

**PROCEEDINGS
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**ANNUAL FALL PUBLIC LECTURE
FOOD, ENERGY, AND THE FUTURE**

by David Pimentel

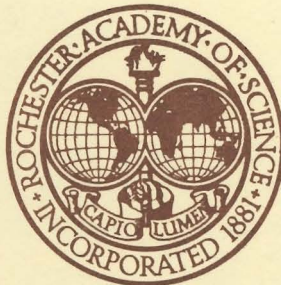
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**ABSTRACTS OF PAPERS
NINTH ANNUAL SCIENTIFIC PAPER SESSION**

**STATE UNIVERSITY OF NEW YORK
COLLEGE AT BROCKPORT, NEW YORK**

6 November 1982

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**6 NOVEMBER 1982
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ANNUAL FALL PUBLIC LECTURE

ABSTRACT

FOOD, ENERGY AND THE FUTURE. Dr. David Pimentel, Department of Entomology and Section of Ecology and Systematics, Cornell University, Ithaca, New York

One is tempted to ask who is responsible for the shortages of world food, energy, land, and water resources. Man cannot escape the answer that he, himself, has allowed his numbers to increase up to and even beyond the capacity of his biological environment to provide adequate supplies of needed resources.

The best estimate is that if there were only about 1 billion human beings on earth, all could enjoy a relatively high quality life. With the current world population above 4.5 billion, world food and energy resources even now are being stretched to cover basic needs. How then can we expect that the same pool of resources will be able to provide amply for the more than 6.5 billion individuals expected by 2000 A.D.? Perhaps we should abandon hope for a high quality life? Or perhaps we can acknowledge the problem now and begin to try to solve it.

The answer is not simply to produce more of the same crops we already grow. Our analysis has shown that even now energy, land, and other biological resource limitations make it impossible to provide the current world population of 4.5 billion a U.S. per capita daily diet of about 70 g of animal protein and 2,500 kcal of food energy. The evidence suggests the standard of living in the world will have to be reduced to accommodate the rapidly growing numbers of human beings in the world. A substantial shift will have to be made in the diet. Less meat will be consumed while more grain, potatoes, and beans will be eaten. The peoples of the developed world, including the United States, will have to join the other two-thirds including China and India who eat a more vegetarian diet.

More people will have to be crowded into small living quarters. Emphasis will be given to utilizing energy for essential purposes and less for pleasure. The overall trend will be a declining standard of living as the world population continues its growth beyond the biological carrying capacity of the earth.

Although man's scientific expertise will help alleviate some of the world shortages of food and energy, science cannot solve the problems the world faces today. To be convinced of this examine what progress has been made in improving the quality of life of the people of the developing countries during the past decade. These poor people make up two thirds of the world population.

AEROBIC RESPONSE TO LOCOMOTION IN THE MARSH CRAB. Assad, J.A. and R.J. Full. State University of New York at Buffalo.

The maximal aerobic response to progressively increasing exercise intensity was measured for the marsh crab, *Sesarma cinereus*. Animals were run on a miniature treadmill enclosed in a respirometer while instantaneous oxygen consumption levels were monitored by a S-3A Applied Electrochemistry Oxygen Analyzer. Exercise, beginning at 0.14km/hr, was sustained for 5 min. Then, treadmill velocities were increased by 0.014 km/hr at 3 min intervals over a 12 minute exercise period. Prior analysis of time to fatigue over a range of treadmill velocities indicated that at the end of the test the animals were running at velocities where fatigue occurred in less than 15 minutes. Throughout the progressive maximal oxygen consumption test, the animals showed only a slight elevation of oxygen consumption levels over the resting levels. Further evaluation of the aerobic response was attempted by 20 min constant velocity runs at 0.06, 0.10 or 0.13 km/hr. The range of velocities were selected to exercise the animals to near fatigue at the highest velocity. Oxygen consumption levels were monitored 60 minutes prior to exercise, during exercise and 60 minutes after exercise. Again, only small increases in instantaneous oxygen consumption levels (less than 0.5 times pre-exercise values) were observed during exercise. In addition, 60 minute runs at 0.06 km/hr showed only modest increases in oxygen consumption over resting consumption.

The increased oxygen consumption of the marsh crab during exercise is less than 1/8 of that observed in other crab species of similar mass and resting oxygen consumption levels, suggesting that anaerobic metabolism plays a significant role during exercise. However, whole body lactate, determined during exercise at 0.10 km/hr, showed no significant increase. *Sesarma* may be utilizing energy from an alternate anaerobic pathway to power its locomotion. Supported by NSF grant PCM 79-02890.

CHARACTERISTICS OF THE HEPATOPANCREAS PEROXIDASE OF THE FRESHWATER CRAYFISH CAMBARUS ROBUSTUS.

R. S. Austin and D. P. Merrill, Department of Biology, Rochester Institute of Technology, Rochester, New York 14623

The hepatopancreas or midgut gland of decapod crustaceans is the site of digestion and nutrient absorption and may, in addition, provide the animal with a measure of protection against pathogenic microorganisms. The organ consists of two lateral pairs of blind-ending lobes, each with a central lumen leading directly into the midgut. The surface of each lobe is a simple columnar epithelium organized into short, hollow tubules. Using morphological and functional criteria, the epithelium consists of at least four distinct cell types representing two cell lines.

Peroxidases isolated from a variety of vertebrate tissues possess bactericidal, virucidal, fungicidal and tumoricidal activities. We have located the crayfish hepatopancreas peroxidase within secretory cells where it is delivered into the collecting ducts of the tubules by a holocrine mode of secretion. Its function is still unknown.

We examined the hepatopancreases of 18 adult, intermolt male crayfish and accumulated baseline data regarding the cellular distribution and enzyme activity levels of peroxidase. The soluble enzyme was extracted by homogenation and centrifugation. The supernatant was assayed spectrophotometrically at 470nm during the oxidation of guaiacol. One unit of peroxidase activity corresponded to an increase in absorbance of 1.00 per min as calculated from the initial reaction rate. Protein content was determined by Lowry assay. Although organ wet weights and total protein contents were remarkably consistent among experimental animals, peroxidase activity showed significant individual variation. Activity, present in all organs assayed, ranged from 272 to 3.4 units per mg protein. It is conceivable that peroxidase is under the control of either environmental or physiological factors which act as either inducers or repressors of protein synthesis.

INDUCING PRE-EXERCISE ALKALOSIS AS AN ERGOGENIC AID.

Daniel F. Bailey, S.U.C. at Brockport.

An examination of the effectiveness of inducing pre-exercise alkalosis as an ergogenic aid. Exercises which rely on anaerobic energy metabolism are subject to a build up of lactic acid and a subsequent decrease in muscular pH. Further energy production and muscle performance is impaired and exercise is limited. Improving the body's acid buffering capacity by inducing pre-exercise alkalosis, in some cases, decreases the effects of lactic acid production.

SURVIVAL AND REPAIR OF PHAGE DNA MODIFIED BY ACETOXY-ACETYLAMINO-FLUORENE.

Michael A. Babich* and William D. Taylor, Biophysics Program, Pennsylvania State University, University Park, PA 16802.

The effect of DNA secondary structure on the formation and repair of DNA adducts of the carcinogen N-acetoxy-2(acetylamino)-fluorene was studied. With ϕ X174 replicative form DNA, the adduct distribution was independent of superhelical winding. However, the total extent of binding was dependent on DNA secondary structure: native form I > native form II > denatured form II. Form I DNA bound 30% more carcinogen than form II. This suggests that the DNA helix is unwound by about 22° in the rate determining step of covalent adduct formation.

Excision repair was studied by transfection of carcinogen-treated ϕ X174 replicative form DNA using *Escherichia coli* K-12 strains AB1157 or AB1886 as hosts. The adduct distribution was varied by reacting carcinogen with denatured form II DNA and then reannealing, because acetoxyacetylaminofluorene forms only one adduct with single-stranded DNA. With AB1886, *uvr A*⁻, a single N²-guanine adduct was lethal. With AB1157, wild type, at least 5 N²-guanine adducts and 50 major, C-8-guanine adducts were required for lethality.

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THE FOUR COLOR THEOREM: ITS CHECKERED PAST AND UNCERTAIN FUTURE. Frank R. Bernhart, Rochester Institute of Technology, Department of Mathematics

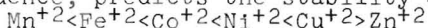
A brief review of the unorthodox history of the famous map coloring problem and the continuing controversy, with a few guesses about its future and suggested reading.

The origin of the four color problem is reliably traced to Oxford graduate student Francis Guthrie, in the middle of the last century. Many flukes and mistaken proofs preceded the recognition of the depth and difficulty of the problem. Many areas within Graph Theory and Combinatorics grew up or were affected by the spinoff from this problem. The famous incomplete proof of Kempe (1879) was at last repaired by Appel, Haken, and Koch (1976), building on many other attempts, and at the cost of many hours of computation on computers. After the proof became public, philosophical and aesthetical objections were voiced by a few. Short and elegant, but flawed proofs continue to arise. Hence the overall importance and implications of the solution for the future of mathematics remains uncertain.

A STUDY OF SOME METAL-FLUORIDE REACTIONS IN WATER AND METHANOL.

J.W. Bixler, D.R. Hallenbeck, K.M. Logsdon and L.R. Solomon, Department of Chemistry, SUNY College at Brockport, Brockport, New York

Several important reaction classification schemes and stability sequences have been proposed, based upon aqueous coordination chemistry. One of these, the Irving-Williams sequence, predicts the stability order:



when comparing the strength of the interaction of each of these metal ions with a given ligand. It has been observed that this stability trend is apparently not observed for the very weak complexes formed with a single fluoride ion (MX^+) in aqueous medium. We have used ion-selective electrode potentiometry to study the enhanced stabilities of these species in methanol, providing previously unavailable information about fluoride complexes in a non-aqueous medium. The stabilities of these species in methanol will be compared to the analogous aqueous cases, and entropy and enthalpy information will be presented. The implications of our thermodynamic data upon the general validity of the Irving-Williams series will be noted.

BIRD AND MAMMAL USE OF A LINEAR HABITAT IN AN INTENSIVELY AGRICULTURAL ECOSYSTEM. Lynn Braband, Roberts Wesleyan College, 2301 Westside Drive, Rochester, N. Y. 14624

Populations and habitat associations of birds and mammals were evaluated on railroad right-of-ways (ROWs) in central Iowa. Of the species normally found in the region, 26 percent of the bird species and 66 percent of the mammals were recorded on the study plots. The number of shrubs, trees, and annual forbs were important habitat components that affected densities and diversities of animal populations on ROWs. Species which were able, and not able, to use a narrow habitat are discussed. Possible implication of the study to New York are mentioned.

LIPOPROTEIN PATTERNS IN WHITE CARNEAU PIGEONS. David Brannigan, Dept. of Biology, SUNY Brockport, NY 14420.

Ninety percent of heart attacks and strokes are caused by obstructive atherosclerotic lesions. The White Carneau pigeon develops lesions which are uniquely like those arising in man. This preliminary study demonstrates that a LDL rich lipoprotein pattern similar to that found in humans at risk emerges developmentally at 11 months post-hatching.

THE PROBLEMS OF DESERT DUST.

Anthony J. Brazel
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Arid and semi-arid regions of the world give rise to dust from insitu bedrock weathering and alluvial deposits and from areas stripped of vegetation by man. In some cases dust is transported hundreds to thousands of kilometers. Approximately five hundred million metric tons of dust are deposited annually in the oceans and on landscapes. In recent years there is an expanding consideration of man's role as a creator of desert dust and a growing interest in man's activities and health related to dust.

In this paper three aspects of dust are reviewed, all in the context of environmental problems of dust in the state of Arizona in the desert southwest. These are: (1) the production of dust from a meteorological and climatological point of view; (2) the effects of dust on earth's regional and global climate; and (3) some interactions between dust and man's activities in the desert southwest.

The main focus of this presentation stems from a University sponsored project involving Geography departments from Arizona State University and the University of Guelph (Ontario, Canada). This project includes an analysis of the historical climatic record of dust storms in Arizona and a first approximation to establishing trajectory patterns of dust storms. The application of this analysis is important in the area of identifying the TSP problem and potential source regions for natural dust in nonattainment areas of Arizona where TSP levels exceed the National Ambient Air Quality Standards a large portion of the time.

TEMPERATURE AND MOISTURE RELATIONS FOR VIRGINIA VALERIAE PULCHRA (SERPENTES:COIUBRIDAE) IN NORTHWESTERN PENNSYLVANIA. Thomas H. Cervone and Richard C. Bothner, St. Bonaventure University, St. Bonaventure, New York 14778

Virginia valeriae pulchra (Richmond) has received little attention since its original description in 1954. Information on its natural history is lacking, thus warranting a thorough study. Temperature and moisture relations are herein reported.

Virginia valeriae pulchra is a thigmotherm and receives its heat from the substrate. Their ecritic (=preferred) temperature in the field and in a thermal gradient are reported. The effects of gravity and spermatogenesis on temperatures selected are discussed.

Moisture relations for Virginia valeriae pulchra were analyzed by studying their desiccation rates (non-lethal) and soil moisture preferences. Desiccation rates and soil moisture preference for Virginia valeriae pulchra, Virginia valeriae elegans, Tantilla gracilis, Carphophis amoenus, and Diadophis punctatus were compared. The relationship of this snake's moisture tolerance to habitat preference is discussed.

DISCOVERY OF FOSSIL SCORPIONS IN THE SILURIAN ROCKS OF INDIANA. Samuel J. Ciurca, Jr., 48 Saranac St., Rochester, N.Y. 14621.

Fossil scorpions are very rare in the geologic record. The earliest scorpion known in North America came from the Late Silurian (Pridoli) Fiddlers Green Formation (Bertie Group) of central-eastern New York State. Here scorpions are found in waterlime beds associated with abundant remains of the eurypterid Eurypterus remipes remipes DeKay and several other species of eurypterids.

As the result of a search of eurypterid-bearing rocks in Indiana during the past several years, I report here the discovery of abundant fossil scorpion remains in the Silurian of Indiana that are probably older than the New York forms (possibly of Latest Wenlock to Ludlow in age). Numerous specimens were obtained from rocks of the Kokomo Formation near Kokomo, Indiana and the site is probably the richest fossil scorpion deposit known.

Associated with the fossil scorpion remains are a variety of eurypterids, brachiopods, plant? remains, graptolites, and a horseshoe crab. Morphological studies are currently underway.

ZOOPLANKTON FEEDING BY HYDRA VIRIDIS.

William S. Clayton, Jr.
Department of Biological Sciences
State University of New York at Buffalo
Buffalo, New York, 14260, U.S.A.

The effects of light regime, feeding regime and tentacle number on the zooplankton feeding capability of Hydra viridis were tested in the laboratory.

H. viridis with 7 tentacles captured and ingested more prey than hydra with 6 tentacles. However, changes in light and/or feeding regimes did not alter the number of tentacles per hydra.

Altering light and feeding regimes altered the number of zoochlorellae per hydra and growth rate without altering feeding capability. This suggests that, under these experimental conditions, H. viridis was unable to alter zooplankton feeding in response to changes in nutritional input from zooplankton feeding and algal photosynthesis.

CORAL MUCUS PARTICLES--A FOOD SOURCE FOR GORGONIAN SOFT CORALS.

M.A.Coffroth., Dept. of Biological Sciences, SUNY @ Buffalo and Rosenstiel School of Marine and Atmospheric Sciences, Univ. Of Miami, Miami, FL.

Mucus produced by reef corals is a potential energy source for the reef community and a possible means of transferring photosynthetic energy fixed by coral zooxanthellae to the reef community. This study examines the utilization of detrital mucus particles

by the gorgonian soft coral, Pseudoplexaura porosa. Mucus labelled with radioisotopes, the vital stain, neutral red, or the muconolysaccharide-specific stain, alcian blue, was injected into flexible-walled in situ feeding chambers containing gorgonian branch tips. Experiments using stained mucus particles demonstrated that gorgonians are able to capture and ingest mucus particles. Isotope-labelled mucus particles were used to estimate gorgonian ingestion and assimilation. The gorgonian soft coral, P. porosa, assimilated 22% of the ingested mucus.

This study confirms the ability of Pseudoplexaura porosa to utilize mucus particles and a comparison of these findings to literature values of coral respiration demands suggest that mucus can be a nutritional resource to these particulate feeders. Because mucus represents photosynthetically-derived energy, ingestion of mucus particles is a means of recycling nutrients to the coral itself, as well as transferring coral production to other reef particle feeders.

DDT IN LAKE TROUT FROM SENECA LAKE, N.Y.

Patrick J. Cooley and Craig S. Smith, Dept. of Biology, Hobart and William Smith Colleges, Geneva, N.Y. 14456

When DDT was banned, it was expected that DDT concentrations in organisms would slowly and steadily decline. Studies by the New York State Department of Environmental Conservation (DEC) on lake trout from Seneca Lake, N.Y. showed a precipitous decline from a 1970, pre-ban mean of 11.3 ppm DDT (+ metabolites) to less than 1 ppm in 1976. When the 1976 study was repeated by the DEC in 1978, the concentration of DDT in lake trout appeared to have increased to 2.75 ppm. We conducted this investigation to determine whether the decline and resurgence of DDT levels were real or the result of sampling variations and to determine the current DDT concentration in lake trout from the lake.

Twenty-one lake trout were sampled, ranging in size from 36 to 75 cm in total length. The concentration of DDT in hexane extracts of standard fillets was measured using electron-capture gas chromatography. The overall mean DDT concentration in the samples was 1.7 ppm. The concentration of DDT increased exponentially with size according to the relationship: $\log \text{DDT (in ppm)} = -1.63 + 0.028 \text{ length (in cm)}$. The strong dependence of DDT concentration of size makes it seem likely that the low DDT concentration found in 1976 was not comparable to the results of the other studies due to the smaller fish sampled that year. Disregarding the 1976 value, the concentration of DDT in large trout from Seneca Lake shows a steady decline with a half-life of approximately 4.6 years.

1981 RED-TAILED HAWK NESTING RESEARCH.

Jerry H. Czech, Cumming Nature Center of the Rochester Museum and Science Center, 657 East Avenue, Rochester, New York 14603.

The 1981 Red-tailed Hawk nesting research began in early March when a search of the 7.5 minute USGS Victor and Honeoye quadrangles was made in an effort to locate ten active nests. At this time of year, nest locations are sometimes obvious due to the large nest structures and presence of adult hawks soaring over their territories. The ten nests were found between March 11, 1981 and April 28, 1981 within, or near, the study areas.

Eventually, contact was made with all landowners except the Department of Transportation on whose land nest number 10 was located. All landowners were interested in the hawks, the research, and very willingly granted permission to conduct the study on their land.

Five of the nests were given protection from Raccoons in the form of aluminum bands wrapped around the tree trunks several feet above the ground. The metal bands were spray-painted with dull black, brown, and gray primer paints to make them less obvious. Finally, moth balls were sprinkled on the ground around the bases of these trees as an added Raccoon deterrent.

The other five nests were given no protection. Observation was conducted from a distance with aid of binoculars, and a special effort was made to stay many feet away from the bases of the nest trees. This was done because Raccoons are known to sometimes follow human scent trails.

Four nests were in Shagbark Hickory, two in Basswood, two in White Ash, and one each in White Oak and Sugar Maple. Trunk diameters varied but all nests were in fairly tall trees and were estimated to be at elevations ranging from sixty to eighty (60-80) feet. Both Basswoods and the White Ash trees were growing in "clump" situations with several trunks sprouting from a single rootstock.

All five unprotected nests failed and one of the protected nests failed. Evidence as to the cause of failure was circumstantial in all instances, but certain clues pointed strongly to the suspects. Great-horned Owls were blamed for the failure of two nests, while Raccoons caused failure of the additional four.

BEAVER POND ANALYSIS AT THE CUMMING NATURE CENTER. Nancy L. DeWitte, Cumming Nature Center of the Rochester Museum and Science Center, 657 East Avenue, Rochester, New York 14603.

Peripheral pond vegetation was identified and quantified on three beaver ponds at the Cumming Nature Center in Naples, New York. Sampling was accomplished along linear transects which extended into the woods from the pond's edge and were delineated by perforated galvanized pipes. Water levels were monitored via the pipes and the micro-topography of the transects was measured with an Abney level. Most plant species had specific zones of occurrence along the transects correlating with the moisture gradient. Thirty to forty percent (30% - 40%) of the plant species were primarily moisture loving varieties and would not normally have occurred there, were it not for the beaver pond. The data collected will be used as a base for comparison with future studies. One or more follow-up surveys are necessary to monitor the beavers' effects on their surroundings and to better understand the life history of the beaver ponds.

BUFFALO WINGS, ORIENTAL STYLE - A MYSTERY. R. Dilcher and J. C. Makarewicz. Department of Biological Sciences, SUNY Brockport, Brockport, New York 14420.

Phasianus colchicus, the Ring-necked Pheasant, is a Eurasian import widely introduced in North America as a gamebird. Despite extensive breeding, research and management efforts, this popular immigrant has only a marginal and spotty reproductive success in New York State. Yet in the industrial and harbor area of Buffalo, there is a successful, unmanaged population of Ring-necked Pheasants. This paper reviews some relevant literature and hypothesizes about some specific factors that may contribute to the unexpected success of Phasianus colchicus in that small unusual area.

THE EFFECTS OF LOW DOSES OF TRITIATED WATER ON SACCHAR-OMYCES CEREVISIAE STRAIN D7

J. Douthwright, B. Tochelli, and D. Williams, Department of Biology, Rochester Institute of Technology, Rochester, New York 14623

The lower eucaryotic baker's yeast Saccharomyces cerevisiae has been utilized in many studies to examine the effects of mutagens; both physical such as x-rays and gamma rays, and chemical. Mutagenesis, permanent alteration of the DNA base sequence can be detected by gene conversion in diploid strains of yeast. Induced gene conversion can lead to the expression of homozygous recessive mutations. Agents that produce mutation commonly cause these types of gene conversion. In this

study, a diploid strain of yeast (D7) is used to examine the effects of radiation from the decay of tritiated-water on gene conversion at two sites in the genome.

A colony with a low spontaneous gene conversion frequency was grown for three days in YPD medium. The cells were spun down, washed twice in sterile distilled water, and resuspended in phosphate buffer at 10^7 cells/ml. Aliquots of this culture were treated at 4°C with 0 μ Ci, 100 μ Ci and 1000 μ Ci of tritiated water. Cells were assayed for gene conversion at the trp5 and ilv1 loci by plating the cells for five consecutive days on SD plates lacking the specific amino acid and by plating for survival on SD plates with both amino acids. Plates were incubated at 37°C for three days for survival and 5 days for gene conversion.

The effect of the tritiated-water was seen both as a decrease in survival and an increase in the number of revertants at both of the genetic loci examined. A slight decrease in survival was exhibited by the control cultures, but not to the same extent as the treated cultures. The dose received by the cells for each μ Ci of the radioisotope is one rad per day. A linear dose-response with no evidence of a threshold was seen. Therefore the linear dose-response hypothesis which has been used to set acceptable radiation safety standards, and to estimate somatic risk and long-term genetic risks hold for this study with tritiated water in the yeast system.

MOLECULAR ORBITAL STUDIES OF AMINOBORANES: THE EFFECTS OF ELECTRONEGATIVITY AND BACK DONATION.

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Interest in aminoboranes $\begin{matrix} R_1 \\ R_2 \end{matrix} > N - B < \begin{matrix} R_3 \\ R_4 \end{matrix}$ stems from their similarities to and differences from the analogous ethylenic compounds. H_2N-BH_2 and $H_2C=CH_2$ are isoelectronic and might therefore be expected to show similar electron distribution patterns. Both should have a "double bond" character that can be modified by substituents.

Electron distributions and rotational barriers for a series of fluoro and methyl substituted aminoboranes were examined in order to investigate the extent of interaction between the boron and nitrogen $p(\pi)$ orbitals and the dependence of this interaction upon substitution patterns. We have confirmed the presence of significant double bond character for the B-N link. More importantly, the alterations caused by attachment of fluorine reveal an interesting interplay of electronegativity and "back π " donation. Electronegativity is found to operate primarily within the σ framework

and to have little direct influence on the distribution of π electrons. Instead the π electron distribution is controlled by the pattern of partial charges that result from the asymmetric σ electron distribution patterns. As a result of this complex interplay, a fluorine substituent will decrease the double bond character of the B-N link when bonded to either B or N.

The barriers to rotation about the B-N are found to be poor measures of double bond character. These rotational barriers depend on other factors as well; these factors will be elucidated in the paper.

THE 55 MPH NATIONAL SPEED LIMIT AND ITS IMPACT ON DEATH RATES.

Dr. David Farnsworth, Mathematics Department, Rochester Institute of Technology, Rochester, New York 14623

One of the leading causes of deaths in the United States is motor vehicle accidents. In January 1974 as a response to the oil embargo, a national 55 MPH speed limit was imposed as an emergency measure to conserve gasoline. This action was accompanied by a reduction in highway fatalities.

In this paper the effect of this speed limit on fatality rates on the New York State Thruway are examined. Using quasi-experimental designs, in particular interrupted time series analysis, the number of lives saved per year since 1974 is measured.

One advantage of the Thruway data is that the number of vehicle miles is known. Because eight years have elapsed since the intervention in the time series of fatalities, the pattern in the post-intervention era is used in the analysis for more control. Possible intervening variables are considered, also.

"LES FEMMES SAVANTES" A PARIS.

K. Thomas Finley, Patricia J. Siegel, Departments of Chemistry, Foreign Languages and Literatures, SUNY Brockport.

Horace Greeley may have said, "Go west young man, go west," but young scientists went East as the nineteenth century dawned. Paris, the cultural mecca, yes, but also the scientific capital of the world. Male visitors to French scientists were numerous, but in fact many of the fairer sex, whom history treats as sheltered, unworshipful, and dependent maternal objects, left these shackles on the wharf and sailed away in search of the best that the scientific community had to offer. Their mission completed, and filled with the rich European scientific atmosphere, they returned to play distinguished roles in the birth and adolescence of American science.

ENERGETIC COST OF LOCOMOTION IN CRABS: AN EVALUATION OF AEROBIC AND ANAEROBIC CONTRIBUTIONS. Full, R.J. State University of York at Buffalo.

The energetic cost of locomotion has been determined for a variety of reptiles, birds and mammals. Our study has focused on exercise in invertebrates, including ten crab species. We attempted to estimate the cost of transport in crustaceans by using methods previously applied to vertebrates. However, this approach requires a sustained aerobic "steady-state" during treadmill exercise over a range of velocities. Two crab species met these criteria; the ghost, *Ocypode quadricaudii* and the hermit crab, *Coenobita compressus*. "Steady-state" oxygen consumption was attained rapidly in both cases and increased linearly with velocity as is seen in many vertebrates. For these crabs no evidence has been found to indicate that the cost of transporting a gram of animal a given distance is different from that predicated for a vertebrate of a similar mass in spite of the striking morphological and physiological dissimilarities between the groups.

Various other crab species, not meeting established criteria, showed a sluggish, reduced aerobic response to locomotion. The fiddler crab, *Uca pugilator*, does not attain a "steady-state" oxygen consumption during 15 min of exercise. An increase in velocity resulted in only a modest increase in the amount of oxygen utilized. Aerobic ATP synthesis is only one strategy for energy production. In the fiddler crab whole body lactate content steadily increased during the exercise bout for each of three velocities. Net whole body lactate production increased with an increase in velocity. At the lowest velocity both aerobic and anaerobic sources contributed equal amounts of energy to power locomotion. At the high velocity the lactate pathway accounted for 70% of the ATP synthesis. Comparison of aerobic and anaerobic metabolism in running crabs reveals that evaluation of oxygen-uptake alone may be incomplete. The data suggest that a variety of energy production strategies may be open to exercising crustaceans. Supported by NSF grant PCM 79-0289.

MASTER'S SWIMMERS REVISITED: THEIR FITNESS. James B. Fulton. SUNY College at Brockport, Brockport, New York

A field examination of Master's swimmers fitness was conducted at the Skwim Swimming Center during 1979, '80 and '81. Nine individuals participated in the program all three years. The average age of the group in 1979 was 51 years.

Following a resting EKG, the group was examined for visiting heart rate, sitting blood pressure, predicted maximum heart rate, and a 12-minute aerobic swimming test. Anthropometric items included in the examination were body weight, percent of body fat, and ankle flexibility. Strength/Endurance items were bent-knee sit-ups and arm depression work capacity.

Results showed Master's swimmer 1) have good cardiovascular function and improve over two years, 2) have good control over body fat, 3) have good abdominal strength and endurance, and 4) have excellent plantar-flexion of the ankles.

CONTROLLING IRON CHLOROSIS IN PIN OAK BY STEM INJECTION. Alfred J. Gianfagna, State University College, Brockport, NY 14420.

Pin Oak, Quercus palustris, will usually develop iron chlorosis whenever the soil pH is about 7.5. Iron chlorosis which is an interveinal yellowing of the young leaves is due to the inability of the roots to absorb sufficient iron. Iron chlorosis was controlled by injecting iron into the trunks using the Mauget system. The method of injection will be demonstrated and the results will be illustrated with colored slides.

PRELIMINARY STUDY OF PHYTOPLANKTON PRODUCTIVITY IN CANANDAIGUA LAKE, ONTARIO COUNTY, NEW YORK. Bruce Gilman, Community College of the Finger Lakes, Canandaigua, New York 14424.

This research project, sponsored by the Canandaigua Lakes Pure Waters Association, examined the significance of seasonal variation in algal abundance and productivity. Six study sites on the lake were sampled bimonthly over the summer of 1982. Laboratory analysis consisted of millipore filtration of the samples to collect plankton, methanol extraction of chlorophyll a and spectrophotometric measurement of its concentration. These measurements will be compared to historical data on Canandaigua and nearby lakes as well as becoming the focal point for a discussion on the status of eutrophication in Canandaigua Lake.

PREREQUISITE ASSESSMENTS FOR DESIGNING APPROPRIATE CONDITIONING PROGRAMS. Natalie Goodhartz, S.U.C. at Brockport.

Studies conducted with undergraduate dance majors at S.U.C. Brockport, and the thirty-two member elite squad of U.S.A. field hockey players reveal a need for detailed assessment of the mechanical and metabolic requirements of these activities prior to instituting a conditioning program. Testing performers for muscular strength and flexibility imbalances are also necessary.

Bilateral imbalances in joint flexibility, particularly in the hip joint for external rotation, were found in many dancers. Such lack of symmetry may predispose the dancer to chronic injury as a result of incorrect technical execution and movement compensation. Muscle strength imbalance between the antagonistic hamstrings and quadriceps were found in the field hockey players. On a single leg extension, some players had an 80 lb./30 lb. relationship favoring the quadriceps.

INFLUENCE OF SEX OF FETUS ON GESTATION LENGTH IN POLLED HEREFORD CATTLE. W.J. Graham, Biology Department, Monroe Community College, Rochester, New York.

Following the 1981 reports of several investigations on the effects of estrogen levels on maternal behavior in rodents, this author proposed that the sex of a fetus might influence the duration of a pregnancy. A few records of pregnancies from artificial insemination services in Polled Hereford cattle were examined and seemed to support the hypothesis.

Through 1982, a total of 22 accurate records of A.I. conceived births have been analysed. The average gestation for Hereford cattle is 283 days; our data show a gestation length of 286.3 days for bull and 280.2 days for heifer calves ($P < 0.001$, t-test).

THE RESEARCH GAME: A SIMULATION. Edward J. Gucker, SUNY College at Brockport, Brockport, New York 14420.

Simulation has long been recognized as an effective method of providing training in situations where very complex processes must be mastered. Scientific research, as practiced in this century, is such a complex process, involving not only elements of individual creativity, but also economic, political and technological components.

In order to make this process intelligible to students in Brockport's Alternate College, a simulation "game" is being developed in which each student must function in the role of a scientist in a college, university, industry or government laboratory. Working alone, or as part of a group, participants must compete for funds and facilities in order to carry out their research programs. Interpretation and

communication of results are entirely in the hands of the players. Data are gathered by specifying an experiment in writing; the instructor generates and reports back the "raw data" which the experiment would produce. Error is introduced in such data in a realistic manner.

The game is currently being played by about twenty students in the course GSM 100 - "The Process of Scientific Inquiry" within the Alternate College. A revision will be developed after feedback has been obtained from the participants.

PHEROMONAL CONTROL OF SEXUAL DIFFERENTIATION IN THE GUPPY. William Hallahan, Biology Department, Nazareth College, Rochester, N.Y. 14610.

Fish appear to be ambisexual during their early postnatal development and in guppies, this state of "sex-undifferentiation" can be manipulated by placing hormones directly in their water. Although the chemistry of fish sex pheromones is still ambiguous, changes in behavior can be attributed to pheromones carried in the water. In coral-reef fish, social factors may actually produce sex reversal. The experiment in this report demonstrates that pheromones from sexually mature adults may influence the sexual differentiation of immature guppies. Water pumped from tanks containing adult guppies influenced the sexual differentiation of newborn fry. Water carrying the odors of females induced the development of males; water from adult males induced the development of females. Sex pheromones may therefore have a direct regulatory role or an indirect, inductive role in their effect on sexual maturation of fish.

AMERICAN ELK (CERVUS CANADENSIS) REMAINS SHED NEW INFORMATION ON THEIR EXISTENCE IN WESTERN NEW YORK STATE. R.D. Hamell, Dept. of Geosciences, Monroe Community College, Rochester, New York 14623.

In the Fall of 1980 Mr. Steven Stein of Caledonia, New York, found two antlers in the side of a drainage ditch on the Guthrie Farm in Mumford, New York.

This find is unique because one of the specimens was from an elk, the other, a white-tail deer. Both of the antlers had been shed; a process which generally takes place in February and March in modern populations. The small antler is from the white-tail deer Odocoileus virginianus. According to methods used by the New York State Dept. of Environmental Conservation the age of the deer can be approximated by determining the diameter of the beam measured one inch above the burr. Caution is advised as this method has been extensively developed using only recent deer populations and known environmental conditions. Using the method described an age of $1\frac{1}{2}$ years was determined.

The elk (wapiti) antler is of significance and interest because the last native elk was killed sometime between 1843-1846 in the Genesee Valley. Since that time the American Elk had been reintroduced into New York State (Adirondack Mountains) during the late 1800's and early 1900's. This population was hunted to extinction. The last recorded elk killed was in 1946 in Essex County.

Elk (*Cervus canadensis*) remains have been found elsewhere in New York State. A recent discovery of antler and jaw remains have been dated at (approx.) 7,000 years BC. These artifacts were recovered during dredging operations near Walworth by the the Rochester Museum.

The antlers recovered at Mumford were taken from the side of a drainage ditch about $3\frac{1}{2}$ feet below the surface. The geologic setting is in a post-glacial outwash channel. Presently the field is a muck-bog. Preliminary dating of material from a site to the east (near Cox's Road) by Dr. Richard Young (Dept. of Geological Sciences, SUNY Geneseo, Geneseo, N. Y.) yielded a date of 6,000-8,000 years BP. The stratigraphic position of the antlers at Mumford would correlate with this approximate age.

EXERCISING COCKROACHES: THE EFFECT OF TRAINING. Harwitz, J.M., and R.J. Full. State University of New York at Buffalo.

The Central American cockroach, *Blaberus discoidalis*, was trained on a miniature treadmill respirometer six days a week for a five week period. Each day an animal underwent 15 min of exercise training which included: 7 min of running at 0.21 km/hr, 5 min at 0.25 km/hr and 3 min at 0.29 km/hr. Maximum rate of oxygen consumption, energetic cost of locomotion and maximal sustained running velocity were the three criteria used to evaluate the effect of training. These parameters were determined during a progressive maximal oxygen consumption test. The test was given prior to training, at 2 weeks and again at 5 weeks (end of training). The test protocol consisted of a 30 min rest period followed by exercise. During the exercise period the treadmill velocity was increased 0.04 km/hr every 6 min. The test period ended when no further increase in oxygen consumption was seen with an increase in velocity. This oxygen-uptake level was defined as the maximal oxygen consumption. Oxygen consumed by the cockroaches was measured by open-circuit respirometry with an S3-A Applied Electrochemistry oxygen analyzer.

The results showed the following: 1. maximal oxygen consumption (1.7 mlO₂/gxhr) was nine times the resting level. No significant difference in the maximal rate of oxygen consumption was found when pre-training values were compared to values determined after training. 2. The energetic cost of locomotion, the amount of energy required to move an animal a given distance (cost of transport = 7.2 mlO₂/gxkm) was comparable to other cockroach species but also was unaffected by training. 3. Training had no effect on the maximal sustained velocity of locomotion. The results indicate that the aerobic response to exercise and exercise performance in cockroaches is not enhanced by training as it commonly is in mammals. Supported by NSF grant PCM 79-02890.

DISTRIBUTION AND ECOLOGY OF LAKE ONTARIO SALMONIDS.
James M. Haynes, Dept. of Biological Sciences, SUNY,
Brockport, NY 14420.

Major salmonid stocking and lamprey control efforts have produced large numbers of salmon and trout in Lake Ontario. Researchers at the SUNY Colleges at Brockport and Fredonia have determined the seasonal movements, distributions and habitat preferences of these fishes.

In autumn, once nearshore lake temperatures drop below 18°C, all salmonid species can be found in abundance within 1 km of the southern shore of Lake Ontario. Salmon and brown trout enter tributaries to spawn. In winter, all species appear to move offshore to deeper, warmest 4°C waters. With the exception of salmon, all species are found in abundance within 1 km of shore again in spring, and rainbow/steelhead trout enter streams to spawn.

As near shore temperatures rise in late spring and early summer, lake trout (<10°C), rainbow/steelhead trout (10°C) and brown trout (18°C) move offshore to deeper, cooler areas of preferred temperature. Rainbow/steelhead trout and the major portion of chinook salmon population are found widely dispersed throughout the entire thermocline area of the lake during the summer. Lake and brown trout and a small portion of the chinook salmon population (especially in August) inhabit areas in and near the thermocline (defined as the zone in the water column where temperatures decrease 1°C/meter or more) within 4 km of shore over less than 50 m of water. Distinct summer temperature preferences are exhibited by lake trout (6-9°C) and chinook salmon (14-17°C), but all nearshore salmonid species share dietary and thermocline preferences. Evidence suggests that as salmonid numbers increase, and if forage stock condition continues to decline, the potential for classical interspecific competition for critical resources (food and temperature) in nearshore thermocline areas is great.

MASTER PLAN FOR THE FANCHER ARBORETUM. Robert A. Hellmann, Dept. of Biological Sciences, SUNY Brockport, NY. 14420.

In 1981 a master plan for designating all of the 500-acre Fancher Campus as an ecological arboretum was presented to the Faculty-Student Association of the College at Brockport, owners of the Fancher Campus. The proposal recommends that the whole 500-acres be designated as an ecological arboretum, administered by the Department of Biological Sciences, with a curatorial staff to manage the land for instruction, research, and cultural purposes. The following units have been identified: the catalogued collections, consisting of detailed reconstruction of natural habitats; The Mall, used for experiment and demonstrations in ecological landscaping, using native stands of wildflowers, shrubs, and trees; the 75-acre demonstration forest; conifer plantations on which will be produced crops of posts and poles and construction lumber for use in the arboretum; a wild-life meadow; a system of wetland habitats; extensive woodland and hawthorn scrub areas to be left in a natural state; an environmental living laboratory for experiments in ecological farming practices. Since the decision by the Faculty-Student Association to sell the Fancher property, an attempt is being made to find a buyer who will be willing to perpetuate the arboretum idea and implement the plan.

H⁺ UPTAKE AND EXTRUSION BY NITELLA. D.J. Holland and C.E. Barr. Department of Biological Sciences, State University College, Brockport, NY 14420.

Very high rates of H⁺ extrusion by internodal cells of Nitella clavata were measured after acid loading at pH 4.6. The highest rate observed, 160 pmol·cm⁻²·s⁻¹, was more than twice the rate of photosynthetic bicarbonate utilization under saturating light. These results are consistent with the recently proposed hypothesis that bicarbonate is not taken in directly but is protonated at the exterior surface; the CO₂ thereby formed diffuses preferentially into the cell because of the asymmetric concentration gradient. The large H⁺ uptake and extrusion currents can be electrically balanced by either OH⁻, K⁺, or Cl⁻ depending on the availability of the ion. The H⁺ uptake capacity of 150 nmol·cm⁻² was virtually saturated after 140 min at pH 4.6; we estimate that at this time 30% of the supranormal H⁺ was located in the vacuole, 40% in the cytoplasm and 30% in the cell wall. The question of whether the H⁺ in the cytoplasm is accommodated by buffering or by vesicular storage remains unresolved. It is clear that the cytoplasmic H⁺ has good access to the site of H⁺ extrusion at the inner side of the membrane. Supported by NSF grant 75-10106.

ACID PRECIPITATION STUDIES. John E. Hubbard, Department of the Earth Sciences, State University of New York College at Brockport.

This report summarizes some scientific and educational activities of the Earth Science Acid Precipitation Project, involving the Meteorology program at the College and science teachers and students in New York and neighboring states.

Measurements of precipitation events at the Brockport Weather Center from 1977-1981 yielded samples with pH values ranging from pH 6.9 (pH 7 is neutral) to pH 3.1. The mean of 110 measurements was 5.2, with a standard deviation of 0.6 pH units.

An exercise involving precipitation pH measurements by teachers and students at a number of schools in New York and other states was carried out in 1979-1981. Measurements and analyses were carried out as part of weather and environmental studies units of the Earth Science Syllabus of the New York State Education Department. Meteorology students at the College analyzed air mass trajectories for rainfall events and pH records throughout the region over eight selected survey weeks. In one event, there was evidence of acid precipitation (mean pH = 4.9) preceding a cold-frontal passage; and less acid precipitation (mean = 5.7) with a shift of air trajectory from a more southerly to northerly component following the front.

SOME ASPECTS OF POST-INDUSTRIAL AGRICULTURE. Donald Q. Innis, Geography Department, State University College, Geneseo, New York 14454

The evolution of modern agriculture into sustainable agriculture will undoubtedly derive many of its aspects from traditional methods of farming. Traditional farmers in both tropical and temperate lands developed non-destructive agriculture, not because they were wiser or more scientific than modern scientists, but because careful observation, experiments and centuries of practice eliminated agricultural methods which were destructive. Self destructive agriculture does not last long. The architects of post-industrial agriculture must solve problems of excessive soil erosion, nutrient leaching, loss of organic matter (which retains moisture and provides nutrients) growing immunity of weeds, insects and disease to chemical sprays, increasing scarcity and cost of fuels and mineral fertilizers, and chronic unemployment.

Current research under controlled conditions is showing that traditional farmers with intercropping are able to harness water, sunlight and nutrients, which are wasted or become destructive without intercropping. The harnessed resources produce extra crops for sale, or food crops along with commercial crops. At the same time intercropping protects or improves the soil.

The results of recent field work in India, Nepal and Jamaica, where there are many expert peasant farmers will be referred to, and slides presented which show the superiority of intercropping in using labor, water, sunlight, nutrients, space and time. For any given amounts of environmental or applied resources, intelligent intercropping utilizes more

of the resources and produces higher total yields than monocropping. Agriculture in the future will not involve the purchase of massive amounts of material to create short-term laboratory-like conditions in large fields. In future, far more experts will work on their own land, as they did in the past, and they will be able to extract maximum sustainable total yields from the land by employing water, sunlight and nutrients at the rate at which nature makes them available.

THERMPRO: AN INTERACTIVE THERMODYNAMICS PROGRAM FOR IBM.PC. Bhairav D. Joshi, Department of Chemistry, State University College at Geneseo, Geneseo, NY 14454

The availability of personal computers has created exciting possibilities for their use in chemical education and research. This paper deals with the use of an IBM.PC for interactive problem solving in thermodynamics. Using the facility we have created, THERMPRO, one can now concentrate on understanding the chemical behavior of the reaction under study while the personal computer calculates, tabulates, and/or plots the desired thermodynamic properties for a process as functions of temperature.

In general accurate calculations of thermodynamic properties of reactions from experimental data are quite involved. Considerable time is required, even of the experienced student of thermodynamics, to do such calculations. A beginner can often get bogged down by the complexities of numerical calculations and thus lose track of what it was that he needed the results for.

THERMPRO can be used to

1. Provide 'instructions' to the user,
2. Store data on diskettes,
3. Update the stored data.
4. Add more data to the diskette-file
5. List the stored data,
6. Carry out accurate calculations of important thermodynamic properties for any chemical reaction for which thermal data is on file, and
7. Display high resolution graphs of specified thermodynamic properties versus temperature.

Examples of the use of THERMPRO will be presented and discussed.

THE STATUS OF THE HELLBENDER, CRYPTOBRANCHUS ALLEGANIENSIS, IN NEW YORK STATE. Stephen Kellogg and Richard C. Bothner, St. Bonaventure University, St. Bonaventure, New York 14778.

Cryptobranchus alleganiensis was sought in the Allegheny and Susquehanna River systems of New York state. These are the only drainages in the state from which this form has been recorded. We found this species to be well distributed in the Allegheny River and its ma-

for tributaries. All age classes were represented and population density appeared to vary with amount of rock cover. One nest was discovered. In the Susquehanna River system (upstream of Binghamton) this form was found only in the Susquehanna River proper and in the Unadilla River, one of its major tributaries. All previously recorded sites, except New Berlin, were still occupied by this animal. Two nests were discovered; however, no immature forms were ever seen.

Cryptobranchus alleganiensis is of moderate to low density and spottily distributed in the Allegheny River system. It appears to be reproducing itself satisfactorily. This form is of lower density and equally spotty distribution in the Susquehanna system where, since no young were observed, its status is indeterminate. It is currently placed in the "special concern" category for New York State.

SUBMAXIMAL OXYGEN CONSUMPTION OF COMPETITIVE STROKES FOR AGE GROUP SWIMMERS. Gregory Kenney, D. U. C. Brockport, Brockport, NY 14420

Submaximal oxygen consumption, $\dot{V}O_2$, in the front crawl, back crawl, breaststroke, and butterfly were calculated for actual swimming on 16 male and 14 female age group swimmers at velocities, v , of .7 and 1.0 m/sec in a 60 meter circumference doughnut shaped pool. It is possible to set the flow rate with great accuracy in the unique annular pool. The subjects were randomly selected from the roster of the Zwicker Aquatic Club in Lockport New York. A random order of performing the strokes was assigned to swimmers on an individual basis at the time of the testing.

Independent t tests were calculated to determine the significance of mean differences for the subjects classified by sex and age (8-13 and 14-17 years of age classifications). The ratio of drag (D) to efficiency (e) is identical to the directly measured energy cost of swimming one unit distance ($D/e = \dot{V}O_2/v = VO_2/d$). The D/e ratio is considered a measure of swimming economy and is dependent upon swimming speed, proficiency, and body composition. Oxygen consumption at submaximum velocities, VO_2/d , was found to be significantly different in front crawl and butterfly ($p < .05$) at .7 m/sec for males and females 14-17 years of age. It averaged 33.80 and 44.28 l/km in the front crawl and butterfly, respectively for the males. The averages for the females were 31.42 and 35.44 for the front crawl and butterfly, respectively.

The results of this study indicated that males and females did not differ for economy of swimming. The front crawl was the most economical stroke, as is the case in competitive swimming. The general constituency of the Zwicker Aquatic Club at the time of the testing, in terms of the number and proficiency of the swimmers represented an atypical situation in contrast to other swim clubs with which this investigator is familiar. Many of the top female swimmers in the Greater Buffalo area have trained there, while a few of the top male swimmers have trained there. Consequently, the females in this study might have been relatively close to the males in competitive ability and proficiency. Generally the direction of the differences between males and females (disregarding age) was consistent with findings of other studies in which females are more economical swimmers than males.

THE DISTRIBUTION OF MIREX AND PHOTOMIREX WITHIN THE SELECTED TISSUE SECTIONS OF CHINOOK (ONCORYNCHUS TSHAWYTSCHA) AND COHO (O. KISUTCH) SALMON.

Brian A. Kent, Dept. of Biological Sciences, SUNY Brockport, NY 14420.

Replicated analyses (n=6) were made for mirex and photomirex concentrations in whole fillets, skin, red muscle, belly flap, anterior dorsal loin, and caudal peduncle in Chinook (Oncorynchus tshawytscha) and Coho (O. kisutch) salmon collected from Lake Ontario in the summer and fall of 1982. Concentrations in skin (0.61 mg/kg mirex and 0.44 mg/kg photomirex) and red muscle (0.45 mg/kg mirex and 0.37 mg/kg photomirex) were observed to be the highest from the six tissue sections analyzed. Concentrations in whole fillets (0.16 mg/kg mirex and 0.15 mg/kg photomirex), belly flap (0.23 mg/kg mirex and 0.17 mg/kg photomirex), anterior dorsal loin (0.14 mg/kg mirex and 0.11 mg/kg photomirex) and caudal peduncle (0.10 mg/kg mirex and 0.12 mg/kg photomirex) were all at or above the 0.1 mg/kg action level set by New York government officials. The mean ratio of mirex to photomirex in all tissue sections except the caudal peduncle was found to be 1.28:1. In the caudal peduncle the concentration of mirex was found to be less than photomirex with a mirex of photomirex ratio of 0.87:1.

NEW CONCEPTS CONCERNING THE MYCORRHIZAL ASSOCIATION OF MONOTROPA UNIFLORA. Michael J. Kernan and A. F. Finocchio, Department of Biology, St. Bonaventure University, St. Bonaventure, New York 14778.

A particular discomycete of the genus Pezizella found fruiting on the roots of Monotropa uniflora was investigated. Superficially, the apothecium appears to develop directly from the mycorrhizal mantle. Cultures made from the ascospores were able to utilize cellulose as a sole carbon source. The hypothesis that Monotropa uniflora may be able to acquire glucose obtained from the saprophytic activities of its mycorrhizal fungus was re-established. The significance of recent literature reports suggesting that inter-plant nutrient transfer via mycorrhizae is not uncommon was discussed.

Attempts to culture Monotropa uniflora tissue for use in mycorrhizal fungus inoculation experiments were unsuccessful. Chemical tests on Monotropa uniflora extract indicated that the Monotropa tissue rapidly undergoes oxidation. The oxidation of the extract was successfully prevented by the addition of reducing agents.

HISTOLOGICAL STUDIES OF THE TESTIS OF THE AMERICAN
COCKROACH, PERIPLANETA AMERICANA: THE NORMAL TESTIS
AND THE EFFECTS OF CHEMOSTERILANTS. H. Khachaturian
and P.M. Fox*, University of Michigan and SUNY-
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The testis in the cockroach possesses a structure uncommon among insect testes. Testicular lobules are scattered around a central duct and may or may not come into direct contact with it. The number of spermatogenic zones within each lobule is not constant. Unlike those in the mammalian testis, the germ cells do not exist in the form of a syncytium throughout their development and there are no equivalents of Sertoli cells. Contrary to previous belief, the testes in the adult cockroach are not atrophic. Mitotic figures are more commonly observed in the nymphal stages, while the testes of adult cockroaches have a greater abundance of mature spermatozoa. Following injections with toxic levels of chemosterilants metepa, thiotepa, and tretamine (in order of increasing toxicity), the testes from treated cockroaches showed evidence of pathological changes. Spermatogonia were the primary cellular elements showing histological signs of damage in the form of nuclear pyknosis into densely staining bodies. In the case of tretamine treatment, the entire spermatogonial cyst became atrophic while the appearance of all other cellular elements remained within normal limits. No damage to any cellular element of the testis, either germinal or non-germinal, was observed after alphachlorohydrin injections. The cystic lesions of duct structures as observed in some mammalian testes after exposure to alpha-chlorohydrin, were not apparent in the cockroach testes after this treatment.

ORIGIN OF THE DUNTOM PEGMATITE, NEWRY, MAINE.

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The crystallization history of the main pegmatite at Newry, Maine has been shown to have been the result of a single injection of magma (King, 1981). The differentiation of that magma resulted in not only a dramatic rise in rare elements in the residual fluid, but also in an extraordinary rise in water concentration. The concomitant rise in "stream" pressure triggered the failure in the enclosing rocks and the loss of water pressure in the system, resulting in the formulation of aplite. This process occurred several times. Each loss of water was accompanied by a depletion of rare elements whose silicate water partition coefficients satisfactorily altered the rare alkali to common alkali ratios. The outward transport of material suggested by reversals in alkali ratio trends supports the thesis that the en echelon pegmatites at Newry could be related, not to the alternate source (Mooselookmegumtic pluton), but from each other.

Several reasons are suggestive that the Duntom pegmatite is derived from the large main pegmatite.

1. Eruptive loss of water in the main pegmatite.
2. En echelon pegmatites present.
3. Vertical feeding vent in the Duntom pegmatite footwall.
4. Unusual elements and minerals in the Duntom pegmatite.

FIELD EXPERIENCES WITH THE EASTERN MASSASAUGA RATTLESNAKE (*SISTRURUS CATENATUS CATENATUS*). Kent Lechner, Community College of the Finger Lakes, Canandaigua, New York 14424.

The Eastern Massasauga Rattlesnake was proposed for endangered species status in late 1981 as a result of studies conducted by the Endangered Species Unit of the N.Y.S. Department of Environmental Conservation. These studies were conducted in Cicero Swamp northeast of Syracuse and indicated a rapidly disappearing population.

Field trips to study the rattlesnake in a western New York habitat were begun in April 1982. Over the next six months, about 50 animals were sighted, 20 captured and 6 marked. Data from these individuals included weight, length, sex, number of rattles, cloacal temperature, location of capture, air temperature and substrate temperature. Most snakes were also photographed.

A large percentage of this species was found basking on sphagnum moss thereby mandating the use of Pillstrom tongs to effect capture. Stress to the snakes was minimized by placing them on a bed of polyester foam in a special handling box. They were then covered by a sheet of clear plexiglass for the handler's protection. The time from capture, through data collection, to release was minimal and emphasizes non-stress for the animal.

The six marked snakes were labeled by inserting a numbered metal tag through the dermis just anterior of the basal rattle. Three of each sex were tagged and will be used to study movements, recapture, mating and overwintering.

Study of this new habitat will be combined with data from Cicero and form the basis for a Management Proposal by the Endangered Species Unit. Final status is still pending at this time but is expected to become effective in early 1983.

THE OCCURRENCE OF BENTHIC BLUE-GREEN ALGAE IN ACID ADIRONDACK LAKES. Maureen A. Leupold, SUNY at Brockport, Department of Biological Sciences, Brockport, New York 14420.

Seven acid lakes were sampled in the south west portion of the Adirondack Mountain region of New York State during the summer of 1982. pH values ranged from 3.45 to 6.15. Alkalinity values were determined by Gran analyses and ranged from -138 to 108 ueq/liter for surface waters. Wolf Lake, pH 3.50, Big Moose Lake, pH 4.10, and Limekiln Lake, pH 5.20, support abundant mats of benthic algae in the littoral area. The blue-green alga Schizothrix calcicola (Agardh.) Gomont (Drouet taxonomic system) forms the matrix of the algae mats in Limekiln Lake and Big Moose Lake. Schizothrix Friesii (Agardh.) Gomont (Drouet taxonomic system) forms the matrix of the mat in Wolf Lake. Blue-green algae were found to occur in all the sampled lakes, either in natural preserved samples or after culturing for 3 weeks under laboratory conditions.

Acid precipitation can cause many biological and chemical changes in aquatic ecosystems in sensitive areas such as the Adirondack region. The development of dense algae mats is an unusual feature occurring in culturally acidified lakes. It is possible that the gradual titration of lakes and the altered chemistry of surface water inputs to these lakes has created a new niche for blue-green algae.

REDUCTION OF MIREX IN BROWN TROUT BY SMOKING.

Theodore W. Lewis, Joseph C. Makarewicz, Dept. of Biological Sciences, SUNY at Brockport, Brockport, NY 14420.

A new fish smoking technique proposed by Scheg, and the traditional fish smoking method were compared with respect to reduction of Mirex loads in Lake Ontario Brown trout (*Salmo trutta*). The two methods differ in two respects - time and temperature. The Scheg method is a low temperature smoking technique with a long duration. The traditional method is a high temperature smoking technique with a short duration.

Weight loss of the fish during smoking was significantly different between the two smoking methods (49.84% for the Scheg method, 35.7% for the traditional method). Mirex concentrations were found to be 0.07 mg/kg in the raw tissue, 0.06 mg/kg for the Scheg smoked tissue, and 0.08 mg/kg in the traditionally smoked tissue. In Scheg smoked Brown trout there was a 46.48% reduction in the Mirex load, while in the traditional smoked fish Mirex loading was reduced by 31.52%.

COMPARATIVE MORPHOLOGY OF ROCK GLACIERS. Ray Lougeay, Department of Geography, State University College, Geneseo, New York 14454

Rock Glaciers comprise a collection of poorly defined detritus and ice flow features. The rugged topography of alpine cirque locations has dictated that most research activities concentrate on the origin and characteristics of a single rock glacier, or at best, a few adjacent rock glaciers. This study compares photogrammetric measurements of 47 rock glaciers in the Wrangell mountains of Alaska with another study of 613 rock glaciers in the San Juan mountains of Colorado. The intricate inter-relationships of regional geologic and climatic variables, plus micro scale variations in weathering rates and temperature regimes of the surface and subsurface, tend to produce significant variations in rock glacier phenomena. While conclusions are not definitive, the results do display the need for further study and comparison of rock glaciers from various alpine regions of the world.

GROWTH RESPONSE OF ANACYSTIS NIDULANS TO SODIUM, PHOSPHATE AND POTASSIUM AVAILABILITY. J. C. Makarewicz, D. A. McKellar. Department of Biological Sciences, SUNY Brockport, Brockport, New York 14420.

The growth responses of Anacystis nidulans to sodium, potassium and phosphate were studied in batch culture under controlled laboratory conditions. Sodium (within the range of 0 - 10 mg/l) significantly enhanced growth most notably after starvation for sodium and phosphate. The magnitude of the increase in growth was dependent on the initial cell density, external concentrations of phosphate, sodium and potassium, and the nutritional status of the algal inoculum. Potassium was found to be required for optimization of this sodium effect.

AN ANTHROPOMETRIC AND PHYSIOLOGICAL DESCRIPTION OF THE N.C.A.A. DIVISION III NATIONAL CHAMPIONSHIP WRESTLING TEAM. Peter J. Maud, Donald Murray, S.U.N.Y. College at Brockport.

The S.U.N.Y. College at Brockport wrestling team has been very successful during the past six years and has won the N.C.A.A. Division III title three times and been runner-up twice. The purpose of this study was to document the anthropometric and physiological parameters that described last years national championship team and to compare them to other elite wrestlers.

The group studies consisted of the number one performer for each of the ten weight divisions. Testing was conducted shortly after the completion of the regular competitive season but while the wrestlers were still in training. Anthropometric data collected included age, height, weight, body fat percent as determined by the skinfold method, and lean body weight. The Margaria test was used to determine anaerobic power, the Katch test for anaerobic capacity, and the Bruce treadmill protocol for aerobic capacity as defined by VO_2 max. Other tests administered included vertical jump height, and left and right hand grip strength.

Test results were: age (yr) 21.0 ± 0.4 ; height (cm) 175.0 ± 10.4 ; weight (kg) 76.7 ± 13.9 ; body fat (%) 7.1 ± 3.6 ; lean body weight (kg) 70.8 ± 10.5 ; left hand grip strength (kg) 53.9 ± 13.5 ; right hand grip strength (kg) 58.7 ± 12.6 ; Margaria anaerobic power test (kgm/sec) 177.8 ± 24.1 ; vertical jump height (cm) 57.1 ± 7.3 ; Katch anaerobic capacity test (kgm/min.kg) 41.2 ± 6.6 ; $\dot{V}O_2$ max (l/min) 4.126 ± 0.59 ; $\dot{V}O_2$ max (ml/min.kg) 51.2 ± 2.6 ; VE max BTPS (l/min) 145.4 ± 32.7 ; HR max (beats/min) 192.0 ± 7.6 ; R 1.26 ± 0.07 .

Compared to the Brockport team the qualifiers for the 1980 Olympic team (Silva et al. Research Quarterly for Exercise and Sport. In Press) has higher aerobic capacities (55.7 ml/min.kg) but slightly higher levels of body fat (8.4%). The qualifiers for the 1972 U.S. Olympic team (Nagle et al. Physician and Sports Medicine. 3(12): 31, 1975) has slightly higher body fat levels (8.3%) but much greater aerobic capacities (60.9 ml/min.kg) and superior right hand grip strength (50.5 kg). Those wrestlers who qualified for the 1979 Junior World team (Silva et al. Research Quarterly for Exercise and Sport. 52:348, 1981) had similar body fat levels (7.3%) but lower right hand (48.9 kg) and left hand (44.4 kg) grip strength. Wrestlers in training at the Canadian Olympic Training Center (Song et al. Canadian Journal of Applied Sport Sciences, 5:1, 1980) had higher levels of body fat (11.8%) and marginally lower aerobic capacities (50.7%). It can be concluded that the Brockport wrestlers compare favorably with elite wrestlers of North American representative level ability.

EFFECT OF DUMMY TELEMETRY ATTACHMENTS ON SWIMMING PERFORMANCE AND BEHAVIOR OF RAINBOW TROUT.

Ernest John Mellas, SUNY College at Brockport, Department of Biological Sciences, Brockport, New York 14420

During the spring of 1981 experiments were conducted to determine the effect of three telemetry attachment methods on the swimming performance and behavior of rainbow trout (Salmo gairdneri). Fish received one of four treatments: control, external dorsal harness, coelomic surgical implantation or stomach insertion. Dominance hierarchies were compared before and after tagging. Swimming performance was evaluated in a circular rotating fish stamina chamber.

Only one fish changed rank in the dominance hierarchy after tag attachment. Subordinate fish had a significantly lower ($P < 0.001$) mean weight than dominant and sub-dominant fish. However, there were no significant differences in swimming stamina among dominance ranks ($P > 0.25$). Among treatment groups, externally tagged fish showed significantly less ($P < 0.001$) swimming stamina.

Transmitter attachment does not appear to affect the behavior of rainbow trout. However, externally attached transmitters may reduce swimming performance of fish under certain environmental conditions.

FATIGUE AND COLOR CHANGE IN CRABS: EVIDENCE FOR A BLOOD-BORNE FACTOR. Mooney, S.M. and C.F. Herreid, II, State University of York at Buffalo.

Crustacean color changes have been found with varying ecological and physiological significance. Investigations into the biochemical nature of chromatophore activity have revealed that the color changes are primarily affected by hormonal factors. Much evidence indicates that the mechanism involves antagonistic hormones, one stimulating the dispersion of a given pigment while the other affects pigment concentration. It appears that each pigment color is controlled by a separate pair of such antagonistic hormones.

In the present investigation, several crab species were observed to blanche with fatigue, and this response in the fiddler crab, *Uca pugilator*, was examined in detail. Individuals were run on a miniature treadmill at velocities of .25 and .35 km/hr. The chromatophores were staged according to the standard Hogben-Slome scale (1-5). The black pigment concentrated in response to fatigue while the white pigment dispersed.

Hemolymph from exercised *Uca* was injected into isolated leg preparations to test for the presence of a blood-borne factor. The results support the whole animal data, with white chromatophores expanding an average of 0.93 Hogben-Slome units while red expanded 0.31 units and black contracted -0.71 units. Control hemolymph samples from unexercised crabs produced no chromatophore changes. These experiments indicate that exercising crabs produce a blood-borne factor which causes a color change similar to that caused by chromatophorotropic hormones.

Similar experiments, conducted upon isolated *Sesarma cinerium* legs yielded analogous results, indicating that the factors present are cross-generic. Supported by NSF Grant PCM 79-02890.

A STUDY PLOT COMPARISON OF RYE GROWN ORGANICALLY.

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The purpose of this study was to compare quantity and quality of Rye grown with different fertilizers. Other plant characteristics such as root structure and grain head were also compared.

The study was conducted on the Funcher Campus of S.U.N.Y., Brockport, New York.

Four experimental plots were delineated next to one another. Each plot measured 15 feet by 15 feet. All plots were prepared in a similar manner with the exception of the types and combinations of organic fertilizers used. All plots were planted with the same amount of seed on November 11, 1981. One plot was left unfertilized as a control. The other three plots were fertilized with, Fertrell Blue Special K plus P3K, Fertrell Blue Special K only and P3K only respectively.

Fertrell Blue Special K is a commercially available dry organic fertilizer blended by the Natural Development Company of Pennsylvania, and P3K is a liquid microbial enzymatic fertilizer produced by V.J. Petrik Laboratories of California.

The hypothesis was that a fertilizer with composted animal waste, minerals etc. used in conjunction with a microbial fertilizer would promote better growth and production in the Rye grain than a microbial or dry fertilizer alone, or no fertilization at all.

Fertilized plots had better germination, root systems and production than the control. The combined fertilizers produced best results.

THE SNOWFALL HISTORY OF ROCHESTER, NEW YORK.

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This paper examines the snowfall record reported by the Rochester office of the National Weather Service from the period 1872 to 1979. Included is a brief descriptive history of winter snowfall records prior to 1872. Official snowfall records were analyzed by standard statistical methods including running averages method (smoothing) and correlation coefficients. The categories of observational data include: total seasonal snowfall, total annual snowfall, monthly snowfall totals, number of days per year with one-tenth inch of snowfall, greatest amount of snowfall in a twenty-four hour period, greatest monthly snow-depth, number of days per year with temperatures of 0 °F or below. Combined, these analyses present a statistical composite of Rochester winter snowfall, while allowing the meteorologist to speculate about future winter snowfall in this region.

SEASONAL MOVEMENTS AND DISTRIBUTION OF LAKE ONTARIO BROWN TROUT. David C. Nettles and James M. Haynes, Dept. of Biological Sciences, SUNY Brockport, NY 14420.

Radio telemetry and vertical gill netting were used to evaluate spring inshore movements and summer vertical distribution of Lake Ontario brown trout. During the spring of 1981 twenty-two brown trout were captured in or near Sandy Creek, Monroe County, N.Y., radiotagged, released, and tracked from Oak Orchard Harbor to Port Bay (119 km). Most fish exhibited alternating east/west movement (68%), stopping periodically to investigate embayments, streams, and power station outflows. Distances moved by individual fish ranged from 16 to 181.6 km (72.6 ± 38.44 km) with periods of contact ranging from 6 to 80 days. Active fish remained inshore as late as July 3, 1981.

During the summer of 1981 vertical gill nets were set at depths ranging from 17 to 48 m within 5 km of shore. All brown trout were captured at depths less than 32 m. Brown trout occupied waters with temperatures ranging from 5-22°C (mean 12.7 ± 4.6 °C), but exhibited no strong temperature preferences within that range. Brown trout showed little association with the lake bottom (8%), but exhibited strong association with regions in (49%) and near (29%) the thermocline.

GRAVITATIONAL RADIATION. Thomas W. Noonan. Physics Dept., Brockport State College, N.Y. 14420.

The problem of emission and detection of gravitational waves is reviewed. Possible astronomical sources include binary stars and vibrating stars. Detection methods include the Weber bar, Doppler tracking, and laser ranging. The only evidence for gravitational waves thus far is the binary pulsar PSR 1913+16, which exhibits a decrease in orbital period consistent with the expected loss in angular momentum in the form of gravitational waves.

ROMANTIC FICTION AND FORMULA SETTINGS: A TROUPE OF HARLEQUINS.

Darrell Norris, Karen Pass, and Margaret Follman, Department of Geography, S.U.C. Geneseo.

Harlequin Romances are inexpensive short novels aimed at a mass market. They exhibit minimal variation of plot and characterization. As a medium of popular culture, the distinctiveness of the Harlequin Romance rests principally on its evocation of place and setting. Our paper explores the evolution of the Harlequin formula since the late 1950's. Content analyses of milieu, jacket designs, and titles reveal the increasing importance of environment and exotic setting as romantic stereotypes biased toward very narrow segments of the 'real' world. These biases can be attributed to the background of Harlequin authors, the required scenarios for romance, and the spatial preferences of the readership. Harlequin Romances are an outstanding example of the underlying role of landscape in popular fiction.

SPRING MOVEMENTS OF STEELHEAD/RAINBOW TROUT IN LAKE ONTARIO AND A TRIBUTARY. Kevin M. Parnell and James M. Haynes, Dept. of Biological Sciences, SUNY Brockport, NY 14420.

From April through June 1981-82, movements of radio-tagged steelhead/rainbow trout were monitored in Lake Ontario and a tributary during and after the spawning season. In 1982, nine fish were tracked ascending Sandy Creek (Monroe Co., NY), one as far as 25 km upstream. Five, two of which had spawned between release and recovery, were caught by anglers, indicating normal feeding and reproductive behavior. The remaining fish entered Lake Ontario and were tracked as far east as Oswego, NY, and as far west as the Niagara River. Two steelhead/rainbow were subsequently caught by anglers in Canadian waters.

In 1981 steelhead/rainbow dispersed to open Lake Ontario as water temperature rose to 10°C in mid-May. After a hard winter and cool spring, the same dispersal phenomenon and temperature relationship was observed in mid-June in 1982, indicating 10°C is an important transition temperature for steelhead/rainbow in Lake Ontario. Fish movement offshore was strongly associated with the migration of the thermal bar, a sharp horizontal temperature gradient observed at the lake surface in spring and early summer in Lake Ontario.

Equal numbers of steelhead/rainbow were tagged with externally mounted and surgically implanted transmitters to compare methods. Surgically tagged fish showed substantially higher mortality within 24 hours and 14 days after tagging, but mortality was equivalent in both groups beyond 14 days after release. Higher mortality among surgically tagged fish resulted from the additional handling and tagging stresses associated with surgical procedures.

ETIOLOGY OF RESIDUAL MUSCLE PAIN, by A. Peppard, Physical Education Department, State University College, Brockport, New York 14420.

Two types of muscle pain have been described: Type I (immediate pain that is produced during muscle activity and Type II (residual pain that is evident 12-24 hours after exercise). The etiological factors involved within Type I pain has generally been determined to be the increased metabolites which result during muscle activity. The etiological factors involved within Type II pain are controversial. Hough has proposed that exercise produces minute tissue destruction. While Karpovich has suggested increased edema and DeVries has suggested an 'inverse myotactic' reflex as causative factors within residual muscle pain. DeVries hypothesis has been extended to include 'Pain Phenomenon' within the Myotonic Theory of muscle pain.

The various hypothesis for Type II muscle pain have produced a number of therapeutic techniques to reduce pain. A treatment program of first aid, rest, and thermotherapy would be utilized within Hough and Karpovich's hypotheses. While ice, stretching and electrical stimulation would be utilized within DeVries and the Myotonic hypotheses. The clinical effectiveness of ice, stretching, and electrical stimulation within the treatment of muscke injuries would suggest that the etiology of residual muscle pain is spasm and pain.

REACTIONS OF FLUORANTHENE.

I.H. Petersen

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Fluoranthene is a ubiquitous polynuclear aromatic hydrocarbon (PAH) which, unlike many other compounds of this chemical class, has not been observed to be carcinogenic itself or in the form of its chemical derivatives. Although first isolated in the early 1800's, its molecular structure was not definitely established until 1929, and its chemical reactions did not begin receiving significant attention until about forty years later.

As a means of introducing substituents and functional groups into specific locations on the fluoranthene molecule, we have investigated three well-known aromatic chemistry reactions, namely thermally-induced rearrangements of arylsulfonic acids and allyl ethers and aluminum chloride-catalyzed (Friedel-Craft) acylation reactions.

We have been successful in achieving a sulfonic acid rearrangement under simpler conditions than reported by others. Evidence has been obtained for a successful rearrangement of an allyl fluoranthenyl ether, although both the ethers and the fluoranthenols from which they are prepared are subject to oxidation and decomposition, and yields have not been high. Results of Friedel-Craft acylation reactions have been inconclusive.

There will be a discussion of methodology and results of the experimental program.

ZURICH BOG: A QUESTION OF SUCCESSION.

C. Proga, Department of Biology, Hobart and William Smith Colleges, Geneva, NY, 14456.

Ecological succession of plant communities has been classically modeled as a series of concentric rings of distinct communities indicating temporal change. In this study, a shrub zone at Zurich Bog in Zurich, New York, was examined for spatial patterns. Linear transects were used for sampling, and Bray-Curtis ordination was employed to determine the relationships among the species composition of different areas. A crude concentric ring pattern, like that typically described, was found. Associations between species were determined and considered along with species location and habitat. These suggested possible mechanisms for successional change that would result in such a pattern.

SOME FACTORS THAT INFLUENCE THE BREEDING BIOLOGY OF THE MALE EASTERN WILD TURKEY. Emilio E. Rende, Department of Biology, St. Bonaventure University, St. Bonaventure, New York, 14778.

Testes were collected from adult and subadult male eastern wild turkeys (Meleagris gallopavo silvestris) that were killed during the New York State spring 1982 hunting season. These specimens came from check stations in Chautauqua, Cattaraugus, and Allegany counties. Three adult males and one subadult male were harvested prior to the spring season. Subadults were separated from adults on the basis of weight, beard and spur length, and retention of the ninth and tenth juvenile primaries. The left testis was larger than the right testis in both adult and subadult males. Testes weights for adults and subadults began to increase steadily from February to May. The average testes weight of the adults was greater than that of the subadults. The subadult testes samples collected during the hunting season showed a slight average decrease in weight as the season progressed. This decrease coincided with the beginning of the molt. The adult samples, though more variable, showed a slight increase in testes weight from the beginning to the middle of the season and a slight decrease in weight at the end of the season. The primary molt in juveniles preceded the primary molt in adults.

Behavioral data questionnaires and blood samples were also collected at the check stations, but the results are not available at this time.

PRELIMINARY FINDINGS OF ROCHESTER GAS AND ELECTRIC'S COLD-SHOCK STUDIES ON SELECTED FISHES OF LAKE ONTARIO. Paul M. Sawyko, RG&E, 89 East Ave, Rochester, NY, 14649

A widely cited concern regarding the discharge of heated water into a water body from an operating electric generating power station is the potential for "cold-shock" to fish during power station shutdown. Cold-shock may occur if fish become dependent upon the thermal plume in order to maintain a certain body temperature, and in the event of plant shutdown are subsequently subjected to thermal stress and possible mortality. In 1979 RG&E initiated investigation into the potential for cold-shock to fish at its Lake Ontario power plants for such species as brown trout (Salmo trutta) and rainbow trout (Salmo gairdneri). Test organisms were collected from the discharge canal at RG&E's Ginna Nuclear Power Station which had discharge water temperatures of 11.5-15.0°C at the time. Internal temperatures of such fish were found to be very near discharge temperatures. These fish were then immediately placed in test waters ranging from 0.4-4.8°C and held for normally 96 hours. Differences between discharge and test temperatures ranged between 10.2 and 11.7°C. Basic results showed that of the 41 brown trout tested, there was an overall survival rate of 97.6%. Overall rainbow trout survival was 87.5% of the 32 tested. While not entirely quantitative in nature (due to ranges in discharge and test temperatures) results did indicate some substantial differences from information previously reported in the literature, thereby suggesting further study. In 1980 and 1981 much more control was possible in the test conditions. Such control allowed the discharge temperatures to remain within a range of 11.5-12.5°C and the test waters to be within 0.4-0.6°C. Under these conditions 96 brown trout tested still showed survival rates of 97%, while 51 rainbow trout tested had a 74% survival rate. In this case results were definitely different than previously reported in the literature. Study results suggest that while these fish remain within the thermal discharge for a period of time sufficient to raise their body temperatures to discharge temperature, such fish are not physiologically adapted, i.e. acclimated, to such temperatures, but are instead acclimated to some temperature intermediate between lake ambient and discharge canal temperatures.

EFFECT OF FLOWER COLOR AND NECTAR VOLUME ON HONEY BEE FORAGING BEHAVIOR. A.Schreffler and E.E.Southwick, BioEnvironmental and Energetics Laboratory, State University of New York, College at Brockport, Brockport, New York 14420

In the summer of 1982, experimentation with the honey bee, *Apis mellifera*, was performed, using two artificial flower patches. These consist of 2'x2' plexiglas sheets, with wells drilled into them to hold sugarwater. Wells are designated as "flowers" by placing colored one-inch-square cardboard squares under them. One patch bears only blue flowers and the other bears an equal number of yellow flowers. On one patch, all flowers are loaded with 8.3ul of 50% sugarwater. This is the "constant" patch. On the other patch, a third of the flowers are loaded with 25ul of 50% sugarwater. This is the "variable" patch. The patches are exposed to foraging honey bees, trained to a specific location. By counting the numbers of bees present at one-minute intervals during ten- or fifteen- minute exposure periods, we hope to determine a statistical preference of the bees for constant or variable. Preliminary results indicate a preference for constant over variable as well as a preference for blue flowers over yellow.

SOME NEW ANIONS FOR LEUCO-DYES. Surjit Singh and Joseph A. Langan, State University of New York, College at Buffalo, 1300 Elmwood Avenue, Buffalo, NY 14222

Colored solutions of many triarylmethane dyes are decolorized when treated with various anions, especially cyanide, hydroxide, or bisulfite. Leuconitriles and leucohydroxides display photochromic behavior, however their commercial applications are limited because of the toxicity and slow reversibility. This paper describes the modification of the current bleaching procedure, which permits us to introduce new anions which improve the photochromic behavior of the dye and are less toxic. The anions successfully introduced were: fumerate, squarate, silicate and pentagonate. Partial success was met with maleate and terephthalate ions. (Rights for proprietary use are reserved by U.S. Air Force).

METABOLIC RESPONSES OF THE FEMALE DISTANCE RUNNER. Lisa M. Slimmer, S.U.C. at Brockport.

The introduction of females as competitors in the Olympic Marathon will occur in 1984. Much debate has preceded this event because of the supposed inability of the female to meet the physiological demands of the race.

It has been shown through empirical evidence that women can successfully compete in endurance performances of marathon and ultramarathon length without suffering any pathological symptoms.

Specific physiological responses of the female are examined in relation to the marathon run. Comparison of both sexes reveals greater energy storage capacity by females in the form of fat. Since fat, in addition to carbohydrate metabolism play such an important role in energy production in endurance performance, female capacity might exceed that of males as length of race distance increases. Fat and carbohydrate metabolism are discussed along with how the female's body reacts and adjusts to glycogen depletion. Thermoregulation, selected aspects of the oxygen transport system and other interrelated processes are discussed, revealing a very capable marathon runner with much untapped potential.

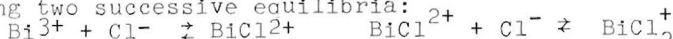
SENSITIVITY OF ISOLATED ATRIA FROM TRAINED RATS TO NEUROTRANSMITTERS AND ATROPINE. D.C. Smith. Dept. of Biological Sciences, State University College, Brockport, NY.

Endurance trained athletes typically have a lower resting heart rate than do sedentary individuals. The mechanism of this bradycardia is not fully understood. In these experiments, trained hearts were produced by exercising rats twice daily in a motorized running wheel over a period of 7 to 9 weeks. At the end of that period the atria were removed to an organ bath and the rate of spontaneous contractions was recorded. This rate was significantly lower in atria from exercised rats than atria from sedentary controls. The chronotropic response of the atria to acetylcholine, catecholamines, and atropine in concentrations of 10^{-5} , 10^{-6} and 10^{-7} M was tested. There was no difference in response to catecholamines, but exercised rat atria were significantly more sensitive to acetylcholine. Atropine produced no rate change in controls, but caused significant acceleration in exercised atria. It appears that the bradycardia is due to increased atrial stores of acetylcholine, as well as increased acetylcholine sensitivity.

ASSESSING THE RELIABILITY OF "BEST FIT" CALCULATIONS. Armin Sommer and James D. McNamara, SUNY College at Brockport, Brockport, New York

Numerical data involving two variables frequently is converted into a form that can be represented by a linear plot. The slope and intercept, representing the two unknown constants in the linear relationship normally can be calculated by the standard statistical method, which also specifies their precision.

There exists, however, many problems of such complexity that the relationship between the two variables involve more than two unknown constants or parameters. This is the type of problem that is encountered in the determination of equilibrium constants by the spectrophotometric method where the spectral constants (molar absorptivities) are not known, such as in the following example involving two successive equilibria:



The two equilibrium constants, K_1 and K_2 , can be determined, in theory at least, by measuring the absorbance (A) of the solutions at varying chloride concentrations (Cl^-) and varying wavelengths. The following equation shows the complex linear relationship where

a_0 , a_1 , and a_2 are the unknown spectral constants:

$$A = K_1 [K_2 (a_2 - A) (\text{Cl}^-) + (a_1 - A)] (\text{Cl}^-) + a_0$$

There exists a number of different computer programs to determine the best fit values for these five

constants as well as the spectral constants for other wavelengths. Essentially the programs instruct the computer to adjust the values of the five constants until the sum of the squares of the differences between the calculated and experimental values of the absorbances (A) is at a minimum.

In our work we have used simulated experimental data with specific random errors to determine the accuracy of computerized best fit calculations. We have also checked on the accuracy of one published set of best fit results by determining the constants by an independent experimental method. Our results indicate that, because of the small but significant random errors in most experimental data, the constants calculated by a best fit program may fit the data extremely well but still contain major errors. Consequently, we are interested in finding statistical methods of measuring the probable accuracy of best fit results.

SUCCESSION IN A NORTHERN BOG. A.K. Southwick, University of Michigan Biological Station, Pellston.

Bryant's Bog, a small northern Michigan wetland area, experienced high tree mortality in the early 1970's, and subsequent regression to an earlier successional stage, apparently due to high water levels. The objectives of the present study were to determine the current status of the community structure, and to seek out the causes of any change encountered. Vegetational changes in the free and grounded mat zones during a five year period (1977-1982) were found to be greatest in populations of Chamaedaphne calyculata and Sphagnum species. No significant changes occurred in the high bog-shrub association. Rate of tree mortality in the two bog zones differed during the last decade, being greatest on the grounded mat. Physical and chemical parameters, primarily light level, high nutrient values, and decreased water levels were apparent as major factors causing changes in vegetation and floristics on the grounded and free mats.

PHENOLOGICAL AND NECTAR CHARACTERISTICS OF FLOWERING PLANTS IN UPSTATE NEW YORK. E.E. Southwick and A.K. Southwick. BioEnvironmental and Energetics Laboratory, Department of Biological Sciences, State University of New York College at Brockport, NY 14420.

Sequence of blooming of nectar and pollen yielding spring plants in western New York is reported. Seasonal progression and importance to honey bees (Apis mellifera) as nectar or pollen plants is discussed. The schedule of nectar production in most species followed a near normal frequency distribution, with exceptions showing left or right skewed frequency distributions. Nectar samples from eight plant families were analyzed for standing crop, sugar concentration and total sugar. Overall average standing crop per blossom was 0.7 ul at 41% (g sugar/100 g solution) concentration containing 0.33 mg sugar providing 1.3 cal of energy.

AN OBSERVATION OF A PELORIC FLOWER ON SHOWY LADY'S-SLIPPER, CYPRIPEDIUM REGINAE, IN WESTERN NEW YORK STATE. R.E. Stauffer, Rochester Academy of Science, Rochester, NY.

In the summer of 1953, a plant of Showy Lady's-slipper, Cypripedium reginae Walt., was found by the author in a tamarack, alder, poison sumac swamp in Wayne County, NY. This plant bore two flowers on a single stem. One of these flowers was normal with slipper-lip, resupinate petal and fused column, whereas the second was a peloric, almost completely regular and symmetrical flower in which the petals were all crystalline-white like the sepals. The lip or slipper had reverted to a simple petaline form, and the two lateral sepals had become completely de-fused. The column had also become nearly fully de-fused and presented a tri-merous appearance. The peloric flower was apparently untwisted, so that it had reverted to within 30° of the non-resupinate position. Such peloria is considered to represent a reversion toward an ancestral form of the species.

Two previous instances of peloria in this species have been mentioned by Correll in his monograph of the Native Orchids of North America North of Mexico, 1950. The specimen described in this paper seems to correspond most closely to a flower reported by Bastin in 1881 from a site near Lake Michigan. In 1941, Curtis reported finding a perfectly regular peloric flower of Cypripedium reginae in a tamarack bog in northern Michigan.

An attempt to follow the behavior of the Wayne County, NY plant in ensuing seasons was defeated by timbering activities at the site and destruction of the plant and habitat.

Observations by the author, over a period of 40 years, of hundreds of specimens of Cypripedium reginae at sites from Newfoundland to Wisconsin has failed to turn up another peloric specimen. On the other hand, Correll states that peloria is fairly common among plants of another North American orchid, Nodding Ladies' Tresses, Spiranthes cernua (L.) L. C. Rich., in the southwestern portion of its range in the states of Missouri, Arkansas, Louisiana, Oklahoma, and Texas.

MITOCHONDRIAL RIBONUCLEASE P. Susan Thieme, Elizabeth Kelly and Larry Kline. Department of Biological Sciences, State University College at Brockport, Brockport, NY 14420.

Ribonuclease P is an endoribonuclease which cleaves tRNA precursors to produce tRNA molecules having mature 5' ends. The enzyme has been detected in prokaryotic and eukaryotic cell extracts, but not in eukaryotic cell organelles. Preliminary studies have indicated that rat liver mitochondria may contain a Ribonuclease P activity. Synthetically prepared [³²P]-labeled ApApApCp-tRNA can be used as a substrate in a simple assay measuring the Trichloroacetic acid solubility of the ApApApC product resulting from RNase P cleavage of the substrate.

DEAE-cellulose column chromatography of mitochondrial extracts result in a nuclease activity which binds to the column and is eluted at low salt, a property common to the RNASE P enzymes.

Attempts to characterize reaction products utilizing DEAE-cellulose thin-layer chromatography are in progress.

SITE SPECIFICITY AND HOME RANGE OF LARGEMOUTH BASS (*Micropterus salmoides*) IN A THERMALLY ALTERED RESERVIOR. Tuel, T.A., and J.R. Spotila. State University College at Buffalo.

Site specificity and home range of largemouth bass were determined in a reservoir receiving hot, lethal effluents from a nuclear reactor. Surface water temperatures of the reservoir were in excess of 50 degrees C. The reservoir, Pond C, is located on the Savannah River Plant, in Aiken, South Carolina. Three refuge areas contain water below the lethal temperatures for aquatic organisms by way of streams and/or underground springs.

Movement of bass and sunfish (*Lepomis spp.*) were found to be restricted due to the amount of time ambient water temperatures were available. Mean distance traveled by the bass was 255 +/- 67 meters and sunfish showed variation in distance traveled from a refuge area with an overall mean travel distance of 240 +/- 42 meters.

A Mark-Recapture experiment was used to determine if refuge selection was random or specific. A total of 257 bass were tagged and released in their specific refuge area. Color and number coded Floy tags were used to identify each fish. It was found that bass were site specific (P less than 0.01) for Sanctuary Cove. A total of ten percent tag recapture was obtained. Supported by DOE contract DE-AC02-76EVO2502.

CLOUD PATTERNS AND THE UPPER LEVEL WIND AND VORTICITY FIELD.

Derrick E. Vile, Dept. of Meteorology, SUNY at Brockport.

Concepts concerning the upper level wind and vorticity fields and associated cloud patterns were examined. Many of the concepts and terminology were developed by Roger Weldon at the National Environmental Satellite Service (NESS - NOAA).

The relationship between the vorticity field and the 500 mb height contours was observed to determine the jet stream and different types of jet segments. The two types of jet segments discussed are the "channel" jet and the "advection" type jet.

"Channel" jets are located where the vorticity isopleths are parallel to the 500 mb height contours. Where the strongest winds are occurring and they are not parallel, then this maximum wind zone is called an "advection" jet.

In all the cases studied these different types of jets occurred around a vorticity maximum or "lobe" of vorticity. How the axis of the vorticity "lobe" is situated to the 500 mb contours will help determine a "channeled" or "advection" type jet.

Cloud patterns associated with these two upper level wind fields were determined. The individual cases reported on occurred between February and April 1982.

THE STING. D.M. Voorheis and E.E. Southwick. Bio-Environmental and Energetics Laboratory, Department of Biological Sciences, State University of New York, College at Brockport, NY 14420.

The stinging organ in hymenopterans is a modified ovipositor and serves an important function in defensive behavior, especially in the social groups. Members of the female worker caste of honey bee (*Apis mellifera*) possess stings with a barbed morphology. Once a sting is embedded in the flesh of the host, the barbs cause it to stay in place and the organ including the attached poison sac is often pulled free of the insect, resulting in death of the insect by desiccation.

Our study of the external morphology of sting organs from 300 individual *A. mellifera* revealed that not all stings in this species are barbed, and those that possess barbs show striking variation. We could identify 16 distinct types of stings with respect to barb placement and sharpness. About 16.5% of the bees examined possessed stings without barbs ("barbless").

We discuss the evolutionary significance and adaptive advantage of barbless stings, and their expected frequency dependence on population size.

QUANTITATIVE WATER BUDGET ANALYSIS OF TWO FINGER LAKES EMPLOYING THE THEISSON METHOD. Lorna Waddell-Kremer, Rochester Waterworks, 10 Felix Street, Rochester, New York 14608.

Hemlock and Canadice Lakes are owned by the City of Rochester and operated by its Water Department. Theisson polygon analysis was employed to quantify the maximum probable output of the combined watershed. Supportive statistical data correlated nicely with the Theisson approach. Statistical analysis also enabled the Waterworks to forecast future probable yields with greater certainty. In addition, various qualitative elements were examined and their effects upon watershed yield were speculated upon.

PRESENT STATUS OF RESEARCH INTO THE INCREASE IN HEAVY METALS IN ACIDIFIED LAKES. J. Warner, Dept. of Biological Sciences, SUNY Brockport, Brockport, NY 14420.

Many lakes in poorly buffered, high elevation regions of eastern North America are experiencing a decrease in the pH of the water due to acid deposition. Acid conditions have been accompanied by an increase in the solubility, mobility and toxicity of dissolved heavy metals such as lead, cadmium, aluminum, nickel and mercury.

In a limnological survey of 57 Adirondack Lakes taken in 1975, 66% were acidified to a pH of less than 5.0. Mean concentration of lead in these lakes was 2.5 ug/l, and in two instances the concentration of cadmium was high enough (4.9 to 5.4 ug/l) to cause concern. Lakes near Sudbury, Ontario, which receive no direct discharge, have nickel concentrations as high as 300 ug/l, whereas an average global mean for nickel is 10 ug/l. Similar increased concentrations exist for aluminum, copper and mercury.

Although trace amounts of many of these elements are considered essential nutrients to aquatic plants and animals higher concentrations can be toxic.

Metal contamination appears to have three possible sources, direct atmospheric deposition, leaching from soils in the watershed and from lake bottom sediments. Since metals are byproducts of many industrial processes, it is believed that the increase in lake bottom sediments is due to increased atmospheric deposition. Sediment cores taken from lakes in the Northeast have shown an enrichment in the upper layers of lead, copper, cadmium and zinc. This enrichment is probably due to an increase in atmospheric deposition in the last 30 years. Researchers have concluded that rainfall in the James Bay region of Quebec can be considered a major source of mercury. High aluminum concentrations in lakes are believed to be

leached from soils in the watershed, since Al concentration in precipitation is negligible.

The exact sources of metal contamination are still debatable due to the difficulty in tracking components back to their origin.

WINTER 1983 IN ROCHESTER - WARM, COOL, WET OR DRY?
Robert S. Weinbeck, Department of the Earth Sciences,
SUNY College at Brockport, Brockport, NY 14420

Beginning in September, forecasts for the coming winter for snowfall totals and winter temperatures appear. The background for these projections will be examined in the light of past records for Rochester. As a basis for comparison, time series analysis techniques are applied to records of December, January, February and composite winter temperatures and precipitation amounts from the Rochester office of the National Weather Service. Trends and periodicities in these weather records are then compared to series of sunspot numbers, solar output and an atmospheric volcanic dust index to identify the major, recognized climatic influences theorized to affect weather conditions. The results of these comparisons will be applied as far as possible to providing a Winter 1983 forecast for Rochester, noting the limitations involved. Finally, a completely subjective overview of long-term forecasting will be offered.

FOREST ECOLOGY OF CLEVELAND HILL, ONTARIO COUNTY, NEW YORK.
Chris Will and Bruce Gilman, Community College of the Finger
Lakes, Canandaigua, New York 14424.

Located in the scenic Finger Lakes region of New York, Cleveland Hill is a massive plateau-like landform flanked on the east and west by deep glacially carved valleys. Situated across the southern part of Cleveland Hill is the Warren Cutler Boy Scout Reservation, the site of this ecological study. During the spring of 1982, fifty eight forest quadrats were permanently staked and inventoried. The species composition, tree diameters at breast height and several characteristics of the physical environment were measured. Forest tree data was summarized into the traditional importance values for each quadrat. Quadrats were then grouped along a moisture gradient thereby allowing changes in composition to be related to a set of environmental factors.

THE LIFE HISTORY OF DERMACARUS TAMIASCIURI RUPES, YUNKER, AND WILSON 1971 (ACARI: ASTIGMATA: GLYCYPHAGIDAE) FROM THE RED SQUIRREL, TAMIASCIURUS HUDSONICUS. M. L. Zettel and E. J. Spicka, Department of Biology, State University of New York, Geneseo, N.Y. 14454.

Dermacarus tiamasciuri Rupes, Yunker, and Wilson 1971 was described from the deutonymphal (hypopodial) stage which is a phoretic associate of red squirrels, Tamiasciurus hudsonicus.

In this study, adult glycyphagid mites were removed from a red squirrel nest and cultured in rearing chambers. After one day, eggs were observed -- followed by larvae (day 3), protonymphs (day 9), and deutonymphs (day 14). Once the deutonymphs were obtained, we were certain that the mites from the squirrel nest were the previously unknown stages of Dermacarus tiamasciuri.

The deutonymphs are highly modified for a pilicolous, non-feeding, phoretic association with red squirrels. However, the larvae, protonymphs, tritonymphs, males, and females are strictly nidicolous forms that probably feed on fungal growths on nest materials.

AGE RELATED CHANGES IN TESTICULAR STEROIDOGENIC FUNCTION AND METABOLIC CLEARANCE RATES OF TESTOSTERONE IN MALE RATS. Joan E. Zummo and Stephen W.C. Chan, Dept. of Biological Sciences, SUNY Brockport, NY 14420.

Comparison of steroidogenic responses to in vitro and in vivo hCG stimulation in young (4 m) and old (18 m) Sprague-Dawley rats showed an age related decline in testosterone (T) levels in peripheral serum, testicular venous blood, and a lowered T output by isolated Leydig cells and testis tissue. Similar basal lutenizing hormone (LH) levels and hCG binding in the two age groups indicated a functional lesion at the testicular level.

A second age-related difference was investigated when it was observed that the initially lower T levels in peripheral serum in old rats became similar to the T levels of young rats three hours after acute hCG stimulation. Monitoring the disappearance of endogenous T in castrated young and old rats showed a slower metabolic clearance rate (MCR) of T in the older rats. Both young and old rats exhibited a two-compartment model for calculation of MCR with the early half life ($T_{1/2}$) value showing a faster clearance rate than the second $T_{1/2}$. Age differences in early and late $T_{1/2}$ were also investigated.

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