weight and control body tone through regulated low carbohydrate intake. The diet is based on six levels in which the carbohydrate intake per day starts from zero the first week, and then varies from 5-8, 10-16, 15-24, and 24-30g/day in successive weeks. In the final week the carbohydrate tolerance level is determined.

The diet accomplishes its results by fat metabolism and the elimination of ketones through the urine and breath. The state of ketosis and the subsequent carbohydrate tolerance level is determined through a weekly ketone urine analysis. This diet is also recommended for the reduction of incidence of cardiovascular difficulties and diabetes.

"The Effects of Temperature and Season on Primary Production by Algae in West Tennessee Farm Ponds. Willard E. Oakley, Jr., Union University. Production by algae in two small West Tennessee farm ponds was measured by the light-dark bottle method using the Winkler technique to determine oxygen content of the water. Production data was evaluated in terms of water temperature and time of year.

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"Energy Requirements of Wintering Brown-headed Cowbirds. Jackie D. Mitchell, Union University. Five male brown-headed cowbirds (*Molothrus ater*) were kept in captivity in a building where the temperature varied with the environmental temperature and where the birds were protected from wind and rain. The weight of each bird and the food were measured near sunrise and sunset each day, and for each bird the overnight weight loss was calculated. The amount of food consumed as also determined. The temperature was recorded at each measuring. Linear regression of overnight weight loss on temperature was significant at the 0.001 level with the relationship inverse and the slope of the line being -0.0232 . The average weight loss from sunset to sunrise was 3.19g. Further analyses of the data are being made.

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GRADUATE SCIENCE ENROLLMENT DECLINES 2 PERCENT FROM 1971-1972

NSF "Highlights (August 16, 1973) featured a resume of the initial findings from the "Survey of Graduate Science Student Support" which indicated some new trends in graduate science enrollment. Among those cited were:

1. "Doctorate-granting institutions reported an overall decline of 2 percent in graduate science and engineering enrollment from 1971-1972, with a drop of 3 percent in first year enrollment, continuing the downward trend.
2. "All areas of science except the life and social sciences reflected this decline. Engineering suffered the largest enrollment drop, 5 percent, followed closely by the physical sciences, with 4 percent.
3. "Enrollment in master's departments in doctorate-granting institutions amounted to 20,200 students in 1972, nearly a 4 percent gain over 1971, which was reflected in all areas of science except engineering.
3. "The number of federally supported full-time graduate students declined by 10 percent, with every area of science registering reduction in enrollment at rates ranging from 6 percent in the life sciences to 20 percent in the mathematical sciences.
4. "While graduate science enrollment waned from 1971 to 1972, the number of post-doctoral appointees rose 9 percent, indicating an increasing dependence upon such personnel for the maintenance of research and teaching capabilities at the graduate level."

Copies of the NSF "Highlights" report can be obtained from The National Science Foundation, Washington, D.C. 20550. The original report, providing a more detailed analysis of the findings, can be requested from Supt. of Documents, U.S. Gov't. Printing Office, Washington, D.C. 20402, by asking for: *NSF Graduate Student Support and Manpower Resources in Graduate Science Education, Fall, 1971* (NSF 73-304). A final report, including Fall, 1972, is scheduled for publication later in 1973.