

Abstracts of Technical Sections

NOTE: Abstracts of posters follow abstracts of podium presentations by section.

SECTION A. Zoology

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

035 Medical Sciences

Dr. Clyde Barbour, Presiding

- 9:00 AXONAL IMPULSE PROPAGATION AT GEOMETRICAL STEP-CHANGES. M.D. Goldfinger and D.F. Miller. Departments of Physiology & Biophysics and Mathematics & Statistics, College of Science & Mathematics, Wright State University, Dayton, OH 45401-0927.

The Hodgkin-Huxley and 1-dimensional cable equations were used to study impulse propagation at a step-change in axonal diameter. First-order differential equations were integrated with trapezoidal or 4th-order Runge-Kutta methods. The second-order derivative (d^2V/dx^2) was integrated with a finite-difference approximation over small Δx (3.0 μ m). The passive analytical solution for uniform-diameter fibers was well-reconstructed. For a step-increase in diameter (1 to 2 μ m), axial conduction velocity changed triphasically (increase, decrease, increase); the latter phase corresponded to conduction velocity in a uniform 2.0 μ m-diameter fiber. [For a step decrease in diameter, the converse obtained.] Axial changes in inward net membrane current paralleled changes in axial conduction velocity. Neither increased Δx values nor diameter averaging at the step altered these results. With step-increase, as the duration of the temporal integration interval was increased from 0.05 to 0.25 μ s, impulse amplitude and axial conduction velocity decreased progressively before and up to the step-change.

- 9:15 INSECT COLD TOLERANCE: INFLUENCE OF ICE NUCLEATING ACTIVE BACTERIA. Janet M. Strong-Gundersen¹; Richard E. Lee, Jr.¹ and Marcia R. Lee² Departments of Zoology¹ and Microbiology², Miami University, Oxford, Ohio 45056

Although the impact of ice nucleating active (INA) bacteria in promoting frost injury in plants is established, the effect of these bacteria on overwintering insects is little known. Ingestion of known INA bacteria, *Pseudomonas syringae* and *Erwinia herbicola*, by the freeze-intolerant lady beetle, *Hippodamia convergens*, significantly increased the temperature at which body fluids froze from -16°C to -4°C. Similarly, topical application of a suspension of INA bacteria to the adult beetles caused a marked elevation of the temperature at which beetles froze. In a separate study, two species of INA bacteria, *Enterobacter agglomerans* and *Enterobacter taylorae*, the latter with previously undescribed ice nucleating activity, were isolated from the gut of two species of field-collected beetles, *Ceratoma trifurcata* and *H. convergens*. Removal or masking of endogenous INA bacteria may be a major factor in the cold-hardening of freeze-intolerant insects. Supported by NSF grant #DCB-88113117 to REL.

- 9:30 MARINE GASTROTRICHS FROM FLORIDA. Wayne A. Evans, Department of Zoology, Ohio University, Athens, OH 45701.

Marine gastrotrichs are small (50 to 3500 μ m), strap- or teardrop-shaped acoelomate worms that live interstitially in littoral and sublittoral sandy sediments. Gastrotrichs locomote by gliding on ventrally located cilia and possess adhesive tubes by which they attach themselves to the substratum. During November, 1989, sediment samples were taken from sandy beaches at three locations in Florida; Ohio Key, Bahia Honda Key, and Vero Beach. The Bahia Honda and Vero Beach sites also included sublittoral samples. Gastrotrichs were extracted from the sediments by narcotization with 7% MgCl₂, followed by multiple

decantations with seawater. Animals were located under a dissecting microscope at 40X, then transferred to slides for viewing under differential contrast optics. Thirteen species in six families belonging to both orders of Gastrotricha (Chaetonotida and Macrodasysida) were identified. *Aspidiophorus tentaculatus*, *Chaetonotus dispar*, and *Xenotrichula carolinensis* comprised the chaetonotids; *Acanthodasys aculeatus*, *Cephalodasys cf. pacificus*, *Dolichodasys delicatus*, *Macrodasys caudatus*, *Megadasys sterreri*, *Paraturbanella dohrni*, *Tetranchyoderma bunti*, *T. papii*, *T. sp. A.* and *Turbanella ambronensis* comprised the macrodasysids. *M. sterreri* represents the first report of the genus *Megadasys* from North America.

- 9:45 DEMOGRAPHY AND HABITAT USE OF PEROMYSCUS LEUCOPUS IN THE ABSENCE OF COMPETITORS ON SOUTH BASS ISLAND, OTTAWA COUNTY, OHIO.

Gregory K. Aldrich, Dept. of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403

Peromyscus leucopus, the white-footed mouse is a common inhabitant of woodlands on the Ohio mainland and must compete with other small mammals for available resources. With the exception of squirrels, the white-footed mouse is the only naturally occurring small mammal to inhabit South Bass Island. If white-footed mice are restricted to woodland habitat because of competition from field-dwelling species such as *Microtus pennsylvanicus* and *Peromyscus maniculatus bairdii*, then white-footed mice should occupy field sites in their absence. A population of white-footed mice was trapped in five different habitats every two to three weeks over a period of 8 months (April-November 1989). The mice were ear-tagged and their reproductive status, pelage, and weight recorded. Habitat data were analyzed according to species composition and habitat structure. The number of habitat dimensions from the original habitat data were reduced using principle components analysis (PCA) and new variables were derived to describe the habitat. Three of the habitats, a cedar woods, an old orchard, and an old field had relatively high densities of mice and two habitats, a vineyard and a new field were nearly devoid of mice. The old field had a lower density and was characterized by less woody structure than the woods or the orchard. Density of mice was highly correlated with vertical habitat structure (i.e., trees and shrubs). The white-footed mouse, in the absence of competitors, appears to be restricted to habitats containing vertical structure and does not appear to be occupying habitats different from mainland populations.

- 10:00 SEASONAL SURVIVORSHIP AND ITS EFFECTS ON LONGEVITY IN A POPULATION OF WHITE-FOOTED MICE (*Peromyscus leucopus*). Schug, M.D., S.H. Vessey and A.I. Korytko. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403-0212.

Most *Peromyscus leucopus* populations in temperate zones have a bimodal breeding pattern with peaks in the spring and fall and a mid-summer decline. Seasonal differences in survivorship are common throughout the geographic range and may correspond to changes in either climate or population density. Little is known about the effects of this differential survival on longevity and reproductive success of mice born during the spring and fall. Using demographic data from a population of *P. leucopus* from Carter Woods, an isolated woodlot in northwest Ohio, we estimated mortality rates for spring- and fall-born animals during a 7 year period. To determine if there was a behavioral or phenotypic difference between long-lived mice and the rest of the population, we selected all of the mice that lived longer than 1 year and compared their home range size, weight, and number of litters with a sample from the rest of the population. Adult sex ratios were male biased during the spring and equal during the fall. There was a significantly higher mortality rate for fall-born animals than spring-born animals. The probability of living longer than one year was greater for fall-born females than spring-born females but the same for fall- and spring-born males. Home range size and weight were not affected by long or short life. Long-lived females had significantly more litters per lifetime than other females; the rate of reproduction was not affected by season of birth or long life. The observed differences in sex ratio are most likely an adaptive response to high fall mortality and the higher probability of long life for fall-born females than spring-born females.

- 10:15 A THERMAL DENATURATION STUDY OF THE GENOMIC DNAs FROM THE NORTH AMERICAN GENERA OF THE FISH FAMILY PERCIDAE. Thomas F. Turner and Matthew M. White. Dept. of Zoological and Biomedical Sciences, Ohio University, Athens, OH 45701.

The genomic DNAs of eleven species, representing the five genera of North American percids are characterized using data from thermal denaturation assays. This technique involves measuring changes in optical density of DNA as temperature is increased incrementally. Base composition is estimated as a function of melting temperature and expressed as %GC values. Among genera, %GC values range between 38.3 and 43.2%. Significant variation is observed among members of the subfamily Percinae. Absorbance profiles are generated for each species and distinct GC rich regions are identified within the genomes of *S. vitreum* and some *Etheostoma*. Compositional heterogeneity and asymmetry values are calculated from absorbance profile data. These give an indication of the distribution of

base pairs within the genome. Patterns of variation in all genomic characters differed among the genera surveyed. Members of the speciose genus *Etheostoma* showed relatively little variation, whereas the comparatively depauperate genus *Stizostedion* exhibited significant variation.

10:30 THE DIVERSITY OF AMPHIBIAN AND REPTILE SPECIES ASSOCIATED WITH THE HARTWELL MORAININE IN SOUTH-WESTERN OHIO. Jeffrey G. Davis and Paul J.

Krusling. Northwest High School, 10761 Pippin Road, Cincinnati, Ohio 45231 and The Cincinnati Museum of Natural History, 1720 Gilbert Avenue, Department of Herpetology, Cincinnati, Ohio 45202.

Thirteen amphibian species, including six salamanders and seven frogs and toads were reported from an area approximating 500 acres in north central Hamilton County and south central Butler County, Ohio. Two lizard, four turtle, and seven snake species represent the reptile diversity from the study area. Species diversity is probably related to the variety of habitats associated with the Hartwell Moraine.

New locality records for the Cave Salamander (*Eurycea lucifuga*), Cope's Gray Treefrog (*Hyla chrysoscelis*), and the Broadhead Skink (*Eumeces laticeps*) are important distribution records for these species in Ohio.

SECTION A. Zoology

Only Afternoon & Business Meeting

at 1:30 p.m.

Saturday, April 28, 1990

035 Medical Sciences

Dr. Miles Coburn, Presiding

2:00 TRANSCRIPTIONAL-TRANSLATIONAL-POSTTRANSLATIONAL REGULATION OF ECDYSONE 20-MONOXYGENASE ACTIVITY IN THE TOBACCO HORNWORM *MANDUCA SEXTA*.

Daniel P. Keogh, John R. Crooks and Stan L. Smith. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

Ecdysone 20-monoxygenase is the cytochrome P-450 dependent steroid hydroxylase responsible for the conversion of the insect molting hormone ecdysone to its more physiologically active metabolite 20-hydroxyecdysone. Using a radioassay in conjunction with classical endocrinological techniques, we examined the factors which may regulate the 50-fold increase in midgut ecdysone 20-monoxygenase activity which occurs during larval-pupal development in *Manduca sexta*. Ecdysone, 20-hydroxyecdysone, or the ecdysone agonist RH 5849 (1,2-dibenzoyl-1-*tert*-butylhydrazine) were all found to elicit the 50-fold increase in midgut ecdysone 20-monoxygenase activity when injected into competent head or thoracic ligated animals. By contrast, cholesterol and phenobarbital (an inducer of b and e forms of cytochrome P-450) were negative. The increase in midgut ecdysone 20-monoxygenase activity was found to be prevented in a dose-response fashion by prior injections of actinomycin D or puromycin. The possibility of posttranslational regulation of this insect steroid hydroxylase by cyclic nucleotides (viz., cyclic AMP and cyclic GMP), calcium ions or other intracellular messengers is currently being assessed. Supported by NIH (AI 20604), OBOR, FRC and BioMed grants.

2:15 POSSIBLE DIURNAL VARIATIONS IN KIDNEY FUNCTION OF SONG SPARROWS (*MELOSPIZA MELODIA*). Elisabeth Rothschild, Department of

Biological Sciences, Wright State University, Dayton, OH 45435.

We infused polyethylene glycol (PEG) intraperitoneally, via osmotic micro-pumps, to measure kidney function in unrestrained song sparrows (avg. weight 19.2 g) fed a low salt diet. We noted high drinking rates for song sparrows (13.0 mls day⁻¹). Midday collections of plasma and urine, and 24 hour PEG excretion rates, resulted in an average GFR of 12.0 mls hr⁻¹ and an average UFR of 459.5 µl h⁻¹. Our results indicated variation through the day in PEG excretion rates within individual birds. This may be due to variations in GFR or to sequestering of urine in the intestines. Preliminary results, including measures of diurnal fluctuations in plasma PEG levels, suggest that both mechanisms play a role.

2:30

CHRONIC WATER RESTRICTION ENHANCES THIRST AND RENAL WATER ABSORPTION IN BOBWHITES (*COLINUS VIRGINIANUS*). David L. Goldstein, Dept. of Biological Sciences, Wright State Univ., Dayton, OH 45435

Bobwhites were raised from hatching either with chronically restricted water (1/2 to 2/3 ad libitum drinking rates; DEH birds) or unrestricted water (HYD birds). Upon reaching adulthood, DEH birds were tested during chronic restriction, during rehydration, and then during short-term water restriction; HYD birds were tested while hydrated, then water restricted, then rehydrated. Kidney function was evaluated by infusion of polyethylene glycol (PEG) from implanted osmotic pumps. DEH birds (during chronic water restriction) had elevated plasma osmolalities (ave. 374 mmol/kg) and hematocrits (ave. 0.42) and reduced glomerular filtration rates, GFR (23.6 ml/h); comparable values for hydrated HYD birds were 349 mmol/kg, 0.35, and 40.5 ml/h. On their first day of free access to water, DEH birds drank copiously (ave. 47, max. 80, ml), gained mass (17 g), reduced plasma osmolality (to 365 mmol/kg) and hematocrit (to 0.37), and increased GFR (to 33.0 ml/h). During water restriction of HYD birds, plasma osmolality rose somewhat (to 360 mmol/kg) and GFR was reduced (20.5 ml/h); upon rehydration, these birds drank substantially less (23.6 ml/d) and gained less mass (5.1 g) than DEH birds, though they had similar changes in plasma osmolality. Maximum U/P ratios of PEG during short term water restriction were higher in DEH (99) than in HYD (72) birds, indicating enhanced tubule water reabsorption in the former group; urine osmolality did not differ between the groups (635 vs. 682 mmol/kg). Compared with short-term dehydration, chronic water restriction appears to stimulate thirst and enhance some aspects of kidney function.

2:45 FAT BODY CHANGES AFTER UNILATERAL CASTRATION IN THE NEWT (*NOTOPHTHALMUS VIRIDESCENS*)

C. J. V. Smith and L. L. Baranowski-Smith. Department of Biology, The University of Toledo, Toledo, OH 43606

Fat bodies have been shown to play a role in testis maintenance as fat body removal results in significant testicular degeneration (Adams and Rae, 1929). An attempt was made to determine if the presence of the testis has an influence on the fat body. This study was conducted at four different times spaced throughout the year. Male newts were unilaterally castrated and maintained under controlled conditions of temperature and light for 3 to 4 weeks. They were then sacrificed and the body weight, body length, testis weight, and fat body weights determined. The data obtained were compared to a control group kept under similar conditions. During the month of June, when there is normally a large increase in fat body weight, the fat bodies of the unilaterally castrated animals showed a substantial increase over the control animals. Both the fat body on the side of the remaining gonad and that on the other side increased by about the same amount. The possible reasons for this and other observations are discussed.

3:00 CHANGES IN GONADS AND FAT BODIES OF THE ADULT RED-SPOTTED NEWT (*NOTOPHTHALMUS VIRIDESCENS*) THROUGHOUT THE YEAR

T. Azizi and C. J. V. Smith. Department of Biology The University of Toledo, Toledo, Ohio 43606.

In the present study, body weight, body length, snout-vent length, and gonadal weight of a population of adult red-spotted newts from Tennessee have been compared with previously published data from population in Massachusetts (Adams, 1933). In addition, fat body weights were determined. In females the mean ovary weight was greatest in April (15.30% of body weight [BWT]) and smallest during August (0.55% BWT). The results also showed that the smallest mean testes weight was found in May (.045% BWT) and the greatest testes weight in August (5.5% BWT) corresponded to a high level of spermatogenesis. Fat body weight in the female was smallest in March (0.25% BWT), when the ovaries were large (14.50% BWT) and it reached maximum size (10.25% BWT) during August when the ovaries are smallest (0.55% BWT). The inverse relationship between the fat body and ovary weights indicated that these structures may be intimately associated with vitellogenesis. In the male fat bodies were smallest (0.39% BWT) during the spring breeding season, (April) when testes were mature and large (1.00% BWT). The largest fat bodies were found in August (5.80% BWT) when the testes were undergoing development for the following year's reproduction. This finding indicated that fat bodies might be nutritional support for testes development.

SECTION A. Zoology

Poster Session at 9:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board A EFFECTS OF MELATONIN ON BROWN ADIPOSE TISSUE
AND TESTICULAR FUNCTION IN DEER MICE
(PEROMYSCUS MANICULATUS). D.A. Freeman,
J. Marcelino and J.L. Blank, Dept. Biological Sciences,
Kent State University, Kent, OH 44242.

Short photoperiods evoke testicular regression in about 30% of laboratory populations of deer mice, while about 29% of all males exhibit normal testis function. This phenotypic difference is known to have a genetic component. In the present experiment, we tested whether this difference results from differential neural sensitivity to melatonin or to a difference in pineal gland function. We also extended our analysis to the effects of short days on brown fat function. Melatonin was administered to mice of each short day phenotype, and testicular and brown fat function evaluated. Melatonin failed to elicit changes in function of either tissue in mice that did not respond to short days. Melatonin mimicked the effects of short days on testis and brown fat function in long day controls. Our results support the hypothesis that individual variation in gonadal and brown fat function following short day exposure results from differential sensitivity of each phenotype to melatonin at a post-pineal site of action, presumably the hypothalamus.

Board B AQUATIC INSECT DISTRIBUTION IN A SPRING-FED
FIELD DRAINAGE SYSTEM IN HARDIN COUNTY, OHIO.
Bonnie Berger and Eric V. Nelson, Department
of Biological Sciences, Ohio Northern University, Ada,
Ohio 45810

Aquatic insects colonizing a quarter-mile section of a 10-year old channelized drainage channel (Range 9-E, Township 5-S, Section 28, Roundhead Quadrangle, Hardin County, Ohio) were surveyed from March 1988 to September 1988. Six collecting stations were located along a warm water ditch, a spring-fed ditch and a drainage channel connecting the two ditches to the Upper Scioto River. Eighty-eight percent of the insect species collected were downstream from the confluence of the cold and warm water habitats in a channel with a heavy growth of Nasturtium officinale and Lemna sp. Corixidae (Hemiptera) made up forty-two percent of the insects collected. Corixidae populations increased significantly during the study. Coenagrionidae (Odonata) and Dytiscidae (Coleoptera) were also collected throughout the study and made up twenty-seven percent of the insects collected. Cold-water species, particularly Ephemeroptera, probably colonized the ditch at the same time as N. officinale. The nearest source of N. officinale is the Mad River area of Logan County and Champaign County.

Board C GROWTH AND REPRODUCTION OF THE ISOPOD LIRCEUS
IN BIG BEAVER CREEK. Swift, Michael C.
Department of Biological Sciences, Wright
State University, Dayton, OH 45435.

Growth and reproduction of a population of Lirceus in Big Beaver Creek was monitored from December, 1988 until Spring, 1990. The 1989 year-class was studied throughout its life cycle. Reproduction occurred in the spring. Most females had produced their broods by the end of April. The smallest ovigerous female was 6.7 mm. Brood size was proportional to female size; the mean brood size was 87 eggs. Males were larger than females and ranged in length from 8.3 mm to 13 mm. Young isopods grew steadily throughout the year; the earliest ovigerous female was collected in December.

Board D CHIRONOMIDAE (DIPTERA) OF THREE NORTHEASTERN
OHIO KETTLE HOLE BOGS. Michael J. Bolton,
Ohio Environmental Protection Agency, 1030
King Avenue, Columbus, OH 43212

Chironomidae (midges) were collected from Fern Lake Bog in Geauga County, Flatiron Lake Bog in Portage County, and Brown's Lake Bog in Wayne County. All three bogs have a central kettle hole lake surrounded by Sphagnum peatlands. Fern Lake Bog and Brown's Lake Bog were classified as weakly minerotrophic by Bryan and Andreas (1986) while Flatiron Lake Bog was semi-ombrotrophic. Three collections were made from each bog in 1988 and two from Fern Lake Bog in 1989. Larvae and pupae were collected from the Sphagnum mats and lake margins. Adults were collected with an insect net from the bogs and adjacent woodlands. Late instar larvae were transported live back to the laboratory for rearing. The immature stages of 46 taxa were collected from the three bogs with an additional 36 taxa collected only as adults. Eight species were collected from all three bogs. These were Monopelepis tenuicalcar, Telmatopelopia n. sp., Limmophyes sp. 1, Limmophyes sp. 2,

Smittia sp. 1, Kiefferulus dux, Polyepidulum (Pentapedilum) tritum, and Polyepidulum (s.s.) trigonus. This is the first Nearctic record for the genus Telmatopelopia. Two species were collected from specialized habitats. Georthocladius luteicornis was collected from wet peaty soil on the margin of Flatiron Lake Bog and Metricnemus knabi was collected from pitcher plants in Brown's Lake Bog. This is the first Nearctic record for Georthocladius luteicornis.

Board E EVALUATION OF A NEW TOOL FOR TICK REMOVAL.
S.N. Lazar, G.R. Needham, Acarology Laboratory,
Entomology Department, The Ohio State University,
Columbus, Ohio 43210

Ticks are vectors of Lyme disease and Rocky Mountain Spotted Fever to man and animals. A key measure to prevent transmission of tick-borne diseases is the immediate removal of the tick from the host. If the tick is damaged or its mouthparts broken, an infection may result. Instruments of Sweden, Inc. has engineered a forcep-like device, "The Tick Solution", which is reported to be an improvement over using tweezers or folk methods. Our objective was to test if the recommended procedure for this tool left the bodies and mouthparts of lone-star ticks, Amblyomma americanum, intact. This species was chosen because it is one of the most difficult to remove due to lengthy mouthparts and a deep vertical deposition of attachment cement. Three rabbits were each infested with Amblyomma americanum larvae, nymphs, adult males and females. Ticks were removed using the manufacturer's instructions for the tick-removal tool after one day. A group of females was allowed to remain to engorge until near repletion. Mouthparts and the tick body were examined for damage immediately after removal and at 24-hour intervals after the procedure. In general, we found "The Tick Solution" performed as described by the manufacturer. Twisting the tick off was an effective means of removal.

Board F STATISTICAL ANALYSIS OF AN
ORNITHOLOGICAL DATA SET:
INTERPRETATION OF CORRELATED TESTS.
Kathleen G. Beal and Harry J. Khamis. Dept.
Mathematics and Statistics, Wright State Univ.,
Dayton, OH 45435

We use a data set consisting of three different measurements of the foraging behavior of migrating male American Robins (Turdus migratorius) to illustrate one simple but important statistical analysis technique. For two foraging sites--differing in amount of grass cover--we wish to simultaneously compare three measurements: the length of foraging bout, the rate of consumption of earthworms (Lumbricus sp.), and the rate of consumption of non-earthworm prey. We perform three t-tests which are correlated (since they are based on the behavior of the same birds) and use the Bonferroni method to draw conclusions. The method is described and motivated. Since the Bonferroni method simply consists of adjusting the significance level it is an attractive alternative to more intricate multivariate analysis of variance (MANOVA). It will be seen that a different conclusion is obtained using the Bonferroni method on these data than when conducting three individual t-tests.

SECTION B. Plant Sciences

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

103 Biological Sciences

Amy J. Scherzer, Presiding

9:00 THE USE OF GEOGRAPHIC INFORMATION SYSTEMS FOR
DEVELOPMENT OF MANAGEMENT PLANS FOR RARE AND
ENDANGERED SPECIES. J.R. Strittholt, Center
for Mapping and Department of Botany, The Ohio State
University, Columbus, Ohio 43210.

In recent years, Geographic Information Systems (GIS) have become increasingly common as tools for management of large data bases involving both physical attributes of the land, including elevation, soil types, drainage patterns, and socioeconomic attributes, such as land use patterns. As such data bases are expanded to include parks, wild lands, and undeveloped land, attributes such as current vegetation patterns, potential or presettlement vegetation patterns,

and landscape linkages may be added as new layers in the GIS data bases. This, then opens up opportunities to utilize GIS technology for the development of land use plans which take the needs of rare ecological communities and/or endangered species into account. This paper reviews the use of GIS systems, to date, for community, ecosystem, and species management programs, and describes examples of the use of GIS for development of management plans for endangered animals and plants.

9:15 ECOPHYSIOLOGICAL EFFECTS OF OZONE ON GROWTH OF SUGAR MAPLE (*ACER SACCHARUM*) SEEDLINGS.

Amy J. Scherzer and R.E.J. Boerner, Department of Botany, The Ohio State University, Columbus, OH 43210.

Sugar maple populations are undergoing a significant decline in the northeast, while at the same time expanding in other parts of the range. We hypothesized that ozone could act as a predisposing factor for sugar maple decline, at least for some populations or in some geographical locations, by reducing net carbon gain and carbohydrate reserves or by altering carbon allocation, any of which could result in reduced growth and vigor of sugar maple seedlings and trees. To test this, 1 yr old sugar maple seedlings were fumigated in open-top chambers with charcoal filtered air, ambient ozone, or ambient ozone \pm 15%. Exposure to these ozone levels for five months did not significantly affect leaf area production, biomass, root:shoot ratio, or photosynthetic rate, all potential indicators of short-term ozone damage. Ozone may reduce levels of carbohydrate storage in roots, or alter transport of photosynthate from leaves to roots, thus increasing overwintering mortality and/or reducing spring growth. Results of tracer experiments designed to test this will be presented. We also speculate on the role of genetic diversity and genotype in determining geographic patterns of susceptibility to ozone in sugar maple.

9:30 GEOSTATISTICAL AND REGRESSION-BASED APPROACHES TO ESTIMATING ABOVEGROUND BIOMASS OF SURFACE-MINED LANDS. Artigas, F.J. and R.E.J. Boerner,

Environmental Biology Program and Botany Department, The Ohio State University, Columbus, OH 43210.

The initial phase of the development of a model for ungulate carrying capacity for the >3000 ha of "pseudo-prairie" vegetation on the reclaimed strip-mined land of the International Center for the Preservation of Wild Animals in Muskingum County involved the sampling of aboveground biomass and productivity of grasses and legumes within a study area of approximately 100 ha. We used two approaches to extrapolate the data generated along three 300 m transects to the larger study area. First, on the assumption of no significant anisotropy along the elevation and aspect gradients we sampled, we utilized a modified Kriging analysis to determine the spatial scale of variation in biomass, and to interpolate biomass values with estimated variance between actual sample points. Second, we developed a predictive equation for aboveground biomass and productivity of each plant group by multiple regression with elevation, aspect, slope angle, and spoil age as independent variables. This regression approach does not depend on the assumption of no anisotropy for its validity. Predictions from the regression analysis were then mapped onto a high resolution contour map for comparison with the Kriged map. We compare the estimates of biomass and productivity generated by the two approaches and discuss the implications for longterm ungulate management.

9:45 SEEDBANK DYNAMICS AND SEED DISPERSAL OF THE WETLAND WEED PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA* L.) Robert A. Klips, Botany Dept., The Ohio State University, Columbus, OH 43210

In field and laboratory experiments, a marsh soil seed bank was found to contain approximately 21,000 purple loosestrife seeds/m². There was no difference in density between spring (pre-germination) and summer (post-germination) densities, indicating the seed bank is persistent over that time period. Seedrain begins in the two-week period from 12 October to 25 October but is very low until late October/early November, the start of a 6 to 8 week period during which most of the seeds are released. The seeds are released into the environment when temperatures are generally below 15°C, the reported threshold temperature for germination. All of the seeds sampled during autumn and winter exhibited some enhancement of germination by storage under cool moist conditions, and this effect was most pronounced for seeds gathered in the earlier part of the seed dispersal period. I performed a laboratory simulation of the ability of purple loosestrife seedlings to become established on marsh soil after floating in water. The

time spent floating, the temperature of the water and its nutrient concentration all had a significant effect on seedling size. Overall the floating seedlings can become established and develop into normal-appearing young plants under a wide range of conditions.

10:15

POLLINATION ECOLOGY OF *PEDICULARIS PUNCTATA* (SCROPHULARIACEAE) IN THE WESTERN HIMALAYA. Lazarus Walter Macior, Department of Biology, University of Akron, Akron, Ohio 44325-3908.

The perianth flowers of *Pedicularis* are grouped by Li into four types, viz., beakless with teeth on the upper lip, beakless without teeth, beaked with a short corolla tube, and beaked with a long tube. Studies on the pollination of the first 3 types in Europe, North America, and Japan indicate a primary adaptation of the floral mechanism to bumblebees (*Bombus* Latr.) foraging for nectar and/or pollen on the nectariferous first 2 types and vibrating pollen from the nectarless flowers of the third type. This first study of the fourth type, which is restricted to mainland Asia, revealed that flowers of *Pedicularis punctata*, with a 19.2mm mean tube length, are nectarless and pollinated almost exclusively by the worker caste of 2 *Bombus* species that vibrate pollen while the stigma, directed by the curved beak, contacts residual pollen in the insect's cervical crevice. Analysis of 333 corbicular pollen loads from *Pedicularis* pollinators indicated a fidelity in pollen foraging on *Pedicularis* ranging from 32% in a mixed plant community to 86% in a virtually uniform *Pedicularis* population. More investigation is necessary to determine the function of the long, nectarless corolla tube in Asiatic species which may reach a length of 10cm. Nectariferous long tubes may accommodate lepidopteran pollinators, but at present no evidence for such adaptation is reported.

10:30 GLUCOSINOLATE EXUDATION AND ALLELOPATHY IN *BRASSICA NAPUS* L.: EFFECTS OF P AND S AVAILABILITY. Devi N. Choesin and R.E.J.

Boerner, Department of Botany, The Ohio State University, Columbus, OH 43210.

The allelopathic effects of species in the genus *Brassica* (Cruciferae) have been attributed to the mustard oil glucosinolates which they produce in large quantities, which upon hydrolysis produce compounds with strong antibiotic properties. To determine whether *Brassica napus* can actually exude sufficient amounts of glucosinolates or their breakdown products into their rhizosphere to inhibit neighboring plants, we grew wild type *B. napus* plants and low-glucosinolate producing mutants at high and low levels of both available P and S. Wild type plants grew faster than mutants during the early portion of the growth period, and plants given high S were significantly larger aboveground than low S plants. The overall differences in growth between genotypes disappeared by the end of the experiment, though plants given high S continued to be larger overall. Genotype and S availability interacted such that there were no differences between genotypes at high S, whereas low-glucosinolate mutants outgrew wild type plants at low S. This may reflect the larger need for S for the production of glucosinolates by the wild type plants. Glucosinolates exuded into the soil were extracted and analyzed by gas chromatography; relationships between growth, genotype, S availability, and exudation rates will be discussed.

10:45 HIERARCHIC AND INTERACTIVE CONTROLS ON GROWTH & REPRODUCTION OF *GERANIUM MACULATUM*. R.E.J.

Boerner, S.D. Koslowsky, and A.J. Scherzer, Department of Botany, The Ohio State University, Columbus, Ohio, 43210.

Summergreen forest understory plants may be subjected to limiting levels of light, water, and soil nutrients simultaneously. Formation of a canopy gap through death of one or more canopy trees may release understory plants from one or more of these resource limitations. To determine the hierarchy of control on growth and on the relative rates of asexual vs sexual reproduction in a long-lived forest herb, we monitored the behavior of >450 plants through the 1986 growing season, moved the plants to a glasshouse during that winter, and exposed them to various experimental treatment combinations through the 1987 and 1988 growing seasons. The experimental design for the 1987 growing season was 2 light levels ("gap" vs "understory") X 2 N/P supply rates X vesicular-arbuscular mycorrhizal (VAM) status (+ or -). For 1988, half of the plants which received "gap" light during 1987 were moved to the "understory" treatment while the other half remained in the "gap". Leaf area and mass, rhizome mass, root mass and length, production of lateral rhizome branches (asexual propagules), number of flower and seeds produced (sexual propagules) and tissue N & P levels were determined at the end of each growing season. Repeated-measures analysis of covariance was used to determine the independent, hierarchic, and interactive effects of light, nutrient supply, and VAM status.

SECTION B. Plant Sciences
First Afternoon & Business Meeting
at 1:30 p.m.
Saturday, April 28, 1990
103 Biological Sciences
Jun Wen, Presiding

- 2:00** JUST HOW DISTINCT ARE THE VARIETIES OF *POLYGONELLA POLYGAMA* (POLYGONACEAE)? Paul O. Lewis, Department of Botany, The Ohio State University, 1735 Neil Avenue, Columbus, Ohio, 43210.

Polygonella polygama is a dioecious, perennial flowering plant of sandy habitats in the southeastern U. S. Currently recognized as comprising three varieties, *polygama* (POL), *crooni* (CRO) and *brachystachya* (BRA), this species has been considered in the past to be monotypic by some investigators and three separate species by others. The aims of this study were to (1) investigate variation in characters found useful in past studies in discriminating among the three varieties and (2) evaluate the ability of a linear discriminant function (LDF) to distinguish among the three varieties. Three sample measurements of eight characters were made on each of 97 individuals representing all three varieties. In spite of the fact that most of the variation in 7 characters was within rather than among varieties, discriminant function analysis resulted in an LDF that was able to classify 93% of the individuals correctly, indicating that the three taxa are indeed quite distinct on a multivariate level.

- 2:15** Chromosome studies in *Clibadium* (Compositae, Heliantheae). Jorge E. Arriagada, Dept. of Botany, The Ohio State University, 1735 Neil Ave., Columbus, OH 43210.

The genus *Clibadium* L. (Compositae, Heliantheae) contains about 40 species distributed throughout Central America and northern South America. Species of the genus have allopatric distributions in different tropical habitats from sea level to 3,000 m. New meiotic chromosome counts are reported from 86 populations from Mexico to Ecuador representing 14 species of *Clibadium*. All counts are $n = 16$ with a few fragments or B chromosomes observed sporadically in some populations. One population, suspected on morphological grounds to contain interspecific hybrids between *C. mexiae* and *C. microcephalum*, showed trivalents. A summary of previous counts in the genus also reveals only $n = 16$ reports yielding now a total of 120 counts from 21 of the approximately 40 species. Species from both taxonomic sections of the genus have been counted, although all but two have come from section *Clibadium*. The uniformity of chromosome number within *Clibadium* correlates with largely allopatric distributional patterns of the species, especially close relatives within the same section.

- 2:30** Preliminary studies and infrageneric classification in the genus *Clibadium* (Compositae, Heliantheae). Jorge E. Arriagada, Dept. of Botany, The Ohio State University, 1735 Neil Ave., Columbus, OH 43210.

Clibadium L. is a Neotropical genus of approximately 40 species distributed from Mexico to Peru in different habitats. They are, in many cases, important vegetational and ecological elements. Despite the importance of *Clibadium*, the basic systematic relationships of the taxa within the genus are poorly understood even to the extent that in many cases routine identification is impossible. Data obtained from morphology (inflorescences, gender of florets and vegetative structures), and distribution have been used to construct a preliminary infrageneric classification of *Clibadium*. This classification is based on the two sections described by Schultz (1912) and Blake (1917): *Trixidium*, characterized by the presence of paleas and multiserial ray florets, and *Clibadium*, characterized by the absence of paleas and by uniserial ray florets. Each section has been divided further into different series which are based on several characters such as leaf shape and margin, inflorescence type and branching, shape and size of heads and, shape and texture of bracts. According to data obtained from herbarium material, the number of ray and disc florets per head seems to be a particularly important character in grouping the species.

- 2:45** THE OCCURRENCE OF *ACICARPHA TRIBULOIDES* JUSS. IN EASTERN NORTH AMERICA. Melanie L. DeVore, Department of Botany, The Ohio State University, Columbus, OH 43210

Acicarpa tribuloides Juss. (Calyceaceae) is native to Southern Brazil, Uruguay, Paraguay, and Northeastern

Argentina where it commonly inhabits grasslands, deltas, river banks, sandy ravines, and cultivated fields. Specimens of *A. tribuloides* have also been collected in the United States. Recent herbarium studies indicate that *A. tribuloides* occasionally appeared in ballast dump sites in New Jersey, Pennsylvania, North Carolina, and Louisiana. Small reported in *Manual of the Southeastern Flora* that *A. tribuloides* was naturalized in Northern Florida. Small's account is apparently based on a single specimen collected by A. H. Curtiss in 1885. No specimens of *A. tribuloides* after 1888 are known and recent floristic inventories of the Florida panhandle have failed to locate a single population. *Acicarpa tribuloides* appears to be a well adapted weed in South America based on abundance, multiple adaptations for dispersal, and ability to invade disturbed habitats and cultivated fields. This weedy annual has apparently never been naturalized in the United States. Founders probably encountered climatic and edaphic barriers, lacked the ability to scatter seeds or reproduce vegetatively, or failed to compete with native or naturalized individuals.

- 3:00** THE *LOBELIA TUPA* COMPLEX OF CHILE. Thomas G. Lammers. Department of Botany, Miami University, Oxford, OH 45056.

Lobelia subg. *Tupa* is represented in Chile by a complex of shrubs and herbaceous perennials. In the most recent monograph of the genus, Wimmer (1953) recognized seven closely related species in this complex. Field studies associated with the *Flora de Chile* project suggest an alternative interpretation of the complex. First, no more than four species can be recognized. Two are robust perennials with decurrent leaves, found in the deciduous forest and evergreen temperate rain forest regions of the south: *L. bridgesii*, with pink flowers, and *L. tupa*, with red flowers. The other two are branched polycarpic shrubs with subsessile leaves, found in the sclerophyllous and xerophytic regions of the north: *L. excelsa*, with large orange to red flowers, and *L. polyphylla*, with small dark purple flowers. The species of each pair are at least partially sympatric, and their isolation may be due to differences in pollinators: hummingbirds in *L. excelsa* and *L. tupa*, bees in *L. bridgesii* and *L. polyphylla*. Second, the two pairs do not appear to be closely related to each other. Studies of seed coat morphology showed that the southern herb pair are most similar to sect. *Tylomium* of the Caribbean, while the northern shrub pair are most similar to sect. *Homochilus* of Mexico, Central America, and northern South America.

- 3:30** MOSSES NEW TO OHIO, INCLUDING SEVERAL NOTABLE RANGE EXTENSIONS. Jerry A. Snider, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221-0006.

Atrichum tenellum, *Diphyscium cumberlandicum*, *Ditrichum rhynchostegium*, *Pleuriditrichum marylandicum*, *Polytrichum pallidisetum*, *Racomitrium aciculare*, *Tetradontium brownianum*, and *Thuidium allenii* are reported new to Ohio. Seven of the eight taxa occur in state nature preserves and therefore are under some degree of protection. The site for *Thuidium allenii* (collected in 1936) is now agricultural land. This report is the first for the occurrence of *Tetradontium brownianum* in southeastern Ohio, southern Indiana, south-central and eastern Kentucky, and northern Tennessee, where it commonly occurs on moist, shaded ceilings of sandstone shelter caves associated with hemlock/hardwood coves. This rare species was previously known to occur only as far south as the south shore of Lake Superior in Michigan, and upstate New York.

- 3:45** *BUTOMUS UMBELLATUS* L.: NOTES FROM THE GERMAN LITERATURE AND NORTH AMERICAN FIELD STUDIES. Ronald L. Stuckey and Gregory Schneider, Botany and Natural Resources, Ohio State Univ., Columbus, OH 43201. Marvin L. Roberts, Biology, Salem State Coll., Salem, MA 01970.

Butomus umbellatus L., flowering-rush, a Eurasian wetland Angiosperm, was first discovered on the North American continent in 1897 at Laprairie near Montreal along the St. Lawrence River. Since then the species has spread into the Great Lakes region and farther westward. Its distributional history here is one of the best documented examples of a foreign invader in wetlands. However, most of what has been written on morphological variation and growth habit is in the German language, including descriptions of rhizome growth, cytological-embryological development, and flower maturation. Individual plants are self-sterile, but cross-pollination occurs throughout populations, forming numerous

seeds in both Europe and North America, contrary to the statement by Cook (1987) who wrote that seeds were not produced in North American plants. Under various treatments, seeds kept in water at 25°C, following a cold treatment, had the highest percent germination (63%, 73%). Three growth forms are described, one terrestrial, one in shallow water, and one submersed. Field transplant experiments with North American plants have demonstrated that the non-flowering submersed form can be converted to a flowering mudflat form; flowering terrestrial plants can be transformed into non-flowering submersed forms.

4:00 GENERIC DELIMITATIONS OF *ARALIA* (ARALIACEAE). Jun Wen, Department of Botany, Ohio State University, Columbus, Ohio 43210.

Aralia L. is a genus showing a high degree of morphological diversity. It has a disjunct distribution between eastern and southeastern Asia and North America. It was once a catch-all genus in Araliaceae. At present, its generic limit is still controversial, especially in relation with *Coudenbergia*, *Megalopanax*, *Pentapanax*, and *Sciadodendron*. The 5-locular ovary of *Aralia* is usually regarded as the most important differentiating character of this genus. However, this feature also occurs in *Coudenbergia* and *Pentapanax*. Thus, the homology of this character state will be discussed in this study based on evidence from fruit anatomy. Cladistic analyses have been utilized to help delimit *Aralia* based on morphological and anatomical characters.

4:15 A PRELIMINARY INVESTIGATION OF CHLOROPLAST DNA AND ISOZYME DIVERGENCE IN *PEDICULARIS* (SCROPHULARIACEAE). Bruce W. Robart, Department of Botany, The Ohio State University, 1735 Neil Avenue, Columbus, Ohio, 43210.

Over 600 species are recognized in the genus *Pedicularis*. Although corolla characteristics have been used to determine phylogenies, the corollas of *Pedicularis* have coevolved with the available pollinators and their specific behaviors. This has resulted in divergence of form for closely related species and convergence of form for more distantly related species. Thus vegetative characteristics are considered to be less variable and more conservative than floral characteristics; therefore, the use of leaf form and phyllotaxy for phylogenetic groupings of *Pedicularis* has been emphasized. Within each of these groups, the corolla is thought to have evolved independently along parallel lines from archaic short-tubed and toothed or toothless forms to derivative long-tubed and beaked forms. However, there may have been as much adaptive response of leaf form to variable habitats as has occurred in the form of the corolla.

At the present time restriction site analysis of cpDNA is being used to construct a phylogeny for ten species of *Pedicularis* from North America. In addition, isozyme analysis is also being used to determine the amount and probable mode of divergence of the taxonomic varieties of *P. bracteosa*, a known monophyletic group. Preliminary data from each of these areas will be presented.

4:30 PHENETIC ANALYSIS OF FRUIT CHARACTERS OF THE GENUS *MULINUM* PERS. (MULINAE, HYDROCOTYLOIDEAE, APIACEAE). James C. Zech, The Ohio State University, Botany Dept., 1735 Neil Ave., Columbus, Ohio 43210-1293.

Historically, characters of the fruit have been considered critical for the identification of Apiaceae taxa. As part of the revision of the genus *Mulinum*, characters of the fruit were examined to determine the significance of these characters within the genus and whether fruit characters alone differentiate *Mulinum* species. A total of twenty-three species of *Mulinum* were studied using standard phenetic analysis. Results indicate the potential of fruit character data for the delimitation of species as well as intrageneric taxa. Characters of the fruit support the placement of previously described *Mulinum* taxa within the genus *Azorella* and also several previously predicted species affinities. In addition, these data provide means to separate previously predicted equivalent taxa and reconfirm the prominent role of characters of the fruit within the family Apiaceae.

4:45 PHENETIC ANALYSES OF THE *ARALIA ELATA* COMPLEX (ARALIACEAE) IN EASTERN ASIA. G. Tao, J. Wen, J.J. Furlow and T.F. Stuessy, Wuhan Institute of Botany, Hubei Prov., P.R.C., and Dept. of Botany, The Ohio State University, Columbus, OH 43210.

The *Aralia elata* complex is one of the most variable and most widely distributed groups within *Aralia*. It occurs in 21 provinces of China as well as in Japan, Korea and eastern U.S.S.R. Because of the complex pattern of variation and wide geographical distribution, more than 10 "species" have been described historically within this complex. Field and herbarium studies have suggested that variation among these "species" is continuous and that they need to be reevaluated critically. In this current study, phenetic analyses using both vegetative and reproductive characters have been utilized to help recognize discontinuities within this complex. Morphological patterns correspond with large-scale geographical distributions to recommend recognition of several varieties within a single variable species.

SECTION B. Plant Sciences

Second Afternoon at 2:00 p.m.

Saturday, April 28, 1990

105 Biological Sciences

2:00 THE IMPORTANCE OF EPIDERMAL AND CORTICAL TISSUES IN GRAVITROPISM OF PRIMARY ROOTS OF *ZEA MAYS*. Maimon, E., and R. Moore. Wright State University, Department of Biological Sciences, Dayton, OH 45435.

The objective of this research was to determine the role of the epidermis and cortex in root gravitropism. We studied this by surgically removing (i.e. girdling) these tissues from primary roots of *Zea mays*. We found that only that part of the girdled roots were graviresponsive --- that part which was apical to the girdle. However, filling the girdle with a mucilage-like substance induced curvature basal to the girdle and, thus, a normal gravitropic response. Stripping the epidermis and outer 2 to 3 layers of cortex from one side of primary roots of *Zea mays* induces strong curvature towards the cut, irrespective of the root's orientation to gravity. This effect is not due to desiccation, since treated roots submerged in water also curve towards their cut surface. Curvature toward the cut stops when the cut surface is coated with a hydrophilic mucilage-like substance. Together, these results infer that the epidermis and cortex play an important role in root gravicurvature.

2:15 LEAF DEVELOPMENT IN *PEPEROMIA COLUMELLA*. Christensen-Dean, G., and R. Moore. Wright State University, Department of Biological Sciences, Dayton, OH 45435.

Leaf development was quantitatively analyzed in *Peperomia columella*, a succulent, window plant native to the deserts of South America. The relative volumes of chlorenchyma and window tissues per leaf were calculated. Young leaves consist of approximately 72.1% chlorenchyma and 11.5% window tissue. At leaf maturity, the percentages are approximately 20.4% and 58.4%, respectively. Thus, the data suggest that the first developmental priority is photosynthesis, and not water storage.

2:30 TISSUE PARTITIONING DURING LEAF DEVELOPMENT IN *FRITHIA PULCHRA* (MESEMBRYANTHEMACEAE), A "WINDOW PLANT". Moore, R., and M. Langenkamp. Wright State University, Department of Biological Sciences, Dayton, OH 45435, USA.

Young (i.e., 5-mm-long) leaves of the window-plant *Frithia pulchra* (Mesembryanthemaceae) allocate approximately 21% of their volume to epidermis, 49% to chlorenchyma, and 29% to window tissue. By the time leaves are 25 mm in length, the relative volumes of epidermis and chlorenchyma decrease to approximately 7 and 27%, respectively. During the same period, the relative volume of window tissue more than doubles, increasing from 29 to 66%. The relative volumes of epidermis, window, and chlorenchyma tissues do not change as leaf length increases from 25 to 57 mm. These results indicate that early stages of leaf development in *E. pulchra* involve preferential reallocations of volume to different tissues, whereas

later stages of leaf development involve uniform expansion of all of the leaf's tissues (i.e., the relative volumes of tissues do not change). The relative volumes of epidermis and window are always largest in the lower third of a leaf. The relative volume of chlorenchyma is largest in the upper third of young leaves but becomes constant in the upper two thirds of leaves during later stages of development. These results indicate that leaves and tissues of *E. pulchra* are asymmetric and develop polarly. These results are discussed relative to corresponding studies of cellular size and leaf structure.

- 2:45** DEFECTIVE SECRETION OF MUCILAGE IS THE CELLULAR BASIS FOR AGRAVITROPISM IN PRIMARY ROOTS OF *ZEAE MAYS* CV. AGEOTROPIC. Miller, I., and R. Moore. Wright State University, Department of Biological Sciences, Dayton, OH 45435, USA.

Root caps of primary roots of *Zea mays* cv. Kys secrete large amounts of mucilage and touch the root all along the root apex. These roots are strongly graviresponsive. Primary roots of *Z. mays* cv. Ageotropic are nonresponsive to gravity. Their caps secrete negligible amounts of mucilage and touch the root only at the extreme apex of the root along the calyptrogen. These roots become graviresponsive when their tips are coated with mucilage or mucilage-like materials. Peripheral cells of root caps of roots of *Z. mays* cv. Kys contain many dictyosomes associated with vesicles that migrate to and fuse with the plasmalemma. Root-cap cells of primary (i.e., nongravi-responsive) roots of *Z. mays* cv. Ageotropic have distended dictyosomal cisternae filled with an electron-dense, granular material. Large vesicles full of this material populate the cells and do not fuse with the plasmalemma. Taken together, these results suggest that nongravi-responsiveness of primary roots of *Z. mays* cv. Ageotropic results from the lack of apoplastic continuity between the root and the periphery of the root cap. This is a result of negligible secretion of mucilage by cells along the edge of the root cap which, in turn, appears to be due to the malfunctioning of dictyosomes in these cells.

- 3:00** THE EFFECTS OF CYTOCHALASIN ON ROOT GRAVIRESPONSIVENESS AND DICTYOSOMAL STRUCTURE IN *ZEAE MAYS*. Iain Miller and Randy Moore, Department of Biological Sciences, Wright State University, Dayton, OH 45435.

Primary roots of *Zea mays* whose root caps were treated with cytochalasin D ($20 \mu\text{g ml}^{-1}$) for 2 h continue to grow but are nonresponsive to gravity. Peripheral cells of caps of treated roots contain many dictyosome-derived vesicles that neither move to nor fuse with the plasmalemma. Washing the root tips with distilled water restores graviresponsiveness. Correspondingly, dictyosome-derived vesicles in "washed" roots fuse with the plasmalemma and secrete mucilage. Thus, "washed" roots function like untreated controls. These data are consistent with mucilage playing an important role in root gravitropism.

- 3:30** MESOZOIC SEED FERNS FROM ANTARCTICA: MORPHOLOGY AND ULTRASTRUCTURE OF *IN SITU* CORYTOSPERM POLLEN Jeffrey M. Osborn and Thomas N. Taylor. Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Corytosperm pollen sacs and associated *in situ* pollen grains of Early-Middle Triassic age are described from silicified peat collected in the central Transantarctic Mountains of Antarctica, using combined light, scanning, and transmission electron microscopy. Pollen sacs are elliptical, unilocular, and possess characteristic secretory cells within the walls. Both mature microsporangia, each with a single epidermal layer and completely dissociated pollen grains, and immature microsporangia, each with an outer epidermal layer, inner tapetal membrane and tightly aggregated pollen, have been isolated from the matrix. Pollen grains are monosulcate, bisaccate, and bilaterally symmetrical with lateral attachment of large, crescent-shaped sacci. The sporoderm is relatively thick and homogeneous in the cappus region, thinner and less well defined near the distal sulcus, and exhibits psilate surface ornamentation. The sulcus is relatively broad and flanked longitudinally by elevated lips at the sites of saccus attachment. Sacci possess distinct endoreticulations and are also found distally inclined. Comparisons are made with similar *sporae dispersae* pollen grains from the same Antarctic rocks as well as other corytosperm pollen grains previously described from compression specimens.

- 3:45** PHYSIOLOGICAL RESPONSES OF *FRAXINUS AMERICANA*. J. Coppinger, R. Gaiser, K. Loats, and K. Jensen*. Biology Department, Denison University, Granville, Ohio 43023 and the USDA Forest Service, Northeast Station, Delaware, Ohio 43015*.

One year old seedlings of white ash were raised in green-houses in an attempt to determine productivity patterns during a growing season. Time of day, leaf age, and ozone

stress were additional factors investigated. A LICOR 6200 photosynthesis system was used to monitor the photosynthetic behavior of selected leaves from June through August. Since this method of analysis is rapid and non-destructive leaves can be remeasured and the photosynthetic behavior can be monitored over specified periods of time.

There was a decrease in net photosynthesis over time in 1988 and a consistent rate during 1989, differences that may be attributable to the external environment. Diurnal rhythm patterns were similar in both summers as was ozone inhibition of photosynthesis. The ozone fumigation was delivered by the square wave technique in 1988 but the concentration was changed every two hours in 1989 to more closely simulate a natural concentration rhythm.

- 4:00** THE ROLE OF PLANT SCIENTISTS IN PROMOTING SUSTAINABLE AGRICULTURE Donald R. Geiger & Jerome C. Servaites, Department of Biology, University of Dayton, Dayton, OH 45469-0001.

Sustainable agriculture, also commonly referred to as alternative or low-input agriculture, is a system that uses the principles of natural ecosystems to develop alternative management practices to reduce the use of costly, energy intensive and potentially polluting off-farm inputs, such as fertilizers and pesticides. Some examples are the inclusion of nitrogen-fixing plants in crop rotations, recycling of farm waste as a source of soil nutrients, integrated pest management and biological pest control, and conservation tillage to maintain profitable and efficient production. Long-term benefits include increased stability and profitability of family farms, maintenance of soil resources, and stability of agricultural and natural environments. As educators and professionals, plant scientists can contribute by sharing their knowledge of plant biology, particularly, with urban dwellers to change attitudes and public policy, increase awareness and secure support for implementing sustainable agriculture. As scientists, they conduct basic research in developing higher-yielding plant cultivars suitable for sustainable agriculture and ways to apply ecological principles to the crop ecosystem.

- 4:15** WRITING IT RIGHT: A COURSE FOR BIOLOGY UNDERGRADUATES. Edward G. Voss, Herbarium, North University Bldg., University of Michigan, Ann Arbor, Michigan 48109-1057.

"Writing for Biologists" (Biol. 301) is designed to meet a University of Michigan College of Literature, Science, and the Arts upper-level writing requirement that all juniors and seniors must fulfill, preferably in the field of their academic concentration. The course carries 3 semester hours of credit and enrolls about 100 students per semester, each of whom attends the one lecture per week and one of the 10 two-hour discussion sections supervised by a trained graduate teaching assistant. Students write a diversity of exercises--and rewrite them after critical sessions with their TAs: essays for non-biologists, abstracts, reviews, critiques, research reports (based on their own simple experiments on plant growth). Besides presenting issues of audience, clarity, use of language, organization, and such writing essentials, the course also offers an opportunity to deal with the nature of science and to confront issues of professional behavior: the standards, conventions, and values involved in communicating what biology is about.

- 4:30** GENERA OF FUNGI IN THE DAYTIME AIRSPORA AT THE TUSCARAWAS CAMPUS OF KENT STATE UNIVERSITY. Francis E. Nussbaum Jr. Kent State University, Tuscarawas Regional Campus New Philadelphia, OH 44663.

Airspora collections obtained during June 1989 on yeast-malt-agar Petri plates that were inoculated by gravitational sedimentation revealed the major types of saprophytic molds and their relative abundance in the atmosphere at several micro-environments on the Tuscarawas Campus. Samples were collected during the morning, midday, and afternoon at five locations: an unshaded lawn, a sycamore grove, a pine grove, an arborvitae windbreak, and an asphalt-covered parking lot. Frequently encountered genera included:

Alternaria, Aspergillus, Aureobasidium, Botrytis, Cladosporium, Drechslera, Epicoccum, Fusarium, Geotrichum, Hyalodendron, Lindochium, Mucor, Nigrospora, Penicillium and Pithomyces. In addition to the genera identified, various pseudomycelial yeasts, red yeasts, white yeasts, pycnidial molds, and mycelia sterilia were observed. Significant variation among generic distributions was frequently present in the collections with respect to microenvironment and time of day.

4:45 HERBAL MEDICINE: ITS HISTORY, SUPERSTITION, FOLKLORE AND QUACKERY PART I. Relda Niederhofer, Firelands College, Bowling Green State University, 901 Rye Beach Rd., Huron, OH 44839.

The use of herbs to treat human illnesses began, at least, 5,000 years ago. All primitive people seem to have used wild plants growing around them for specific remedies to treat their illnesses. Hieroglyphs and pictographs from Egypt and Mesopotamia record the uses of anise, coriander and cumin as medicine of the day. The Chinese and Hebrew Sanskrit writing reveal their herbal treatments for leprosy and respiratory disorders. The knowledge of herbs was expanded by Greeks and Romans through the writings of their philosophers.

Part I of a three-part series begins with prehistoric times and concludes at about the time of the European Renaissance.

SECTION B. Plant Sciences

Poster Session at 9:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board H EXPOSURE OF RED SPRUCE NEEDLES TO ELEVATED LEVELS OF OZONE AND ACID RAIN AFFECTS RESPONSE OF SPRUCE BUDWORM LARVAE.

W. N. Cannon, Jr., C. R. Krause, and B. R. Roberts. USDA For. Serv. and Agric. Res. Serv., 359 Main Rd., Delaware, OH 43015

Picea rubens Sarg. needles exposed to 15 ppm ozone and pH 4.2 or 3.0 rain were presented to 2nd-instar spruce budworm larvae, *Choristoneura fumiferana* (Clem.), in a Y-type wind-tunnel olfactometer. Larvae responded negatively to ozone plus acid rain treated needles. Scanning electron microscopy showed altered epistomatal wax structure. Plant water potential readings suggested a reduction in transpirational water loss via stomatal closure.

Board I EFFECTS OF GRAZING BY COLLEMBOLA, COMPETITION, AND RELATIVE GERMINATION TIME ON GROWTH OF TWO OLD-FIELD PLANT SPECIES. Kathleen K. Harris

and R.E.J. Boerner, Department of Botany, The Ohio State University, Columbus, OH 43210.

These experiments were designed to evaluate the effects of grazing by collembola on VAM hyphae and relative germination date on growth of *Panicum virgatum* (a mycotrophic perennial grass) and on competition between *Panicum* and *Brassica nigra* (a non-mycotrophic annual). In the absence of competition, grazing by collembola did not affect total *Panicum* growth, though it did lower the root:shoot ratio; collembolan grazing had no significant effect on competition between *Brassica* and *Panicum* seedlings. To evaluate the importance of relative germination date, we compared the effect on *Panicum* growth of competition from *Brassica* seedlings of the same age as the *Panicum* (simultaneous germination) to competition from *Brassica* seedlings which germinated three weeks into the eight week competition period (offset germination). Competition from "simultaneous" *Brassica* reduced *Panicum* growth approximately 3X as much as "offset" *Brassica*. The root:shoot ratio of *Panicum* plants given "simultaneous" competition was >2X that of control or those give "offset" competition. Effects of collembola grazing, competition, and relative germination time on N and P uptake will also be discussed.

Board L EFFECTS OF SHOOT INVERSION ON THE DGT MUTANT TOMATO. Liang Shi and Morris G. Cline, Department of Botany, Ohio State University, Columbus, OH 43210.

The effects of shoot inversion on ethylene production and elongation of the inverted stem were investigated in the diageotropica (dgt) mutant tomato and its isogenic parent VFN8. The growth of the dgt shoot is horizontal. This anomalous habit can be corrected by exposure to ethylene. The question has been raised as to whether this lesion is in ethylene synthesis capacity or in the auxin receptor (for auxin-induced ethylene production). Our objective here has been to determine whether shoot inversion-induced ethylene production and retardation of stem elongation which may be caused

by ethylene are normal (i.e. comparable to that of the wild type VFN8). The results have shown that shoot inversion for periods of 24 to 72 hr retarded the elongation of the inverted dgt shoot. The fact that treatment with 0.5 mM AgNO₃ (an ethylene action inhibitor) partially reversed this retarding effect of inversion is suggestive of ethylene production and some inhibition of elongation in dgt. Determinations have and will be made on ethylene production following shoot inversion. We hope to report on these soon.

Board J PURIFICATION AND LOCALIZATION OF ENZYMES OF STARCH DEGRADATION IN SUGAR BEET LEAVES

Bin Li, Jerome C. Servaites, and Donald R. Geiger, Department of Biology, University of Dayton, Dayton, OH 45409-0001.

Sugar beet (*Beta vulgaris* L) leaves exhibit high starch phosphorolytic and hydrolytic activities, but the bulk of these activities are extrachloroplastic. Quantitative subcellular localization of enzymes that degrade starch showed that only about 20% of starch phosphorolytic and 30% of starch hydrolytic activities were associated with the chloroplast fraction. Starch phosphorylase, endoamylase, starch debranching enzyme and exoamylase were observed both inside and outside the chloroplast. Multiple forms of extrachloroplastic endoamylase and exoamylase were found. One of extrachloroplastic endoamylase was partially purified and its properties were studied and compared with that of chloroplastic enzyme. A debranching enzyme was purified to homogeneity. The purified enzyme is a monomer with a molecular weight about 105 KD. It has the maximum activity with pullulan as its substrate, but also has lower activities with soluble starch and amylopectin. Optimum pH was at 6.0. Some other characteristics of the purified enzyme such as subcellular localization, activation and inhibition by a number of factors were also investigated.

Board K YELLOW VERSUS REDCHRYSANthemum PIGMENT: COMPARISON OF TWO INDICATORS. Carol T. Oravec, Notre Dame College of Chio, 4545 Cllge Rd., Cleveland, OH 44121.

A readily available source of pH indicators is found in flowers of various colors. It has long been known that these pigments, when extracted with ethanol, would change color in various pH solutions. Ethanol extraction of the yellow and red mum yielded a similar yellow color. In acidic solutions the yellow mum turned green, whereas the red mum pigment turned orange. The pKa=3 for both the yellow and red mum extracts, as found by ultraviolet absorption spectroscopy. The visible absorption spectra of these two samples shows an absorption peak at 455 nm. for the yellow mum extract and a peak at 440 nm. for the red mum extract. HPLC separation and Infrared spectra indicate that the pigments are similar in their chemical structure. However, the yellow mum pigment has an extra FTIR peak at 2300 cm⁻¹, indicating a triple bond, possibly a nitrile. The NMR spectra also shows the yellow mum pigment to have an extra functional group near 1 ppm. Final identification of these two compounds should be possible with mass spectroscopy.

This research was initiated as a prototype study for a future undergraduate project. Any flower's extractable pigment can be used and its properties identified by the student. Miscibility in various solvents and color changes at various pHs is easily done with little equipment. A UV/VIS spectrophotometer is used for pKa determination.

Board M DOWNWARD AUXIN TRANSPORT POLARITY ACROSS GRAVISTIMULATED ROOTS IN CATION DEPENDENT. K. Bodo, L.M. Young and M.L. Evans, Department of Biological Sciences, Ohio Northern University, Ada OH 45810 and Department of Botany, The Ohio State University, Columbus, OH 43210.

Free Ca²⁺ appears to be required for normal gravicurvature in maize roots (Lee et al., 1983, Science 220: 1375-1376). Also, Ca²⁺ as well as certain other divalent cations (Ba²⁺, Cd²⁺) can induce curvature when applied asymmetrically to the caps of maize roots (Hasenstein et al., 1988, Plant Physiol. 86:885-889). Since asymmetric auxin redistribution across the root cap appears necessary for gravicurvature, we examined the movement of ³H-IAA across caps of gravistimulated roots in the presence of EGTA, a Ca²⁺ chelator. Following 90 min of gravistimulation, control roots developed significant downward auxin asymmetry (polarity-1.6). This did not occur with roots pretreated with 2 mM EGTA. Subsequent treatment with Ca²⁺ reversed the inhibitory effect of EGTA on gravi-induced asymmetric auxin movement. Ba²⁺ and Cd²⁺ restored some asymmetric auxin redistribution but not as effectively as Ca²⁺. The effect of EGTA/cation treatment on gravicurvature was also examined.

Board M
@ 9:00

THE EFFECTS OF ROOT CAP PLASMOLYSIS/REHYDRATION ON GRAVITROPIC CURVATURE AND GRAVI-INDUCED ASYMMETRIC AUXIN REDISTRIBUTION. ¹L.M. Young,

¹K. Rapp and ²M.L. Evans, ¹Department of Biological Sciences, Ohio Northern University, Ada, OH 45810 and ²Department of Botany, The Ohio State University, Columbus, OH 43210

Recent studies with maize roots indicate a strong correlation between gravitropic curvature and asymmetric auxin redistribution across the root cap (Young and Evans, 1988, Plant Physiol Suppl. 86:67). To test this relationship further and to obtain indirect information on potential pathways of auxin movement across the cap (apoplastic or symplastic), we examined the effects of transient root cap plasmolysis on curvature and ³H-IAA redistribution across the caps of gravistimulated roots. Prior to gravistimulation, root caps were plasmolyzed using either 0.5 M or 1.0 M mannitol for 30 min and then rehydrated. Gravitropism of roots treated with 0.5 M mannitol lagged slightly behind control curvature while the curvature of roots treated with 1.0 M mannitol was severely retarded. Asymmetric movement of ³H-IAA was strongest in controls, slightly weaker in roots treated with 0.5 M mannitol and sharply reduced in roots treated with 1.0 M mannitol. These results are consistent with the hypothesis that asymmetric auxin redistribution across the cap is a key factor in gravitropism.

SECTION C. Geology

First Morning at 9:00 a.m.

Saturday, April 28, 1990

132 Oelman

James Noel, Presiding

9:00 IS THERE A SYMBIOTIC RELATIONSHIP BETWEEN THE ARTS AND THE GEOSCIENCES?

G.D. McKenzie and L.M. Gaertner, Dept. of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210-1398.

The objective and rational geosciences interpret the world in a different way than the subjective, irrational and emotional arts; however, both disciplines improve our understanding of the environment. Interaction between the disciplines is growing and mutually beneficial. The arts impact the geosciences by improving the education of students and public, scientific communication, the promotion of the geosciences to the public, and the techniques (and in some cases the availability of data) of research. An understanding of the geosciences improves the quality, meaning, and enjoyment of an artistic product including art, music, literature/poetry, and cinema/video. In addition to providing inspiration for the arts, the physical environment also provides many of the materials used in the arts; indeed, in some cases the materials, processes, and forms of the earth are considered to be art. Metageology has been used to describe this realm where the arts and geosciences interact. Landscape architects also draw on metageology in designing landforms.

9:15 GEOLOGY OF THE INTERNATIONAL CENTER FOR THE PRESERVATION OF WILD ANIMALS (ICPWA), MUSKINGUM COUNTY, OHIO. P. Catanzariti,

W. True, E. Law and J. Kovach, Geology Department, Muskingum College, New Concord, Ohio 43762.

The International Center for the Preservation of Wild Animals (ICPWA), located in Muskingum County on reclaimed surface-mined land donated by Ohio Power Company, is a 9,154-acre preserve for endangered species. The Center's primary functions are preservation, research, and education.

Detailed geologic studies of the rocks exposed within and near the preserve were undertaken by us in an attempt to determine the stratigraphy and environments of deposition of the Pennsylvanian strata that comprise the local bedrock.

The results of our studies will be presented to the ICPWA in the form of an interpretive educational exhibit/panel that we anticipate visitors to the Center will find to be helpful in furthering their understanding of the geologic setting and history of the area and in the appreciation of some of the natural features that they may encounter there.

9:30

SHALLOW GEOPHYSICAL INVESTIGATION OF SANDY HOOK, SAN SALVADOR ISLAND, BAHAMAS.

Van Koughnet, R.W., Carney, C., Wolfe, P.W. Dept. of Geological Sciences, Wright State University, Dayton, Ohio 45435 and Boardman, M. R., Geology Dept., Miami University, Oxford, Ohio 45056.

Sandy Hook is a late Holocene carbonate strand plain located on the southeastern end of San Salvador Island, Bahamas. The strand plain consists of a series of skeletal sand ridges, underlain by Pleistocene carbonate rock. Little is known about the nature of this type of sand body. Strand plains form near sea level and exhibit characteristics of both eolian and marine sedimentation. Because of a lack of recognition criteria, they have seldom been recognized in ancient carbonate sand deposits. As part of a larger study of Sandy Hook, a number of geophysical methods were applied to test their usefulness in this type of environment, and to characterize the thickness of the sand body, fluids contained within the sand body, and the upper contact of the underlying Pleistocene rock. Seismic refraction and reflection were employed to provide seismic velocity data and depth information. Resistivity was used to model electrical properties and infer porosity with depth. Groundpenetrating radar was attempted to interpret shallow stratigraphy using the electrical properties of the subsurface. Preliminary data suggests an approximate depth of two meters to the water table and eight meters to the Pleistocene at Sandy Hook.

9:45 DELINEATION OF BURIED VALLEYS USING INTEGRATED

GEOPHYSICAL TECHNIQUES. Steven Becker, Benjamin H. Richard, Paul J. Wolfe. Wright State University, Department of Geological Sciences, 260 Brehm Lab, Dayton, Ohio 45435.

Various geophysical techniques have been used to study buried valleys. In this study we have integrated gravity, resistivity, magnetic, ground penetrating radar, seismic reflection, and seismic refraction techniques to determine the cross section of a valley and the character of the fill. The site investigated is in southwestern Ohio and has two buried valleys partially superimposed on one another. The bedrock consists of Silurian carbonate rock and Ordovician shale; the valley fill consists of glacial outwash and till. Each technique is dependent on different physical properties of the materials. The density contrast between the fill and bedrock permits delineation of the valley and approximate depth calculation. The magnetic susceptibility contrast between the fill and bedrock is so small that definition of a valley is improbable but more tests are necessary to establish the value of this technique. The resistivity survey led to a four-layer model with depths supported by seismic refraction and gravity. Seismic refraction located the boundaries of the valley and the depth to water and bedrock. Seismic reflection delineated a multilayered fill. Ground penetrating radar defined the near surface layers.

10:00

SEISMIC ANISOTROPY INVESTIGATION OF CARBONATE FRACTURE ZONES. Stephanie A. Clasen, Paul J. Wolfe. Wright State

University, Department Geological Sciences, Dayton, Ohio 45435.

Gravity studies in Morrow County, Ohio showed there was a positive correlation between gravity highs and erosional highs on the Knox Unconformity. A geological model that fits the results is for the gravity lows to represent solutioning valleys, caused by dewatering of shales overlying the Knox and fracturing of the Upper Silurian to Lower Devonian carbonate units above the shale. The purpose of the study was to determine the feasibility of detecting the fracture zones using seismic compressional waves and horizontally polarized shear waves. A site was chosen in Marion County, Ohio where approximately 30 feet of glacial till directly overlies the carbonate bedrock. Data were collected along four lines oriented N-S, E-W, NW-SE, and NE-SW using a twelve channel seismograph with varying offsets and a ten meter geophone spacing. Wave arrival times and amplitudes were examined for evidence of fracturing. Detection of fracturing in the shallow bedrock may prove to be a means of determining deep structure.

10:15

MINERAL IDENTIFICATION BY FOURIER TRANSFORM INFRARED REFLECTANCE SPECTROSCOPY.

Frederick R. Voner, Dept. of Geology Marietta College, Marietta, OH 45750

Fourier Transform Infrared Spectrometers allow rapid spectral reflectance measurements of minerals over the range 4000 to 400 cm⁻¹. The technique requires little or

no sample preparation and the spectra are sufficiently distinct and reproducible to be used for mineral identification purposes.

Mineral identification can be accomplished by comparing unknown target spectra with a library of reference spectra and searching for the best match. The reliability of a search result is a measure of the closeness of the match and the selectivity of the search result is a measure of the separation between the best match and the next n best matches.

Tests on a set of 48 target spectra using a reference library of 63 mineral spectra were performed over four different wavelength regions (4000 to 400 cm^{-1} , 4000 to 700 cm^{-1} , 1400 to 400 cm^{-1} , 1400 to 700 cm^{-1}). The results show that the most reliable and selective search results occur when the spectral comparisons are confined to the 1400 to 400 cm^{-1} wavelength region which contains the most intense spectral features. For this wavelength region 46 of the 48 searches gave acceptable results and of these all were correctly identified.

10:30 USE OF HISTOGRAMS IN "FINGERPRINTING" CRUDE OIL IN THE NORTHERN APPALACHIAN MICHIGAN, AND ILLINOIS BASINS. James A. Noel, Dept. of Geology, Ashland University, Ashland, OH 44805

Several methods have been used to uniquely identify crude oils: trace element analysis, gas chromatography, nuclear magnetic resonance, and chemical analyses. In a project at Ashland University to trace the origin and migration of crude oil, trace element analysis with nickel/vanadium ratios was used. Evidence presented shows that crudes from the northern Appalachian Michigan, and Illinois Basins of similar age especially Devonian and later have different ratios.

However, in trying to uniquely separate crude oils of the "Clinton" were not successful, even though, as is how they differed markedly in physical appearance. Histograms of the total suite of trace element analyses were made. The overall shape and distribution of the graphs clearly "finger print" the crudes from the different basins.

The project was made possible by a grant from the Ohio Board of Regents and the use of equipment at Sohio's Research Center.

10:45 ORIGIN OF THE EARTH'S MOON BY INTACT CAPTURE: IDENTIFICATION OF SOME FAVORABLE CAPTURE ORIENTATIONS. Robert J. Malcuit, David M. Mehringer, and Ronald R. Winters, Denison University, Granville, Ohio 43023

A three-body numerical integration code with an energy-dissipation subroutine has been devised to assess the conditions for intact gravitational capture of lunar-like planetoids from coplanar, near Earth-like heliocentric orbits. In our systematic examination of parameter space for capture, we can change (1) the eccentricity of the Earth's orbit, (2) the eccentricity of the planetoid's orbit, (3) the pericenter radius of the Earth's orbit, and (4) the pericenter radius of the planetoid's orbit. Using a zero eccentricity (circular case) for both the Earth's and planetoid's orbits and a semimajor axis of the planetoid's orbit of 0.969 AU (i.e., just slightly smaller than the Earth's orbit) we have had no successful capture scenarios. However, when the eccentricity of the planetoid's orbit is increased to 0.01, with the semimajor axis stated above and with the pericenter radius at 180°, we find that the zone of successful capture is about 60° wide along the Earth's orbit (from Earth anomaly 270° to 330°; Earth anomaly is the position of the Earth at the beginning of the calculation). Thus successful capture can occur in this anomaly zone for all prograde encounters within 1.43 Earth radii (measured from center of Earth) when the displacement Love number of the lunar-like planetoid is about 0.4 or higher and its Q value (dissipation factor) is near 1.

SECTION C. Geology

Second Morning at 9:00 a.m.

Saturday, April 28, 1990

103 Oelman

Mike Angle, Presiding

9:00

SYCAMORE FARM A FIELD LABORATORY FACILITY FOR RESEARCH IN PROBLEMS RELATED TO NON-POINT SOURCE CONTAMINATION OF SOIL AND WATER.

Schmidt, R.G., R.W. Ritzl, K. Kramer, S. Cheng, R.H. Andolsek, C. Lawson, and R. Schairbaum, Center for Ground Water Management, Wright State University, Dayton, OH 45435.

Wright State University has established a dedicated facility for advancing multidisciplinary research in environmental hydrogeology, environmental hydrogeochemistry and environmental biogeochemistry. Initial efforts have been directed toward preliminary characterization of the setting and establishing baseline parameters to be studied through a comprehensive longitudinal program. Sycamore Farm is a demonstration farm managed by the Montgomery County Soil and Water Conservation District and owned by the Ohio Department of Natural Resources. Its setting is typical of many similar farms in the glaciated terrain of the midwest and research results should be applicable widely.

A two-phase exploration program has been initiated and the first phase was completed this year resulting in the definition of four hydrostratigraphic units. This first phase consisted of an exploration/characterization program to delimit the physical-chemical environment of the farm. Initial activities included drilling, geophysical surveys and test pits to establish critical soils, surface and hydrogeologic parameters. The results have produced a conceptual model of the hydraulic setting of both the saturated and unsaturated zones as well as preliminary depth to bedrock and water table maps; soil type characterization; rainfall and runoff data; and agricultural and land use practice summaries for the area.

Soil and water monitoring devices were installed in preparation for the second phase for the purpose of filling previously identified data gaps and thereby further characterizing the site.

Other papers given at this meeting present results from the first and second phases of this research.

9:15 THE IMPACT OF FARMING PRACTICE ON HYDROGEOCHEMICAL EVOLUTION AT SYCAMORE FARM

Cheng, S., C. Lawson, and K. Kramer, Department of Geological Sciences, Wright State University, Dayton, OH 45435

The goals of this study are to find out the interaction between pesticide/fertilizer and hydrogeochemical processes, and to provide baseline information for future studies. This paper discusses our preliminary findings and next investigative strategy.

Because of respiration of roots and oxidation of organic matter, soil zone normally has high CO_2 content. CO_2 -charged soil water releases hydrogen ion, which is the major driving force for water-rock interaction. The addition of pesticide and fertilizer undoubtedly will change the chemical environment that plant and microorganisms depend on. As a result, CO_2 production and water-rock interaction will be affected. Plant and microbial activities are strongly seasonal dependent. $\text{P}(\text{CO}_2)$ and water chemistry should also reflect seasonal variation.

Six pressure-vacuum lysimeters have been installed at a depth of ~22" on fallow and tilled areas. Nitrate peak was observed after 50-60 days of fertilizer application.

In this study, soil gas and water samples will be collected from various depths and locations at different seasons. With the fallow area within the farm as control, the impact of pesticide and fertilizer applications and hydrogeochemical control of their mobilities can be reliably and objectively assessed.

9:30 ADVECTIVE FLUID TRANSPORT IN THE SUBSURFACE SATURATED ZONE AT SYCAMORE FARM EXPERIMENTAL WATERSHED

Ritzl, R. W., R.G. Schmidt, and R.H. Andolsek, Department of Geological Sciences and Center for Ground Water Management, Wright State University, Dayton, OH 45435

The Sycamore Farm Experimental Watershed is a ground-water research station in Southwestern Ohio, established for the long term study of non-point source pollution resulting from rural land use and agricultural practices (see Schmidt et al., this issue). The advective velocity of fluids including nitrate and pesticide within the fluid saturated groundwater regime is controlled by the hydraulics of an upper zone of fractured rock. The presence and orientation of these fractures is evident in core sample, electric borehole logs, azimuthal surface resistivity survey data, and hydraulic stress testing results. At the continuum scale, flow is horizontal. The eigenvector associated with the major principal value of the hydraulic conductivity tensor is directed N30E, as determined from the azimuthal resistivity survey, and from fitting anisotropic flow models to the results of hydraulic packer testing. The direction of the hydraulic gradient vector is co-linear with the principal axis of the hydraulic conductivity ellipse and consequently flow is also directed N30E. The magnitudes of the gradient and hydraulic conductivity in this direction were used to compute an advective velocity in the upper fracture zone on the order of .08 m/day, assuming a porosity of 15%. A lower, less fractured zone exists which is hydraulically isolated from the upper zone by an argillaceous aquiclude. The advective velocity of the lower zone is an order of magnitude less than the advective velocity of the upper zone.

9:45 REMOVAL OF PHENOL BY SOILS AND SOILS PLUS ACTIVATED SLUDGE. Howard H. Lo and Shirleen Nurmi, Department of Geological Sciences, and Yung-Tse Hung, Department of Civil Engineering, Cleveland State University, Cleveland, Ohio 44115.

The removal of phenol using different types of soils and soil/activated sludge mixtures was evaluated in the laboratory. Four types of soils were collected from the Cleveland Metropolitan area, namely, loam, sandy loam, silty loam, and silty-clay loam. The 1:1, 1:2, and 1:5

soil to solution ratios and the 1, 2, 3, 5, 7 day treatment time were used. The solution was composed of dechlorinated tap water and phenol. Activated sludge of various concentration was added in soils for treatment and a predetermined concentration of phenol was used in this experiment. Results showed that the loam, silty loam, and silty-clay loam appeared to be effective in reducing phenol levels over the given soil/solution ratios and designated treatment time intervals. The phenol removal efficiency ranged from about 25 to 50 %. Among the four types of soils which have been treated with activated sludge, silty loam and silty-clay loam proved to be most effective in removing phenol from solution with a phenol removal efficiency up to 70 %. Results indicated that addition of activated sludge to the soil enhanced biological oxidation of phenol.

10:00 GROUND WATER POLLUTION POTENTIAL MAPPING AND GLACIAL/SURFICIAL MAPPING IN SANDUSKY COUNTY, OHIO: A COMPARISON. Michael P. Angle, Ohio Dept. of Natural Resources, Div. of Water, Ground Water Resources Section, 1939 Fountain Sq., Cols., Oh. 43224

A basic premise of Ground Water Pollution Potential (GWPP) mapping is the heavy emphasis placed upon pre-existing data, particularly water well logs. Previous geological reports, theses, and mapping are also important sources of data. Glacial/surficial geologic mapping conducted by the O.D.N.R. Division of Geological Survey (DGS) in Sandusky County assisted in the determination of hydrogeologic settings, vadose and aquifer media, aquifer recharge, and soils. In return, examination of sub-surface data for aquifer and vadose ratings revealed interesting trends in the glacial geology of central Sandusky County.

In counties where glacial/surficial mapping has not yet been conducted, GWPP mapping can serve as a useful reconnaissance tool. GWPP mapping can also serve as a precursor to stack-mapping glacial deposits. GWPP mapping done in conjunction with glacial stack-mapping would provide the optimum background for future projects such as comprehensive aquifer evaluations and updated County Ground Water Bulletins.

10:15 CUYAHOGA RIVER: COMPOSITION UPSTREAM DEPENDS UPON RAINFALL. CORBETT, Robert G., MANNER, Barbara M., and QUICK, Thomas J., Department of Geography-Geology, Illinois State University, Normal, IL 61761, Department of Physics, Duquesne University, Pittsburgh, PA 15282, Department of Geology, University of Akron, Akron, OH 44325

Water quality of the Cuyahoga River upstream is a function of baseflow (ground water) and runoff, and downstream also of use by society. The upper 46 kilometers is a protected watershed, which provides water supply for Akron from Lake Rockwell. Downstream from Lake Rockwell to junction with the Little Cuyahoga River (26km) the river flows through a densely populated and industrialized area. Outfall farther downstream from Akron's wastewater treatment facilities results in serious decrease in water quality.

Discharge has been at extremes in 1988 and 1989, years of drought and high rainfall. We sampled the Cuyahoga River from headwaters (sites 1 and 2), between two major reservoirs also in the protected watershed (sites 3-7), and downstream from Lake Rockwell to junction with the Little Cuyahoga (sites 8-12) on June 22, 1988 and June 21, 1989. June, 1988 rainfall was 25% of normal whereas June, 1989 rainfall was 202%, resulting in a 16 fold greater June discharge the second year.

Effects of these extreme conditions on water quality are documented by this study. Data from the protected area indicate that baseflow (resembling ground water) is distinctly a Ca HCO₃ water, more concentrated than runoff. Runoff in the pristine area is nearly no dominant cation no dominant anion (MDC NDA) type, based upon Piper diagram interpretation.

Major element composition downstream from Lake Rockwell changed markedly in the drought year, ranging from Ca HCO₃ type from outfall of Lake Rockwell to MDC-C1 near the Little Cuyahoga, resulting from influence of Human activity on limited discharge. During high discharge in the wet year, water remained Ca HCO₃ type.

10:30 PROPERLY SEALING UNUSED WELLS. Douglas J. Barber, Ohio Dept. of Natural Resources, Division of Water, Ground Water Resources Section, 1939 Fountain Square, Columbus, Ohio 43224.

Unused or abandoned water wells pose a serious environmental threat to our drinking water supplies. These wells should be properly sealed to avoid aquifer degradation. Wells that no longer serve a purpose should be properly sealed, whether it be an abandoned well, a replaced well, or an unneeded monitor or test well. Reasons for sealing these wells include: 1) the prevention of surface contaminants from entering an aquifer; 2) the prevention of intermixing of water between aquifers; 3) the restoration of the aquifer to as close to its original condition as possible; and 4) the elimination of physical hazards. Basic procedures exist for properly sealing unused wells. These procedures include: 1) the removal of all equipment such as pressure lines, pumps, etc.; 2) the removal of screens, casings and liners where possible; 3) the placement in the well of a low permeability sanitary sealing agent, either clay, neat cement, or a combination of clay

and cement; and 4) the reporting of location and procedures used to the Ohio Department of Natural Resources, Ohio EPA, or your local county health department.

10:45 HYDROGEOLOGIC IRREGULARITIES IN THE CARBONATE BEDROCK OF NORTHWEST OHIO: THREE CASE STUDIES. James Raab. Ohio Dept. of Natural Resources, Division of Water, 1939 Fountain Sq., Columbus, Oh. 43224.

Ground-water investigations conducted by the Division of Water in the carbonate areas of Northwest Ohio have resulted in various observations. The City of Findlay's well field is located in a ground-water discharge area at the base of Limestone Ridge. Long term pumping of 1 mgd from two wells resulted in a radius of influence of less than 1/2 mile. The drilling and pumping test of two water wells for the City of Van Wert resulted in yields of 160 and 500 gpm. Both wells were drilled through the entire Silurian System. Major dewatering of the upper carbonate aquifer occurred. After 24 hours of pumping, the radius of influence had extended 1 mile from the pumping well. The pumping test of a well near Kalida, Ohio resulted in the differential drawdown in observation wells. After 7 days of pumping, water levels had declined 2.5 ft. in a well 1500 ft. south of the pumping and 7.73 ft. in a well located 2000 ft. west-southwest. Because of these irregularities, the use of aerial photography and landsat imagery, careful logging of wells drilled, and the use of caliper logs or down-hole camera are strongly recommended in all carbonate aquifer investigations.

SECTION C. Geology

Only Afternoon & Business Meeting

at 1:30 p.m.

Saturday, April 28, 1990

132 Oelman

Mike Angle, Presiding

2:00 COAL MINING METHODS IN OHIO DURING THE LAST 160 YEARS, HARRIS, Ann G., Department of Geology, Youngstown State University, 410 Wick Avenue, Youngstown, OH 44555

In order to predict the stability of an abandoned deep mine one must know and understand how the mining was done. From the 1830's until sometime in the 1940's the "room and pillar" method was used. The "longwall method" was used commonly in the large commercial mines.

Originally the tracks were wooden strips with metal strap nailed on. Eventually the mines changed to a narrow gauge metal rail. In the longwall mines the track is laid to the working area. The equipment runs on rubber tires.

Miners originally used hand tools such as picks, shovels, tampers & scrapers, needles, wedges, brass sledge hammers, black powder and carbide lights. The seam was undercut, holes were drilled into the coal, powder was placed and the coal was blown down. This basic method of mining remained the same even though the types of tools became more advanced. Hand tools gave way to steam powered tools which were replaced by equipment powered by electricity.

The major changes in mining occurred with the invention of the mechanical rotary cutters used in the longwall method of mining. The coal is then dumped into a loader from which it is transported to a conveyor to the surface.

2:15 MORPHOMETRY OF LOWER-ORDER TRIBUTARIES OF THE CUYAHOGA RIVER BETWEEN AKRON AND CLEVELAND, OHIO. John P. Szabo. Department of Geology, University of Akron, Akron, OH 44325-4101

Proximity to former ice margins, soil parent materials, depth to bedrock, response to baselevel changes, and relative age has influenced development of lower-order tributaries of the Cuyahoga River. Older tributaries near the Summit County morainic complex are oriented parallel to or extend southward from former ice margin positions, are developed in deltaic and lacustrine deposits, and have drainage densities as high as 23 km/km². North of the morainic complex, the flow directions of many tributaries have a northerly component. Drainage densities of these streams are as low as 3 km/km² where they flow across sandstone. Lower-order basins in this area are elongated, suggesting rapid response to a lower baselevel. Basins near Akron formed in unconsolidated materials have high basin area ratios. Long profiles of streams flowing across bedrock in both areas are irregular whereas those of streams flowing across valley fill are generally

concave up. Hypsometric integrals range from 0.45 to 0.65 and reflect the influence of baselevel not basin material. Analyses suggest that streams near Akron developed before or during the late glacial whereas those north of the morainic complex formed in response to headward erosion by an ancestor of the lower Cuyahoga River graded to Early Lake Erie.

2:30 TWO WISCONSINAN AND TWO ILLINOIAN TILLS IN HAMILTON, OHIO Richard P. Goldthwait, P.O. Box 656, Anna Maria, FL 34216

Exposed until 1960 by Two Mile Creek in northwest Hamilton City at the "dead end" of Lagonda Street was a 60-foot section of four glacial tills; the lower two separated by varves, the middle two by thick Sangamon paleosol, and the upper two by organic-rich silt on thin gravel. The upper three tills are covered by 7 to 60 inches of loess.

This cut was discovered by Fenneman before 1916, re-discovered by Durrell, and thoroughly analysed in 1959-60 by an Ohio State soils and geology team.

The upper rolling surface with Melvin loess and Russell soil, and the 36-45-17 sand-silt-clay till, agrees with Gooding & Stewart's "Shelbyville" (Woodfordian) till. A spruce log 47 inches above the base of the top till is ¹⁴C dated at 19,400±400 B.P. This agrees well with Lowell's and others' dates in Hartwell terminal moraine of Miami lobe. The silt break below it has juvenile accretion soil with horizontal carbonaceous streaks and a few freshwater mollusc shells. It represents a short withdrawal of Wisconsinan ice, maybe "Connersville". Thus the second till down is also Wisconsinan, probably Farmadalian "Fayette till" or possibly Altonian "Whitewater till". This earlier ice advance did not reach Wisconsinan terminal moraine.

The bottom two tills are Illinoian. Their similarity and the limited (100?) varves between them suggest a short deepwater break.

2:45 HOW MANY YEARS TO MAKE ONE WESTERN-OHIO END MORAINE? Jane L. Forsyth, Geology Dept., Bowling Green State University, Bowling Green, Ohio 43403.

There are approximately 12 end moraines in western Ohio, formed during the retreat of the Wisconsinan glacier. Their formation must have been relatively fast, since radiocarbon dates bracket this retreat as having taken place between 18,000-19,000 years B.P. (from Butler and Ross Counties to the south) and about 14,1000 years B.P. (post-till date from Williams County to the north). Twelve end moraines forming in a little more than 4000 years gives only about 350 years for each, but this does not provide time for the deposition of the intervening ground moraine. In addition, evidence such as overlapping end moraines, buried loess (at Goldthwait's "loess line," and northern tills with more clay content than those to the south (interpreted to have come from lake clays formed during a significant pre-moraine retreat) reveals that repeated retreat-readvance patterns occurred that also took time. As a result, each end moraine in western Ohio must have been formed in a period of no more than 100 years, and maybe only 50-75 years, less than an average human lifetime!

3:00 PLEISTOCENE STRATIGRAPHY OF THE KNOX COUNTY LANDFILL, VOISARD, Karen and WEATHERINGTON-RICE, Julie, Bennett & Williams, Inc., 2700 E. Dublin-Granville Road, Suite 550, Columbus, Ohio 43231

An extensive geophysical and test boring program at the Knox County Landfill has made it possible to develop a detailed Pleistocene stratigraphy and environment of deposition for the site. The stratigraphy has been correlated with Dr. Jane Forsyth's work for Knox County.

Two Late Wisconsinan tills have been identified, the Centerburg and the Mt. Liberty. Below the Mt. Liberty is a lacustrine clay unit which covers much of the site. Pollen analysis from organic deposits within the unit indicate a cold climate environment of deposition that may have been open water.

Below the lacustrine unit is a much older till, identified as Knox Lake. The till, which varies in thickness from 0 feet to over 80 feet has a significant weathered zone averaging about 10 feet vertically. The deposit is divided into two units by a series of sandy, silty outwashes ranging in thickness from 0 feet to over 10 feet. A pollen analysis from this zone indicated a cold depositional climate. There is no weathered zone below the outwash layer, indicating a short time between the two advances.

3:15 THE BURNING TREE MASTODON: A NEARLY COMPLETE SKELETON FROM SOUTHCENTRAL LICKING COUNTY, OHIO. P.E. Hooge, B.T. Lepper, T.A. Frolking, D.C. Fisher, J.E. Sanger, D.A. Wymer. Licking County Archaeology and Landmarks Society, Newark, Ohio, 43055

On 12 December 1989, a very well preserved mastodon skeleton (*Mammuth americanum*) was discovered in a shallow depression on property of the Burning Tree Golf Course, 4 km northeast of Hebron, Ohio (NE 1/4, NW 1/4, SE 1/4, Sect. 3, T. 1 N., R. 12 W.). The site is a small wetland situated on the gently undulating western flank of a north-south trending late-Wisconsinan end moraine approximately 6 km west of the late-Wisconsinan ice maximum. The partially-articulated skeleton occurred in fibric and hemiic peaty material approximately 3/4 to 2 m below a disturbed surface. The very poorly drained environment accounts for the excellent preservation of bone and plant material. The salvage excavation was a combined effort of volunteers from the Burning Tree Golf Course, Flowers Excavating, the Licking County Archaeology and Landmarks Society, the Ohio Historical Society, and Denison University.

3:30 SYMBIOTIC ASSOCIATION OF CRINOIDS, PLATY CERID GASTROPODS, AND CORNULITES IN THE UPPER ORDOVICIAN (CINCINNATIAN) OF THE CINCINNATI REGION

Stephen H. Felton, 5678 Biscayne Ave, Cincinnati, Ohio 45248 and Robert W. Morris, Dept of Geology Wittenberg University, Springfield, Ohio 45501

The presence of the crinoid *Glyptocrinus* on the Cincinnati seafloor created a new substrate niche for exploitation by platycerid gastropods and associated epizoans, notably *Cornulites*. The platycerids having become established in a coprophagous mode on the crinoid tegmen, became a substrate themselves for settling larvae of *Cornulites*, a tube dwelling epizoan. Five species of platycerid gastropods belonging to the genera *Cyclonema* and *Naticonema* have been found with *Cornulites* attached in several distinct patterns of life orientation. Many *Cornulites* oriented themselves to receive the fecal wastes of the platycerids, while others presumably took advantage of bottom currents filtered by the crinoids. Coprophagy was thus employed simultaneously by both platycerids and *Cornulites* in this symbiotic association with *Glyptocrinus*. In summary, *Glyptocrinus* provided a viable attachment and feeding site in an otherwise unstable bottom environment.

3:45 FOERSTE'S FORGOTTEN FORMATION, THE LOWER SILURIAN CENTERVILLE FORMATION OF OHIO. Mark A. Kleffner and Steven W. Riddle. Department of Geosciences, The Ohio State University at Lima, Lima, Ohio 45804 and Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210.

The base of the Brassfield Formation, or Belfast Member if present, is generally shown to mark the base of the Silurian System in Ohio. Foerste (1931) however, recognized a bluish clay shale unit with Silurian affinities underlying the Brassfield at three localities in Ohio. The unit was named the Centerville Formation by Foerste (1931), based on exposures just northeast of Centerville, Ohio, in a now flooded quarry. The Centerville underlies the Brassfield at many localities in Adams and Montgomery Counties in addition to those at which it was recognized by Foerste. It is a bluish green or green, slightly silty shale near its type section and a green, slightly silty shale with lenses, stringers, and/or interbeds of silty dolomite in Adams County, ranging in thickness from 0.6- to about 4.0-m. The Centerville is early Silurian (Rhuddanian) in age, bounded by unconformities, and probably a very shallow-water deposit. The Centerville is similar in lithology to both the underlying Ordovician Drakes Formation and overlying Belfast Member of the Brassfield, but can be distinguished from the former based on its dolomite interbeds and higher silt content and from the latter by its much greater shale content and absence of a massive nature.

4:00 PALEOSOL DEVELOPMENT IN THE MISSISSIPPIAN MAXVILLE LIMESTONE, EASTERN OHIO. Carney, C., Department of Geological Sciences, Wright State University, Dayton, Ohio 45435 and Boardman, M.R., Geology Department, Miami University, Oxford, Ohio 45056

The Maxville Limestone is exposed along a discontinuous outcrop belt trending northeast to southwest in eastern Ohio. The outcrop belt parallels the shoreline of a shallow sea that transgressed into the central Appalachian basin during Late Mississippian time. The Maxville is comprised of a laminated dolomite characteristic of tidal flat sedimentation overlain by shallow-water, restricted sediments (peloidal wackestones) and normal-marine deposits (fossiliferous packstones and grainstones). The upper part of the tidal-flat dolomite is commonly

brecciated, containing clasts of dolomitized mudstone. Its contact with overlying rocks is irregular and varies from flat to undulating with depressions of up to 0.5 meters. Teepees, complex fractures filled with coarse calcite cement, clotted peloidal micrite, circumgranular cracked grains, laminar micritic coatings or rinds on grains, and floating grains are indicative of a period of subaerial exposure and soil development. The presence of this paleosol indicates that transgression was not continuous, but was perhaps punctuated by sea-level fluctuations permitting the exposure surface (paleosol) to develop. Similar features in the Bahamas are recognized and require only about 100,000 years to develop.

4:15 CONTROLS OF FLUVIAL SANDSTONES IN THE DUNKARD BASIN, NORTHERN WEST VIRGINIA
DOMINIC, David F., Dept. of Geological Sciences, Wright State University, Dayton, Ohio, 45435

The coastal plain, on which Upper Pennsylvanian sandstones were deposited, prograded into a sea-lake separated from the larger mid-continental sea. Thus, the base level of these channels was isolated from eustatic changes. Climate during this 10 m.y. interval was also stable. The evolution of channel properties, therefore, most likely reflects the influence of intrabasinal controls. Quantitative reconstructions of bankfull geometry and hydraulics indicates that channels were of moderate sinuosity (1.3-1.8), were not braided, and were of two distinct sizes (average width 78 m and 250 m). Smaller channels show a consistent hydraulic geometry with an overall decrease in discharge throughout the studied interval. This decrease may reflect slower subsidence rates as the locus of sedimentation prograded beyond the northwestern margin of the Rome Trough. Larger channels occur only in the uppermost Waynesburg Formation. The increase in channel size and discharge is not accompanied by an increase in channel slope and is therefore not the result of regional tilting of the depositional surface. The superposition of channel sizes can be attributed to the progradation of the upper fluvial-deltaic plain, with a single trunk stream over the lower fluvial-deltaic plain where flow was divided among two or more distributary channels.

4:30 THE RELATIVE EFFECTIVENESS OF THREE TREE SPECIES IN STABILIZING URBAN HILLSIDES.
M.E.Thompson and M.M.Riesterberg, College of Mount St. Joseph, Mt. St. Joseph, Ohio 45051.

Trees can stabilize shallow soil on naturally wooded hillsides in Cincinnati, but the extent to which trees may enhance slope stability in heavily polluted areas in the city has not been determined. The effectiveness of a species in enhancing soil strength is dependent upon its capacity to reduce soil moisture and its roots' strength and distribution. Three pollution-tolerant species, black locust golden raintree, and white ash, were selected for a study of their relative effectiveness in enhancing the strength of silty-clay soil on a hillslope bordering a busy thoroughfare plagued with landslides. Test plots were planted in the silty-clay soil. Rows of 36 saplings of each species were planted using three soil treatments to determine the best method of enhancing root growth. A greenhouse study, run concurrently with the field study, measured the reduction of soil moisture by the three selected species via soil tensiometers and psychrometers. Preliminary studies of the depth and extent of roots measured from the field study, and the reduction of soil moisture within and between the three species suggest that black locust may be most effective in enhancing the stability of shallow soil on hillslopes in heavily polluted urban areas in southwest Ohio.

4:45 COMPARISON OF THE GEOLOGIC CONSTRAINTS ON ENVIRONMENTAL CONTAMINATION FROM TWO DOE URANIUM FACILITIES IN SOUTHERN OHIO. A. Dwight Baldwin, Jr., Geology Department, Miami University, Oxford, Ohio 45056.

The Portsmouth Gaseous Diffusion Plant (PGDP) and the Feed Materials Production Center (FMPC) at Fernald, OH, were built in the early 1950's to satisfy U.S. needs for both enriched and depleted uranium. The degree of environmental pollution from plant construction and operation reflects differences in regional geology and perception of plant operators concerning the associated environmental hazards.

Site selection for the uranium enrichment plant near Portsmouth, OH was based partially on the proximity of ample ground-water in the outwash aquifer of the Scioto River and its 37m elevation above the Scioto River floodplain. The low hydraulic conductivity of the Pliocene/Pleistocene sediments (filling a former Teays-Valley tributary in which the plant is located) has assured that the extensive PCB, VOCs, uranium and technetium contaminants have not moved offsite.

The same geologic factors that dictated the location of the PGDP were important in locating the FMPC at Fernald, OH. The plant produces milled and extruded metallic uranium for breeder fuel in DOE reactors. Unlike the PGDP, the FMPC sits on a Pleistocene river terrace and overlies a productive aquifer, resulting in extensive uranium and other industrial contamination of the Miami-River aquifer.

SECTION D. Medical Sciences

First Morning at 9:00 a.m.

Saturday, April 28, 1990

041 University Center

Dan Ely, Presiding

9:00 ENHANCEMENT OF TWENTY FOUR HOUR ISOLATED HEART PRESERVATION WITH AN IRON CHELATOR.
Gail Dunphy, Dan Ely, and Helen Richter*
Departments of Biology *Chemistry. The University of Akron, Akron, OH 44325.

During in-vitro heart preservation and reperfusion irreversible tissue damage caused by reactive oxygen intermediates, such as, the superoxide anion, hydrogen peroxide, and the hydroxyl free radical may occur. Prevention of hydroxyl radical production and the related oxidative damage of reperfused ischemic tissue by scavengers and/or chelators are primary importance in maintaining the tissue integrity and heart function. We have assessed whether the addition of deferoxamine mesylate (DFR) to a cardioplegia solution inhibited or scavenged free radicals during twenty-four hour heart preservation and reperfusion. The Langendorf isolated rat heart preparation was used and control hearts were compared to those preserved with DFR after 24 hours. The DFR increased cardiac performance as indicated by 22% lower diastolic pressure ($p < .05$) and 24% higher contractility ($p < .05$) compared to controls. The DFR group actually had 90% of its original systolic pressure after 24 hours. Lipid peroxidation as measured by malone dialdehyde (MDA) and cellular damage as indicated by creative kinase release were both decreased in the DFR group ($p < .001$ and $p < .01$, respectfully). In conclusion, DFR preserved left ventricular function, cell membrane integrity and reduced lipid peroxidation which suggests the mechanism of action is primarily through free radical removal.

9:15 THE USE OF CHIMERAS AS A TECHNIQUE TO STUDY A Y CHROMOSOME LOCUS IN SHR HYPERTENSION.
Schaus, S. and M.E. Turner, Department of Biology, The University of Akron, Akron, Ohio 44325-3908.

Y chromosome loci are difficult to analyze, due to their unique pattern of inheritance. We have developed a method to study these loci using gynandromorphs (chimeras). In the SHR model of hypertension a Y chromosome gene is involved, and this Y chromosome has been crossed into a WKY (normotensive) background. Male:female chimeras are produced to study this hypertensive Y chromosome. Eight cell stage embryos are removed from oviducts and the zona pellucida removed. Two embryos are fused in phytohemagglutinin and incubated overnight *in vitro*. The fused embryos are inserted into the uterus of a pseudopregnant female and carried to term. Resulting offspring are tested using a Y chromosome DNA marker to determine those offspring with both male and female cells. The correlation of male tissue with hypertension will allow those tissues where the Y chromosome locus is active to be discovered.

9:30 TWENTY FOUR HOUR MONITORING OF BEHAVIOR, RENAL AND MESENTERIC BLOOD FLOW IN SPONTANEOUSLY HYPERTENSIVE RATS ON HIGH SODIUM AND CONTROL DIETS.
Jacqueline Novak and Dan Ely, Department of Biology, The University of Akron, Akron, OH 44325

The objectives of this study were: 1) to monitor blood flow over a twenty-four hour period and 2) to determine if a high sodium diet (3%) produced greater stress induced reductions in renal and mesenteric blood flow in 4 month old spontaneously hypertensive rats after 8 weeks as compared to those on a control diet (0.3% sodium). Blood flow was measured by ultrasonic Doppler technique before and after acute mental air stress and over a 24 hour period. There were similar reductions in both renal and mesenteric blood flow (40%) responses to stress regardless of diet. The rats on the high sodium diet had higher systolic blood pressures (5%) higher and significantly greater increases in plasma norepinephrine (103%) ($p < .01$) as compared to the controls. Twenty-four hour blood flow recordings showed that behaviors such as grooming and standing caused significant increases

(75-100%) in renal and mesenteric blood flow. During sleep blood flow decreased to 20% of steady state. In conclusion, twenty-four hour blood flow monitoring in conscious freely moving rats is possible and specific behaviors dramatically change blood flow. Both high and normal sodium diets produced equal reductions in renal or mesenteric blood flow in response to acute stress.

9:45 SALT AND STRESS ACCELERATED HYPERTENSION IN THE SPONTANEOUSLY HYPERTENSIVE RAT (SHR) REQUIRES CENTRAL SYMPATHETIC OUTFLOW.

D. L. Ely, H. R. Bhagat and G. Dunphy. Dept of Biology, The University of Akron, Akron, OH 44325.

A high sodium (Na) diet (3% Na) and chronic social stress accelerates hypertension in the SHR. The mechanism of action is not fluid volume expansion but appears to involve the sympathetic nervous system. The objective of the study was to determine the role of the central nervous system sympathetic outflow and β -adrenergic receptors in sodium-stress accelerated hypertension in the SHR. The following groups of male SHR's (11 wks of age) were studied for 14 weeks with drugs administered in the drinking water (n=12/group): control group on a normal Na diet, (0.3% Na); high Na group (3% Na); high Na+ clonidine (centrally blocks sympathetic outflow); high Na+ propranolol (peripheral beta blocker); and high Na+ reserpine (central and peripheral norepinephrine depletion). Blood pressure (BP) was measured weekly by the tail cuff method and after 7 weeks each group was placed in a large population cage with females to induce territorial stress. The controls at 25 weeks of age had a BP of 190mmHg as compared to the high Na B.P.=225mmHg ($p < .001$); the propranolol B.P.=215mmHg ($p < .01$); the reserpine B.P.=200mmHg (n.s) and the clonidine B.P.=185mmHg (n.s). The data supports the concept that central nervous system sympathetic outflow is required for sodium-stress accelerated hypertension in the SHR, but beta adrenergic effects were not involved.

10:00 MEDIAL COLLATERAL LIGAMENT INJURIES IN FOOTBALL: A STUDY OF ACUTE, VIRGIN MEDIAL COLLATERAL LIGAMENT SPRAINS TO STRUCTURALLY SOUND KNEES

Sean E. Apke, Nelson J. Moore, and Owen J. Keller
Ohio Northern University, Department of Biological Sciences, Ada, OH 45810

The study determined the incidence, mechanisms, and conditions causing acute, virgin medial collateral ligament (MCL) sprains to structurally sound knees. Such knees had no past history of soft tissue injury. Data were collected from the Ohio Northern University Football Team during the 1987 and 1988 seasons. Data consisted of player position, class rank, method of injury, area of point tenderness along the MCL, severity of injury, turf type, weather conditions, physician referral, and the strength of the quadriceps and hamstring muscles based upon a pre-injury Cybex evaluation. The incidence of acute, virgin MCL sprains at ONU was fairly high, 17 for 250 players. Sixteen of the 17 injuries were first degree sprains. The junior class had the highest incidence of 11.1% for sustaining an MCL injury. Results showed that there was no significant relationship between strength or weakness of the quadriceps and hamstring muscles and injury. Six players were known to have good to excellent leg strength before injury. The mechanism causing 65%, or 11 of the 17 injuries, was a blow to the lateral aspect of the knee, and the position most injured in this way was the offensive lineman who had 5 injuries. All 17 injuries occurred on a dry, natural turf.

10:15 PARENTAL ATTITUDES REGARDING NEONATAL RESEARCH
Marcel Biel and R.E. McClead, Depts. of Nursing and Pediatrics, Children's Hospital, 700

Children's Drive, Columbus, Ohio 43205

The purpose of this study was to determine the attitudes of parents regarding the purpose, importance, and appropriateness of neonatal research. **Methods:** A questionnaire was mailed to 154 mothers of infants hospitalized in a Level III neonatal intensive care unit. **Results:** Seventy (45%) of the questionnaires were returned. Respondents were: married (77.1%), white (87%), high school graduates (88.6%), and primigravida (70%). Parents believe the purpose of medical research is to increase medical knowledge (90%), to improve the quality of medical care (96%), and to help the participating infants (96%). Most respondents (95%) believe medical research is important, and 74% believe medical research should be performed on infants. 86% of parents have a favorable opinion of parents who allow their infants to participate in medical research. Reasons parents would allow their infant to participate in a research project are: to increase medical knowledge (62%), to help their baby (68.4%), and to get the very best care (82.9%). **Conclusions:** Our findings document that parents find neonatal research an important and appropriate method of increasing medical knowledge. We

speculate that parents are more likely to consent to neonatal research if their child is to directly benefit from the research.

10:30 LITERATURE AND INTERVIEW BASED COMPARISON OF AIDS IN NORTHEASTERN OH-WESTERN PA WITH SAN FRANCISCO

S. Brown and M. Rudzik. Department of Biology, Westminster College, New Wilmington, PA 16172

The two areas were compared on the basis of cases, which were broken down by risk group and age. Also compared were anti HIV-I treatment, both standard and experimental, as well as ease of acquiring medical attention and the general nature of organizations to help those infected. Information sources included public health officials, health care workers and AIDS case managers.

Official reports showed approximately 7400 AIDS cases for San Francisco and approximately 70 in the five OH and PA counties. These may be underestimated. AZT, for adults, and AZT with inactivated gamma globulin for pediatrics, are standard treatments. The new drug DDI is also prevalent.

Regional attitudes have hindered organization and restricted housing in the OH-PA area, but through law and education, this is gradually changing. San Francisco saw AIDS peak in the mid 80's from those thought to be infected in the late 70's. The virus was thought to be transmitted to the OH-PA area by those infected in the early 80's with a peak expected in the late 80's or early 90's.

SECTION D. Medical Sciences

Second Morning at 9:00 a.m.

Saturday, April 28, 1990

043 University Center

Jere Boyer, Presiding

9:00 PHARMACOLOGICAL RESPONSIVENESS OF WINTER

DEPRESSION. Steven C. Dilsaver, Valerie, DelMedico, Amjed Quadri. Department of Psychiatry, The Ohio State University, 473 W 12th Avenue, Columbus, Ohio 43210-1228

Winter depression was demonstrated to respond excellently to tranlycypromine during the winter of 1988-89. The responsiveness of this syndrome to desipramine was assessed during the winter of 1989-90. Patients with winter depression (WD) were offered treatment with desipramine (DMI). Subjects typically reported > 10 consecutive winters of MD with spontaneous recovery in between the end of March and early June. The daily dose of DMI was increased to 200 mg/day over 4 to 8 days if tolerated. A plasma DMI level was obtained ≥ 7 days after reaching a constant dose. DMI was effective (mean reduction in symptoms > 75%) but produces more side-effects than tranlycypromine. Recovery was defined as attainment of a modified HRSD score of ≤ 5 . This scale rates weight gain, hypersomnia and increased appetite. Response occurs over a two- to four-week period. The rate of response to DMI is slower than that experienced by subjects treated with tranlycypromine (23 days, n = 14). Demographic and outcome data of subjects treated with DMI will be presented and contrasted with those of subjects treated with tranlycypromine.

9:30 ASSOCIATED PSYCHOPATHOLOGY IN WINTER DEPRESSION.

Valerie DelMedico, Amjed Quadri, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, OH 43210-1228

Eighteen (18) women and 4 men ranging in age from 24 to 57 years met either National Institute of Mental Health or DSM-III-R criteria for winter depression. Three (3) patients had bipolar disorder. Nearly 70 percent of the subjects met the DSM-III-R criteria for melancholia. Twelve (12) subjects reported unremitting pain with the onset of winter depression. Six (6) patients had headaches, two gastrointestinal pain alone for which they received the diagnosis of irritable bowel syndrome, one gastrointestinal pain and chest pain, and individual patients had chronic back and knee pain, arthralgias, and pain in the heels diagnosed by an orthopedic surgeon as due to "bone spurs." All patients with chronic pain treated with an antidepressant experienced complete relief. Three (3) patients had recurrent panic attacks. Two (2) patients exhibited bulimic behavior while depressed. Two (2) patients had exhibited bulimic behavior in the past not linked to the seasons. These patients had not been bulimic for > 3 years prior to treatment for winter depression. These data imply that winter depression is associated with forms of psychopathology not previously linked to it in the literature.

10:00 **NARROWING OF REGULAR PHOTOPERIOD PRODUCES INCREASED RESPONSIVENESS TO AN α_2 AGONIST.** Jason Peck, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Ave., Columbus, OH 43210

Properly timed bright artificial light (9:00 - 11:00 PM) blunts the physiological responsiveness of a central α_2 mechanism in the rat. The authors hypothesized that exposure to 18 hours of darkness per day would enhance the sensitivity of the rat to clonidine. The thermic responsiveness of 9 Sprague Dawley rats to clonidine 0.1 mg/kg ip was telemetrically measured at baseline, after 7 days of dark exposure (18 hours per day, lights on from 12:00 to 6:00 pm), and 7, 14, 21, and 28 days after being re-entrained to a 12-hour photoperiod. Following 7 days of dark exposure, the mean thermic response to clonidine was enhanced by 56% which differed from baseline significantly ($p < 0.02$, $df=8$). After the animals were re-entrained to a normal 12-hour photoperiod, the thermic response to clonidine remained elevated by 28%, 61%, 50%, and 30% on days 7, 14, 21, and 28, respectively. These data are consistent with the possibility that aberrant noradrenergic mechanisms are involved in the biology of seasonal depression.

10:15 **EFFECT OF DURATION OF PHOTOPERIOD ON RESPONSIVENESS TO A MUSCARINIC AGONIST.** Jason A. Peck, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Ave., Columbus, OH 43210

Bright light subsensitizes a central muscarinic mechanism in rats. We hypothesized that reducing the length of the photoperiod would enhance sensitivity of this muscarinic mechanism. Change in hypothermic response to oxotremorine was measured using an intraperitoneally implanted telemetric thermosensor. Seven (7) days of constant darkness dramatically increased the thermic response of the group to oxotremorine (0.25 mg/kg). The mean thermic response increased from $-0.35 \pm 0.4^\circ\text{C}$ (SEM) to $-0.96 \pm 0.18^\circ\text{C}$ ($p < 0.0001$, $df = 12$). The thermic response remained elevated for two days after return to standard vivarium conditions. To rule out the possibility that the induction of free-running accounted for our results, rats were exposed to a 6-hour photoperiod (12:00 to 6:00 PM) for 28 days. The sample exhibited "paradoxical" subsensitivity following 14 days and continuing until 28 days after exposure to a 6-hour photoperiod. Healthy rats apparently compensate to the stress of a narrowed photoperiod. The results will be discussed with reference to the cholinergic hypothesis of depression.

10:30 **EFFECT OF PHOTOPERIOD ON SENSITIVITY TO NICOTINE.** Steven C. Dilsaver, Jason A. Peck. Department of Psychiatry, The Ohio State University, 473 W 12th Ave, Columbus, OH 43210

Treatment with bright light blunts the thermic response of the rat to nicotine. We hypothesized that reducing the photoperiod would have the opposite effect. The change in hypothermic response to nicotine was measured using an intraperitoneally implanted telemetric thermosensor. The thermic responsiveness of 11 rats to nicotine (base) 0.25 mg/kg ip was telemetrically measured at baseline and after 7 days of exposure to constant darkness. Exposure to constant darkness resulted in significant enhancement of the hypothermic response to nicotine. This finding could be due to the induction of free-running. The effect of maintenance in an environment with a 6-hour photoperiod will allow us to determine whether entrained rats also exhibit an augmented hypothermic response to nicotine. Nicotine regulates the release of amines within the nigrostriatal and mesolimbic tracts. Manipulation of the light/dark cycle produces systematic alterations in the physiological response to nicotine. This is consistent (but not confirmatory) with the possibility that these manipulations affect the function of aminergic systems.

10:45 **SENSITIVITY TO CLONIDINE IS RELATED TO TIME OF DAY.** Jason A. Peck, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Ave., Columbus, OH 43210-1228

We measured the thermic response of the rat to the α_2 agonist clonidine (0.1 mg/kg, ip) at 9:30 AM, 2:30 PM, and 4:00 PM using a telemetric thermosensor implanted into the peritoneal cavity. Temperature was measured every 10 min for 120 min after the ip injection of clonidine. The mean thermic responses at 9:30 AM, 2:30 PM, and 4:00 PM were $-1.16 \pm 0.08^\circ\text{C}$ (mean \pm SEM, $n = 10$), $-0.50 \pm 0.12^\circ\text{C}$ ($n = 12$), and $-0.25 \pm 0.11^\circ\text{C}$ ($n = 9$), respectively. These means differ

significantly ($df = 2/28$, $f = 14.19$, $p < 0.0001$, one-way ANOVA). A post-HOC analysis showed that all means differed except 2:30 PM versus 4:00 PM. This may be due to insufficient time between clonidine challenges. Thus, the time of day when clonidine is administered appears to be related to physiological responsiveness. These data have implications for all basic and clinical studies in which clonidine is used. Circadian factors may greatly influence the outcome of these studies.

SECTION D. Medical Sciences

Only Afternoon & Business Meeting at 1:30 p.m. Saturday, April 28, 1990 041 University Center Lee Meserve, Presiding

2:00 **PCB AND ESTROUS CYCLICITY IN FEMALE RATS.** Lee A. Meserve, Joel Yeasting, Monica Sharma, and Laura M. Juarez de Ku, Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403-0212.

Ingestion of polychlorinated biphenyl (PCB) has been shown to depress thyroid status and alter adrenal steroid production in adult rodents. Additionally, reproductive capabilities of experimental rodents fed this pollutant have been found to be subnormal. These findings prompted the present study to determine whether PCB ingestion altered estrous cyclicity or circulating levels of estradiol and progesterone in sexually mature female rats. Normal cyclicity was established by performing vaginal smears on 12 female rats through at least two complete estrous cycles. Six control rats were continued on standard lab mash and six experimental animals were fed the diet to which 250 ppm of the PCB mixture Arochlor 1254 had been added. The experimental diet was fed for a minimum of 14 days, and both control and experimental rats were decapitated when the vaginal cytology was indicative of estrus. Estrous cycles for control animals averaged 4.5 days in length (range 3.0-6.0 days) and 5.1 days (range 3.0-6.8 days) for PCB-fed rats. While means estradiol levels did not differ significantly (control- 58.7 pg/ml; PCB- 64.7 pg/ml), values obtained for PCB fed rats demonstrated greater variability. These results can be interpreted to suggest that two weeks of PCB ingestion causes only subtle modification of estrous cyclicity. Acknowledgement: Thanks are due Phyllis Luke of ICN for provision of RIA kits.

2:15 **THE EFFECT OF ANTI-THYROXINE ANTI-SERUM ON CIRCULATING LEVELS OF THYROID HORMONES IN FIFTEEN DAY OLD RATS.** David E. Albert and Lee A. Meserve. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403-0212.

Autoimmune thyroiditis results clinically when antibodies against thyroid products alter thyroid status. However, experimental examination of this problem has not been reported. In the present study the effects of anti-thyroxine anti-serum injection on thyroid status in neonatal rats were studied. This was accomplished by administering the anti-serum to rat pups on the second and fourth days after birth and by subsequently measuring serum thyroid stimulating hormone (TSH), thyroxine (T_4) and triiodothyronine (T_3) levels by radioimmunoassay when the pups were fifteen days old.

Interpretation of results indicated a significant elevation of both serum T_4 and T_3 as well as TSH levels depressed to one-third of normal in the rats that had received injections of the anti-serum. Electron microscopic examination of thyroid tissue from those rats which received anti-thyroxine anti-serum revealed numerous colloid-filled vacuoles in the follicular cells, whereas tissue from control rats had fewer of these vacuoles. These findings clearly suggest that the exogenous administration of anti-thyroxine anti-serum to rats during the neonatal period induces a state of hyperactivity of the thyroid gland. This effect appears to be primarily directed at the thyroid gland itself, rather than at hypothalamic or hypophyseal levels of control of thyroid status.

2:30 **MODULATORY EFFECTS OF VASOPRESSIN ON THE AUTONOMIC NERVOUS SYSTEM.** Linda N. Capwill, Cyrilla H. Wideman, and Helen M. Murphy, John Carroll University, Cleveland, Ohio 44118.

This research examined the modulatory effects of vasopressin on the autonomic nervous system (ANS) in vasopressin-deficient Brattleboro rats (DI) and Long Evans rats (LE) under normal and stressful conditions. The activity of the ANS was evaluated on the basis of heart rate and gastric ulceration. Four groups of animals were studied. Group 1 served as controls for the entire project, DI and LE rats were subjected to 16 days of nonstressful conditions. In Groups 2-4, the experimental paradigm was 7 days of non-stressful and 9 days of stressful conditions. The external stress was a period of 23 hours of food restriction. Group 2 consisted of DI and LE rats that had been surgically bilaterally vagotomized or sham-vagotomized. Group 3 consisted of DI rats which received daily injections of vasopressin or an equivalent volume of peanut oil (vehicle). This group was utilized to study the activity

of the ANS within DI rats receiving replacement vasopressin therapy. Marked changes in heart rate, body weight, food and water intake, survival time, presence or absence of gastric ulceration were evident within specific rat groups. Vasopressin replacement significantly ameliorated deficits noted in DI rats subjected to the stress of food restriction.

2:45 THE EFFECTS OF VASOPRESSIN ON MATERNAL BEHAVIOR IN THE RAT. Ida A. Friedman, Cyrilla H. Wideman, and Helen M. Murphy, John Carroll University, Cleveland, Ohio 44118.

Maternal behavior in the rat consists of a number of integrated activities concerned with the birth, maintenance, nutrition and protection of the young. In the rat, an altricial species, the young are physically and behaviorally immature. The normal maternal behavior patterns exhibited by the postpartum female are essential for rat pup survival. The spontaneous appearance of maternal responsiveness seems to be initiated by hormonal changes that occur prior to parturition. The effect of vasopressin, a polypeptide hormone synthesized in the anterior hypothalamus, was studied as to its effect on the maternal behavior of the rat at the time of parturition and for three weeks postpartum. Nest building, pup retrieving, nursing, time on the nest, pup survival, and pup growth were evaluated in primiparous control Long Evans (LE) rats, vasopressin-deficient Brattleboro (DI) rats, DI rats injected with vasopressin (DIVP), and DI rats injected with peanut oil. All of the rats built nests, retrieved pups, and nursed pups similarly. The LE and DIVP mothers spent considerably more time on the nest and their pups had a significantly higher percent of weight gain. These results indicate that, although vasopressin may not affect spontaneous initiation of maternal behavior, it does play a role in the maternal-infant relationship.

3:00 THE EFFECTS OF VASOPRESSIN ON ACTIVITY STRESS. Michael J. Leslie, Helen M. Murphy, and Cyrilla H. Wideman. John Carroll University, Cleveland, Ohio 44118.

The hormone vasopressin was studied with respect to its central effects on activity stress and subsequent self-starvation, as well as its peripheral effects on water consumption and ulcer formation. This study was conducted by comparing normal Long-Evans (LE) rats to Brattleboro (DI) rats which, because of a genetic mutation, are incapable of producing hypothalamic vasopressin. All rats were housed in individual activity wheel cages throughout the experiment. Animals were divided into the following groups: 1) ad-lib access to food and water (DI-AL and LE-AL), 2) ad-lib access to water and 1 hour access to food (DI-FR and LE-FR), 3) ad-lib access to water, 1 hour access to food, and daily injections of vasopressin (DI-VP), and 4) ad-lib access to water, 1 hour access to food, and daily injections of peanut oil (DI-OIL). Water consumption was significantly lower in groups LE-FR and DI-VP than in the groups DI-FR and DI-OIL. Ulcer formation was significantly higher in groups DI-FR and DI-OIL than in groups DI-VP and LE-FR. Neither vasopressin nor oil injections ameliorated enhanced running associated with food restriction in DI animals. These results indicate that injections of vasopressin can control peripheral disorders in DI animals, but due to its inability to cross the blood-brain barrier, may not affect centrally mediated behaviors.

3:15 SEROTONERGIC ALTERATIONS OF SUCROSE CONSUMPTION IN NORMAL AND VASOPRESSIN-DEFICIENT RATS. Stephen R. Archacki, Cyrilla H. Wideman, and Helen M. Murphy. John Carroll Univ. Cleveland, OH 44118.

The Brattleboro rat (DI) is a mutant form of the Long-Evans strain (LE) and lacks the gene necessary to synthesize vasopressin. The purpose of this experiment was to determine if LE and DI rats have a different preference when simultaneously offered an 8% sucrose solution and tap water. Furthermore, it was determined if the preference of the rats noted under nonstress conditions could be altered by: a) food restriction, b) the administration of cyproheptadine (a serotonergic antagonist), or c) fenfluramine (a serotonergic agonist). The animals were divided into six groups. Group 1 was subjected to ad-lib access to food during the entire 16 day experiment. Groups 2-6 were subjected to two conditions: i) ad-lib access to food during a 7 day habituation period and ii) one hour access to food during a 9 day experimental period. In addition, groups 3 and 4 received an injection of cyproheptadine or fenfluramine respectively. Groups 5 and 6 served as vehicle controls. The LE rats displayed a modulated or regulated intake of sucrose compared to DI animals. In addition, both strains had an increased intake of sucrose solution with the administration of cyproheptadine and

food restriction, while fenfluramine decreased it. The results suggest an interaction between vasopressin and the neurotransmitter, serotonin, which plays a key role in the carbohydrate preference of an animal.

3:30 THE EFFECTS OF VASOPRESSIN ON SALT PREFERENCE IN RATS. Colleen McKale, Cyrilla H. Wideman, and Helen M. Murphy, John Carroll University, Cleveland, Ohio 44118.

The absence of vasopressin, as found in the genetic mutation of the Brattleboro rat (DI), has helped to identify regulating mechanisms of this hormone through comparisons done with the normal parent strain, the Long-Evans rat (LE). In this experiment, the intake of water was measured against the intake of .9% sodium chloride solution to determine if there was a significant preference among groups. Four subject groups were used: 1) LE rats, 2) non-injected DI rats, 3) DI rats injected with vasopressin, and 4) DI rats injected with the vehicle. A habituation period of ad-lib access to food, water, and saline solution took place for 7 days. This was followed by an experimental period of 9 days with a 23-hour food restriction period and ad-lib access to both the water and saline solution. The LE rats were not found to have a significant preference for the intake of water or saline solution during habituation, but did significantly prefer the saline solution during the experimental period. The uninjected DI rats and the vehicle injected DI rats preferred water during the habituation period, but had no preference during the experimental period. The vasopressin injected DI rats did not have a preference for water or saline during either period.

3:45 NAPHTHALOCYANINE DERIVATIVES AS PHOTSENSITIZERS FOR TUMOR THERAPY.

M.M. Zuk(1,2), B. Rihter(2), W. Ford(2), M.E. Kenney(3), M.A.J. Rodgers(2) & M. Kreimer-Birnbaum(1) (1)Research Department, St. Vincent Medical Center, 2213 Cherry St., Toledo, OH 43608; (2)Center for Photochemical Sciences, Bowling Green State University, Bowling Green, OH; (3)Department of Chemistry, Case Western Reserve University, Cleveland, OH

Bis(di-isobutyl octadecylsiloxy) silicon 2,3 naphthalocyanine (iso-BOSiNC) has been synthesized with a high degree of purity. Due to its strong optical absorbance near 770 nm ($\epsilon \approx 5 \times 10^5 \text{ M}^{-1} \text{ cm}^{-1}$) it is being studied for potential use in photodynamic therapy of tumors. IsoBOSiNC is stable in solutions kept either under laboratory lighting conditions or even with intense illumination, for up to 4 hours. Pharmacokinetic studies were carried out in controls and in rats carrying transplantable FANFT (N-[4-(5-nitro-2-furyl)-2-thiazolyl]formamide) induced urothelial tumors: utilizing solvent extraction and HPLC on silica columns, serum clearance and tissue distribution of the drug was achieved. At an injected dose of 0.50 mg/kg body weight, the ratio of drug in tumors to drug in surrounding (non-tumorous) tissues was maximal 24 h after injection. Photodestruction of this tumor by illumination with laser light may therefore be most effective at this post-injection time.

[Supported by grants from NIH CA-46281 and the F. M. Douglass Foundation.]

4:00 PERFLUORODECANOATE (PFDA) EFFECTS ON RAT LIVER ENZYMES OF FATTY ACID METABOLISM. S.S. Singer, K.C. McGee, S.L. Payson, and C.A. Knapke. Department of Chemistry, U. of Dayton, Dayton OH 45469

The toxicant PFDA causes major changes of rat liver lipids. To model the basis for the changes we studied carnitine acyltransferase(CA), acyl-CoA oxidase(AO), and acyl-CoA synthetase(AS) from rat liver. 1) Lauroyl-CoA was a better CA substrate than palmitoyl-CoA(activity ratio, 1.99[±].22). Palmitoyl and lauroyl transfer to carnitine was activated by 55-440 μM PFDA. The PFDA effect on palmitoyl transfer (79-16%) was larger than that on lauroyl transfer(33[±]12%). Kinetics were complicated and suggested that PFDA turned CA on maximally until substrate gave out, regardless of acyl-CoA level used. 2) Study of AO used palmitoyl- and lauroyl-CoA. Lauroyl-CoA was the better substrate(activity ratio 1.52[±].23). PFDA inhibited lauroyl- and palmitoyl-CoA oxidation from 36 to 440 and 110 to 440 μM , respectively. Inhibition of C-18 acyl-CoA oxidation was competitive(K_I , 313[±]61 μM). We could not determine K_I with lauroyl-CoA. However, data supported similar inhibition and a K_I 1/3 that with C-12 acyl-CoA. 3) With AS, laurate and palmitate were equivalent substrates. 110-440 μM PFDA inhibited both acylations similarly. PFDA effects on the enzymes are compared to those with nonrat enzymes already tested.(This effort was supported by AFOSR Minigrant S49620-88-C-0053).

4:15 EFFECTS OF MATERNAL CRACK/COCAINE USE ON HUMAN FETAL DEVELOPMENT: A LITERATURE REVIEW
Karen O. Wilson and Bonnie L. Lamvermeyer. Department of Biology, Denison University, Granville, Ohio 43023.

An extensive literary review was conducted to study the effects of maternal cocaine use on human fetal development. The study revealed that infants exposed to cocaine in utero are at a higher risk of fetal death than non-exposed infants. Cocaine infants at birth were reported to weigh as little as 2400 g, and have gestational ages as early as 34 weeks. Genitourinary tract malformations, such as hydronephrosis, have been observed in cocaine infants. Neonates have been found to exhibit temporary irregular electroencephalograms. The defects found might be explained by the postulate that the vasoconstrictive action of cocaine reduces uterine blood flow and fetal oxygenation such as has been demonstrated in the sheep model. Cocaine-exposed infants have been shown to display irregular post-natal psychological behavior. Future research on infants born to mothers of higher socioeconomic status will be necessary to confirm these findings.

4:30 NEUROMUSCULAR STIMULATION EXERCISE FOR SPINAL CORD INJURED PATIENTS. SP Hooker, MM Rodgers, SF Figni, and RM Glaser. Dept. of Rehabilitation Medicine & Restorative Care, Wright State University Research Ctr, 3171 Research Blvd., Kettering, OH 45420.

Several studies were conducted to determine physiologic responses in SCI patients to acute and chronic functional neuromuscular stimulation (FNS) knee-extension (KE) and leg cycle ergometry (LCE) on a specially constructed KE device and "ERGYS 1"™ ergometer. Peak levels of oxygen uptake ($\dot{V}O_2$) and cardiac output (Q) increased 130% and 32%, respectively, during acute FNS-KE exercise. However, acute FNS-LCE elicited markedly higher increases in $\dot{V}O_2$ (350%) and Q (250%) indicating that FNS-LCE may be more effective in promoting cardiovascular training effects than FNS-KE. Compared to able-bodied subjects performing voluntary (VOL) LCE at equal power outputs (PO), SCI subjects displayed significantly ($p < .05$) higher levels of $\dot{V}O_2$, heart rate (HR) and pulmonary ventilation (\dot{V}_E), and lower levels of calculated net efficiency during FNS-LCE. These data indicate that FNS-LCE is mechanically inefficient and physiologically more stressful than VOL-LCE. Compared to VOL-ACE, FNS-LCE elicits significantly higher changes in blood lactate level per unit of $\dot{V}O_2$ -increase suggesting substantial anaerobiosis during FNS exercise. Significant increases in knee range of motion and quadriceps muscle strength (peak FNS-KE load), and decreases in thigh skinfold thickness were observed following both FNS-KE and FNS-LCE training (36 training sessions). However, only FNS-LCE training resulted in significant changes in peak levels of PO, $\dot{V}O_2$, \dot{V}_E , Q, and HR during FNS-LCE which supports the principal of training specificity. A lack of change in left ventricular stroke volume indicates that the increased physiologic responses observed after FNS-LCE training are due to the higher PO attained via peripheral muscular rather than central cardiovascular training adaptations.

Supported by VA Rehabilitation R & D Service (Grant #B433-RA)

SECTION D. Medical Sciences

Poster Session at 3:30 p.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board 0 HYPOSMOTIC STIMULATION OF GASTRIC ACID SECRETION. Thomas J. Sernka, Department of Physiology & Biophysics, Wright State University, Dayton, Ohio 45435
@ 3:30 p.m.

As measured by aminopyrine (AP) accumulation, acid secretion by isolated gastric glands and parietal cells was increased several-fold by incubation in hyposmotic medium, 200 mOsm/kg. Studies were undertaken to determine the mechanism of this stimulation of acid secretion. Gastric glands and parietal cells were prepared by enzymatic digestion of a gastric mucosal mince obtained from the rabbit stomach perfused under high pressure. Parietal cells were purified by density gradient centrifugation. Glandular and cellular volumes were determined from wet and dry weights corrected for extracellular inulin space. Hyposmotic stimulation of acid secretion was transient with a peak at 10-15 minutes incubation. Glandular cell volume also achieved its maximum at 10-15 minutes. Both the hyposmotic AP accumulation and the intraglandular water declined thereafter to isosmotic values after 45 minutes. The hyposmotic stimulation of parietal cells was completely abolished by pre-incubation with omeprazole, a specific inhibitor of H/K-ATPase, or by substitution of nitrogen

for oxygen gas in the medium. It is concluded that hyposmotic stimulation of gastric acid secretion involves increased activity of parietal cell H/K-ATPase triggered possibly by K and/or Cl efflux to achieve down regulation of cell volume.

THE ROLE OF 5-HT₃ RECEPTORS IN CHEMOTHERAPY-INDUCED NAUSEA AND VOMITING. Richard E. Stark.
Board P
@ 3:30 p.m. Adria Laboratories, 7001 Post Road, Dublin, Ohio 43017.

Nausea and vomiting are among the most common and debilitating side effects of cancer chemotherapy. These side effects can cause patients to refuse potentially effective regimens or in some cases the dosages used in these regimens must be reduced below efficacious levels. Precisely how cytotoxic drugs cause emesis has not been determined. Cytotoxic drugs are known to increase levels of serotonin (5-HT) in plasma by causing release of large amounts of 5-HT from enterochromaffin cells. Recent evidence has suggested the possible involvement of a 5-HT receptor subtype (designated 5-HT₃) in the mechanism of chemotherapy-induced emesis. Metoclopramide (MCL), a dopamine antagonist which possesses weak 5-HT₃ antagonist activity, is known to effectively reduce vomiting caused by cytotoxic drugs, while other more potent and selective dopamine antagonists such as domperidone and haloperidol are ineffective against such emesis. Moreover, ADR-851, a compound which is more potent than MCL in antagonizing 5-HT₃ receptors both *in vivo* and *in vitro* but which lacks dopaminergic activity, has been found to be more effective than MCL in blocking emesis induced by cisplatin in dogs. Radioligand binding studies have revealed the existence of large populations of 5-HT₃ receptors both centrally in the emetic center (EC), and peripherally on the membranes of vagal afferent neurons which send projections to the EC. These results indicate that 5-HT₃ receptors may be involved in the mechanism of chemotherapy-induced vomiting, although it remains to be determined if the specific receptor populations which could be responsible for such emesis are located in the brain, in the periphery, or both.

EFFECT OF FETAL STRIATAL TRANSPLANTS ON THE PERMEABILITY OF THE BLOOD-BRAIN BARRIER IN ADULT RAT STRIATUM.

Board B
@ 3:30 p.m. K.J. Bertram, S.Y. Lu, L.K. Mannix, A.B. Norman, and P.R. Sanberg. Depts. of Psychiatry and Physiology, University of Cincinnati, College of Medicine, Cincinnati, OH 45267.

The break down of the blood-brain barrier (BBB) may complicate the use of fetal tissue transplants in the treatment of neurodegenerative disorders. To determine the integrity of the BBB following tissue transplantation, unilateral 16-17 day fetal striatal transplants (1-1.3mm³) were placed stereotaxically into the striatum of adult male Sprague-Dawley rats (200-250g). Sham operated rats received equivalent amounts of Ringer's solution. BBB permeability to phospholine iodide, an acetylcholinesterase inhibitor which normally does not cross the BBB, was examined at one and four weeks post transplantation. Half of the rats from each treatment group were injected with phospholine iodide (65ug/kg i.m.) 30 minutes prior to cardiac perfusion. Brains were sectioned (40um) on a microtome and stained for cresyl violet and acetylcholinesterase. In a control experiment, phospholine iodide (32.5ng) was injected unilaterally into the striatum of normal adult rats 30 minutes prior to perfusion. There was a marked inhibition of acetylcholinesterase in the injected striatum. In contrast, no penetration of systemically administered phospholine iodide into host striatal tissue was detected in rats which received transplants or sham operations. It was concluded that the BBB is not permeable to phospholine iodide via the fetal striatal transplants indicating that the BBB is intact.

Board G THE EFFECT OF THICKNESS OF CERAMIC RESERVOIR @ 3:30 p.m. CAPSULES ON THE SUSTAINED DELIVERY OF STEROIDS. Hamed A. Benghuzzi, Ann Marie Barbaro and Praphulla K. Bajpai. Biology Department, University of Dayton, Dayton, OH 45469.

The purpose of this investigation was to study the effect of thickness of the aluminum-calcium-phosphorous oxides (ALCAP) ceramic reservoir on the delivery rate of testosterone (TE), corticosterone (CS), and Estradiol (E₂). ALCAP capsules were fabricated by compressing calcined powder and sintering the capsules at 1400°C for 36 h. The final inner surface areas of the ceramics were 2.53 ± 0.035 (group I) and 1.71 ± 0.023 cm² (group II). Outer surface areas were 4.31 ± 0.064 and 3.44 ± 0.023 cm². The amount of steroids released was determined spectrophotometrically. Results of this investigation showed that: (1) the lower surface area (thin ceramics) released steroids at a faster rate, (2) the molecular structure and weights of steroids played an important role in the release of steroids from the ceramics. Thus, both thickness of the ceramic capsule the molecular structure of the steroid should be taken into account when designing a sustained release ceramic drug delivery system.

Board L THE USE OF POLYCAPROLACTONE AND POLYLACTIC ACID CYLINDRICAL RESERVOIRS FOR SUSTAINED DELIVERY OF STEROIDS. Hamed A. Benghuzzi, Laura Loos, and Praphulla K. Bajpai. Biology Department, University of Dayton, Dayton, OH 45469.

Various forms of both polycaprolactone (PCL) and polylactic acid (PLA) have been used experimentally and

clinically as drug delivery devices. The objective of this study was to investigate the capability of compressed cylindrical capsules of these polymers to deliver testosterone and progesterone. A total of 20 capsules were fabricated from each polymer by compressing the powder at 900 Kg compression load. The reservoir of each experimental capsule was loaded with 20 or 40 mg of either testosterone or progesterone. Total amount of steroid released from each capsule in ethanol solution was measured spectrophotometrically. Results of this investigation showed that: (1) PCL cylindrical capsules released steroids in a sustained manner but in higher amounts than PLA capsules, (2) the rate of testosterone release was higher than the release rate of progesterone from both polymeric systems. It is apparent that both physicochemical nature of the polymers and molecular structure of the steroids delivered played a role in the release of steroids from the PCL and PLA capsules.

Board D BIOMECHANICAL PROPERTIES OF THE GUT IN @ 3:30 p.m. COPPER DEFICIENT RATS. Keith A. Crist & Augusta Askari. Department of Surgery, Medical College of Ohio, Toledo, OH 43699

Copper deficiency is known to result in reduced collagen crosslinking. Here we have evaluated effects of copper deficiency during growth on biomechanical properties of the gut in 11 wk old rats. Weanling male Sprague-Dawley rats (50+9 g) were fed ad lib a copper deficient (.6 ug/7g) or adequate (6 ug/g) diet for 8 wk. Copper deficiency was evaluated at termination of the experiment by liver analysis. Copper deficient rats had lower final body weights than controls (284+7 g vs 310+17 g). Following euthanasia, samples of descending colon and jejunum were removed for determination of breaking strength and elastic stiffness by means of a specially constructed tensiometer. Breaking strength was greater for colon than jejunum (.64+.06 N vs .42+.04 N); elastic stiffness was greater for jejunum than colon (1.21+.04 N vs .88+.06 N) across dietary treatments. There was no significant effect due to copper deficiency on either parameter. Development of bowel strength appears insensitive to copper deficiency during this phase of growth in the rat.

Board H THE EFFECT OF A COPPER-DEFICIENT DIET ON ENZYME ACTIVITIES IN RAT AUDITORY STRUCTURES. @ 3:30 p.m. William B. Farms, Donald A. Godfrey, and Augusta Askari, Departments of Otolaryngology and Surgery, Medical College of Ohio, Toledo, Ohio 43699-0008.

Weanling male Sprague-Dawley rats fed a copper-deficient diet ad-libitum for eight weeks exhibited no noticeable effect on the activities of four enzymes in the cochlea, cochlear nucleus (CN), or inferior colliculus (IC). Enzymes studied included two enzymes of energy metabolism, malate dehydrogenase (MDH) and lactate dehydrogenase (LDH), and two enzymes of neurotransmitter metabolism, choline acetyltransferase (ChAT) and acetylcholinesterase (AChE). Copper-deficient rats were fed 0.6 mg Cu/kg diet; the control rats were fed 6.0 mg Cu/kg diet. Mean initial rat weight was 50 g. At sacrifice, mean copper-deficient rat weight was 287 g, while mean copper-adequate rat weight was 314 g. Enzyme activities were assayed in homogenates of the auditory structures. Although the amount of copper in the feed affects other aspects of the biochemistry of the rat, it does not affect MDH, LDH, ChAT, or AChE activity in these sensory regions. [Supported by NIH grant NS17176]

Board A URINARY MINERAL LOSSES OF Cu ADEQUATE (CuA) OR Cu DEFICIENT (CuD) SPRAGUE-DAWLEY RATS. @ 3:30 p.m. Augusta Askari, Yahong Wang, Eugene Orlowski, Zijian Xie, Keith A. Crist, James E. Klauing, Neil R. Thomford, Ronald H. Birkhahn. Departments of Surgery, Pharmacology & Pathology, Medical College of Ohio, Toledo, OH 43699-0008.

CuD intakes result in such diverse metabolic malfunctions as cardiovascular abnormalities, elevated blood pressure, hypercholesterolemia, decreased cellular membrane resistance to oxygen free radicals and impaired immune responses. Since minerals interact with each other, we evaluated the overall impact of Cu deficiency upon other metabolically important minerals. Male weanling rats were fed ad libitum either a CuD diet at 0.6 mg Cu / Kg chow or a CuA diet at 6 mg / Kg chow for 7 weeks. Urine from CuA (n=24) or CuD (n=39) rats were assayed by atomic absorption for Cu, Zn, Fe, Mn, Na, K, Ca, and Mg. Only Cu and Zn urinary excretions were decreased significantly in CuD rats (p < 0.001). Rats on CuD diets grew almost as well as

rats on CuA diets (273 g vs. 287 g) and had no obvious adverse effects due to Cu deficiency. Since both Cu and Zn are needed to maintain health, this study emphasizes that even small Cu deficiencies over prolonged time are detrimental.

Board M TIMING OF BRIGHT LIGHT AND CLONIDINE @ 3:30 p.m. SENSITIVITY: RELEVANCE TO SAD?. Jason Peck, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Ave., Columbus, OH 43210

The authors hypothesized that chronic phase-advance (morning) and phase-delay (evening) bright-artificial-light (BAL) treatment would differentially alter the sensitivity of rat brain α_2 receptors. Change in the hypothermic response to the α_2 agonist clonidine was measured using an intraperitoneally implanted telemetric thermosensor. Treatment with BAL during either the regular photoperiod or phase advance portion of the PRC increased the thermic response to clonidine by 25% (p < 0.02, df=12) and 17% (p < 0.05, df=9), respectively. In contrast, treatment during the phase-delay portion of the PRC blunted the thermic response to clonidine by 22% (p < 0.02, df=11). The presynaptic α_2 receptor is an autoreceptor. Reduced sensitivity to clonidine is consistent with the possibility that BAL treatment induces increased release of norepinephrine. Treatment with TCAs, MAOIs, Li⁺, and ECT also blunts physiological responsiveness to clonidine. The data suggest that some but not all procedures for the administration of BAL subsensitizes α_2 autoreceptors. The physiological variable used in this study can be used to study whether treatment with BAL alters the sensitivity of subjects with winter depression to a presynaptic α_2 agonist.

Board N BULIMIA NERVOSA IN WINTER DEPRESSION. Amjed @ 3:30 p.m. Quadri, Valerie DelMedico, Steven G. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, OH 43210-1228

The syndrome of seasonal affective disorder is marked by regularly recurrent changes in mood in association with changes in season. The syndrome of winter depression is the most common form of this phenomenon. This illness is characterized by the onset of a disturbance of mood accompanied by an array of somatic symptoms each fall or winter. The patient's mood may be described as sad, anxious, or indifferent. The most commonly associated symptoms are hypersomnia (sleeping \geq two hours more than usual), mental slowing and imprecision in thought, and carbohydrate craving and hyperphagia (excessive eating). Two patients with seasonally related bulimia nervosa were recently identified at The Ohio State University. The histories and treatment responsiveness of these patients will be described. The authors tentatively conclude that bulimic behavior may be a component of winter depression. The requirement for epidemiological studies addressing this issue is highlighted.

Board F THE FLINDERS SENSITIVE LINE IS SUPERSENSITIVE TO NICOTINE. @ 3:30 p.m. Steven G. Dilsaver, David H. Overstreet, Jason A. Peck. Department of Psychiatry, The Ohio State University, 473 W. 12th Ave., Columbus, OH 43210

The Flinders sensitive line (FSL) of rat was bred to maximize sensitivity to an antiacetylcholinesterase (DFP). DFP inhibits the degradation of acetylcholine at both muscarinic and nicotinic receptor sites. The FSL is advanced as a useful animal model of depression. Antidepressants alter the function of nicotinic mechanisms. A chronic stressor producing learned helplessness attenuates the hypothermic response to nicotine. These points render the issue of the responsiveness of the FSL to nicotine interesting. We conducted an experiment to determine whether the FSL is also supersensitive to the hypothermic response to nicotine. Temperature was measured every 10 minutes for 120 minutes following the administration of nicotine. The FSL sample exhibited a mean hypothermic response of 1.55 \pm 0.19°C in response to 0.5 mg/kg of nicotine (base) ip. This is 13% (ns) greater than the effect exhibited by the Sprague-Dawley rat in response to the injection of 1.0 mg/kg nicotine ip. These are the first data indicating that the FSL is supersensitive to both muscarinic and nicotinic agonists.

Board I BRIGHT LIGHT DOES NOT ALTER mAChR BINDING. @ 3:30 p.m. Monique Giroux, Ewa Malatynska, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, Ohio 43210-1228

Bright artificial light (BAL) is used to treat Winter Depression. BAL antagonizes the hypothermic effect of oxotremorine. This effect is unique to BAL. Tricyclic antidepressants upregulate QNB binding sites in the rat brain or myocardium. The retinohypothalamic pathway provides a means for BAL to act on the hypothalamic mechanisms. We

measured the effect of BAL on QNB binding parameters in homogenates from rat striatum and hippocampus. Contrary to our predictions, there was no effect on density of QNB binding sites. Striatal and hippocampal B_{max} in the control group (standard vivarium conditions) were 8484.6 ± 1708 (fmol/mg protein \pm SEM) and 2809.2 ± 393 , respectively. K_D values were 65.8 ± 30.4 (pmol \pm SEM) and 24.98 ± 2.85 in the respective regions. The rats treated with BAL from 6 AM to 6 PM for 7 days had B_{max} values of 7975.38 ± 1280 and 2946 ± 395 in the striatum and hippocampus. K_D values for the BAL group were 37.72 ± 8.72 and 23.05 ± 30.3 , respectively. The values are not significantly different. Alternative means for BAL to affect hypothalamic mechanisms will be discussed.

Board E LITHIUM CAN WORSEN WINTER DEPRESSION. Valerie DelMedico, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, Ohio 43210-1228

Lithium phase delays biological rhythms in microorganisms, laboratory animals, and man. We have observed that the treatment of bipolar subjects with this ion can exacerbate dysphoria, phase delay the time of arising, and prolong the duration of nocturnal sleep in two bipolar I subjects (followed for 9 and 1 winters, respectively). Both patient's learned that if they discontinued lithium in the fall that their mood, sleep disturbance, cognitive function, and energy level improved. The most dramatic and quantifiable change was in the duration of nocturnal sleep. Each patient experienced an increase in the duration of nocturnal sleep from 7 to 14 hours. The changes in the sleep-wake cycles of these patients strongly suggest that lithium worsened their episodes of winter depression. One subject had been severely depressed for 7 consecutive winters before it was discovered that his condition is greatly improved by stopping lithium. However, he experiences severe initial, middle, and terminal insomnia in the spring unless lithium is restarted. These observations suggest that a worsening of the occurrence of winter depression in bipolar subjects might be managed by discontinuing lithium and restarting it early in the spring. The case histories of these patients will be presented.

Board J TRANLYCYPROMINE WITHDRAWAL PHENOMENA. Mark Halle, Steven C. Dilsaver. Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, Ohio 43210-1228

The effects of withdrawing tranylcypromine was systematically studied in 18 adult patients who were being treated with 20 to 140 mg daily. The withdrawal of tranylcypromine produces anxious and depressed mood, agitation, fatigue, nausea, headaches, cognitive slowing, and impairment of concentration and memory. The rate of withdrawal appears to be a critical variable. The severe anxiety and agitation produced by the abrupt withdrawal of tranylcypromine responds to benzodiazepines. The literature indicates that the withdrawal of tranylcypromine can also produce delirium and psychosis characterized by auditory and visual hallucinations and paranoid delusions. These dire effects were not observed in our patients. Tranylcypromine withdrawal symptoms can nonetheless be incapacitating. However, even the more severe withdrawal states respond to a benzodiazepine. A bipolar patient became hypomanic when tranylcypromine was discontinued. She experienced relief of anxiety within an hour of taking a 200 mg dose of oral carbamazepine. Patients tend to do well when tranylcypromine is discontinued at a rate of 10 mg/week. Case vignettes of patients having severe withdrawal symptomatology and their management will be presented.

Board C ANTIDEPRESSANT WITHDRAWAL PHENOMENA: A PROSPECTIVE STUDY. Alfonso Ceccherini-Nelli, Luigi Bardellini, Angelo Cer, Mario Guazzelli, Carlo Maggini, *Steven C. Dilsaver. *Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, Ohio 43210-1228

The withdrawal of tricyclic antidepressants (TCAs) reportedly produces four syndromes: (1) nausea and decreased appetite occasionally accompanied by anxiety, (2) insomnia, (3) parkinsonism or akathisia, and (4) hypomania¹. Ten (10) patients (mean age \pm SD = 50 ± 8.6 years) hospitalized at the University of Pisa (Clinica Psichiatrica I) were subjected to the abrupt withdrawal of antidepressants. These four operationally defined syndromes were observed in addition to less commonly reported phenomena such as cardiac arrhythmia. Two patients became hypomanic or manic. Six subjects spontaneously reported the development or worsening of symptoms previously reported to be associated with the withdrawal of TCAs. Patient diagnoses, Hamilton Rating Scale for Depression scores across time, specific withdrawal symptoms reported, and results of rater- and observer-completed scores of EPS dysfunction derived by the examination of videorecordings will be presented.

¹Dilsaver SC, Greden JF. Antidepressant withdrawal phenomena. *Biological Psychiatry* 1984;19:237-256.

ANTICONVULSANTS: AN EFFECTIVE TREATMENT FOR MANIA. Mark T. Halle, Steven C. Dilsaver, Edith Jolin, Emil Pinta, Daniel Martin. Department of Psychiatry, The Ohio State University, 473 W. 12th Avenue, Columbus, OH 43210-1228

Antipsychotic agents and lithium are routinely used in the acute and chronic management of patients with mania. The former agents are causally linked to the development of a disabling disorder of movement when administered chronically. Carbamazepine (Tegretol[®]) and sodium valproic acid (Depeken[®]) are used in the treatment of complex-partial seizures. Both agents are useful in the management of manic patients. A consecutive series of 8 severely manic inpatients were treated with the combination of an anticonvulsant and lithium. Clonazepam (Klonopin[®]) was used to treat agitation and insomnia in the first week of treatment. The combination of these drugs either completely obviated ($n = 6$) or greatly limited the use an antipsychotic agent. All patients tolerated this mode of management well, and those who were previously treated with antipsychotic agents expressed a preference for this non-conventional treatment. The presentation of patients and their progress will be described.

SECTION E. Physics & Astronomy

Only Afternoon at 3:30 p.m.

Saturday, April 28, 1990

140 Health Sciences

Dr. James Y. Tong, Presiding

3:30

A REEXAMINATION OF INVERSE SQUARE LAWS
Steven R. Lampman
6577 Maplewood Dr. #301
Mayfield Heights, Ohio 44124

The concept of an inverse square law, which forms a historical basis for unifying gravity and electricity, can be modified to describe the same qualitative phenomenon as Einstein's general theory of relativity. Quantum considerations of field interactions in a central force field also lead to the differential relation:

$$(dE)(dt) = (dP_r)(dr) > h$$

which is used to demonstrate the unattainability of inverse square laws. Consequences of this result include photon rest mass, precession of gravitational orbits, the nonexistence of magnetic monopoles, and perhaps the dissipation of photons.

3:45

"MEASURING DRIFT VELOCITIES IN ARGON, NITROGEN AND ARGON-NITROGEN MIXTURES ASSISTED BY A MICRO COMPUTER" by Douglas M. Abner and Merrill L. Andrews, Physics Dept., Wright State University, Dayton, OH 45435.

A micro computer, custom electronic circuits and a system of programs to aid the researcher in planning, collecting, and analysing electron drift velocity data in gases will be discussed. A mathematical error analysis to estimate drift velocity and its independent variable electric field to number density (E/n) will be examined.

Data will be presented for electron drift velocity in argon, nitrogen and both 1% and 10% nitrogen-argon mixtures in the E/n range of 0.01 to 15.0 Townsends ($1 \text{ Td} = 10^{-17} \text{ Volt cm}^{-2}$). Error estimates of E/n and drift velocity will be given. The nitrogen-argon data demonstrates negative differential conductivity (NDC) where the electron drift velocity decreases with increasing electric field.

*Supported by Air Force Contract F33615-86-C-2720 through SCEEE

4:00

"ANALYSIS OF A PROTOTYPE PLASMA CONFINEMENT CHAMBER WITH EXTERNAL MICROWAVE-PERMANENT MAGNET COUPLED SOURCES FOR POSSIBLE APPLICATION TO LARGE AREA THIN DIAMOND FILM DEPOSITION" by Steve Adams and Merrill L. Andrews, Physics Dept., Wright State University, Dayton, OH 45435.

A prototype plasma reaction chamber was designed and constructed. The special characteristic desired of the chamber was a gas discharge which would result in uniform plasma parameters applicable to diamond chemical vapor deposition (CVD) throughout a relatively large volume. External microwave sources and permanent magnets were

coupled for two purposes: achievement of resonant electron gas excitation and magnetic confinement of the inner plasma volume. A hydrogen gas flow through the chamber was used to simulate plasma conditions required for the diamond CVD. A Langmuir probe was used to analyze the plasma density and electron temperature throughout the reaction chamber volume for three different magnetic field configurations. The results of the simulation show that the plasma parameters depend strongly on the hydrogen pressure, as well as configuration of the confining magnetic field. A comparison of the optimum operating conditions of this reactor, and the conditions reported in successful small area diamond film CVD, will be made. Future directions using the reactor concept will be recommended.

*Supported by Air Force #F33615-86-C-2720 through SCEEE

- 4:15** "ELECTRON MOBILITY OF XENON AND XENON-NITROGEN GAS MIXTURES" by Edward L. Patrick and Merrill L. Andrews, Physics Dept., Wright State University, Dayton, OH 45435.

Electron swarm parameters, such as drift velocity, in multi-component gas mixtures are important in the study of electron collision processes and in the design of plasma switches and gas-filled detectors. The drift velocity of an electron swarm in pure xenon gas (99.995% pure) and xenon gas mixtures, containing 0.1%, 1%, and 10% nitrogen additive, was measured in a pulsed-Townsend drift tube in order to determine the feasibility of using such a mixture as a detector gas, observe the effects of the additives on electron mobility, and to demonstrate negative differential conductivity (NDC). The detector for the swarm-generated transient current was a current-integrating (charge) pre-amplifier, which introduced the amplified signal to the transient digitizer. The digitized signal was analyzed by an IBM-PC/XT using software developed in Pascal to produce swarm drift time measurements approaching the theoretical limits of the experimental apparatus. The amount of nitrogen contaminant necessary to perturb the electron drift velocity in pure xenon is quantified and the suitability of xenon-nitrogen mixtures for use in particle detectors is discussed.

*Supported by Air Force Contract F33615-86-C-2720 through SCEEE

- 4:30** "A MICROPROCESSOR CONTROLLED SCATTERED LIGHT TELESCOPE" by Conrad Ball and Harvey Hanson,

Wright State University, Physics Dept., 248 Fawcett, Dayton OH 45435.

A microprocessor controlled, land-based, scattered light telescope has been developed. By changing the orientation of a collimator with respect to the sun and by indexing different filters between the collimator and the silicon photodiode detector, this device may be employed to characterize the distribution of scattered light and make comparative measurements of intensity at several wavelengths. Signatures of this scattered light can also determine the presence of various atmospheric aerosol, gas, and vapor constituents. This battery powered device has been designed to facilitate the collection of such data over extended periods of time in remote locations. A prototype will be displayed and the design, fabrication, preliminary characterization and future plans for the system described.

- 4:45** "A MONTE CARLO SIMULATION OF ELECTRON DRIFT LIMITED BY COLLISIONS IN GAS MIXTURES USING THE NULL COLLISION METHOD" by David O. Ramos

and Merrill L. Andrews, Physics Dept., Wright State University, Dayton, OH 45435.

A Monte Carlo simulation using the null collision method is explored as an alternative to expansion solutions of the Boltzmann transport equation for determining electron swarm parameters. The efficiency of the null collision method depends on the amount of the null collisions, which can be reduced by selecting a transition energy that divides the energy range of interest into two or more regions each with a different total null cross section. A detailed study reveals that the energy distribution function is extremely susceptible to developing jump discontinuities or spikes when more than one null cross section is used unless the updating techniques are carefully refined. It is possible to minimize the number of null collisions, therefore maximizing the efficiency of the simulation, by selecting the appropriate transition energy. The calculated drift velocities are in excellent agreement with new experimental data in xenon-nitrogen mixtures.

*Supported by Air Force Contract F33615-86-C-2720 through SCEEE

SECTION E. Physics & Astronomy

Poster Session at 9:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board N CHAOS IN THE INTRODUCTORY PHYSICS LAB.
Timothy R. Vierheller / The University of
@ 9:00 a.m. Akron - Wayne College, 10470 Smucker Road,
Orrville, Ohio 44667

With the increasing awareness and application of the science of chaos, a brief overview in an introductory physics course is deemed useful. This presentation includes a summation of chaos and examples of its manifestations which may be demonstrated in class or lab. These examples include the following: computer simulations, chaotic toys, pendulums, and mathematical models.

SECTION F. Geography

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

070 Rike

David Stevens, Presiding

- 9:00** PATTERNS OF MORTALITY IN THE LORAIN TORNADO OF 1924. Thomas W. Schmidlin, Geography Department, Kent State University, Kent, Ohio 44242.

The deadliest tornado in Ohio history struck Sandusky and Lorain at 5:20 P.M. on Saturday June 28, 1924. Initial press reports indicated that over 300 died but the final death toll was 78. The tornado struck hardest at Lorain, sweeping along the lakefront and into the downtown without warning. Two hundred businesses and 500 homes were destroyed. The median age of the persons killed was 32 years, 18% were under the age of 10, 9% were 65 and older, 59% were male, and 97% were white. Most persons died in collapsed homes, but 8 were killed at a bathing beach, 7 children died in the collapsed State Theater, and 11 died in other commercial establishments. Compared to patterns of mortality in modern Ohio tornadoes, the Lorain tornado killed fewer children and elderly, fewer died in cars, and more died in commercial buildings.

- 9:15** SPATIAL VARIABILITY OF SUMMER RAINFALL IN CUYAHOGA COUNTY, OHIO. Timothy G. McKee, Geography Department Kent State University, Kent Ohio 44242.

Daily and monthly rainfall totals and the number of days with heavy rainfall were examined from a network of 24 rain gauges over a period of 11 years. This unusually dense network of gauges (one gauge/19 sq. miles) covers a wide variety of land uses and elevations ranging from 600 to 1250 feet within 25 km of Lake Erie. Average June monthly rainfall had a normal frequency distribution and ranged from 2.58 to 4.09 inches. An F-test showed the hypothesis of equal June rainfall among the 24 gauges could be rejected (P=0.06). Effects of urbanization, elevation, and Lake Erie on rainfall in the county were analyzed for applications in urban climatology, storm drainage design, and flood control.

- 9:30** EFFECTS OF URBAN BUILDING STRUCTURE ON NET SOLAR AND LONG-WAVE RADIATION. John Mauk and Mike Kelsey. Department of Geography, Kent State University, Kent, Ohio 44242.

The urban climate has been found to differ from the rural climate. These differences have been attributed, in part, to the physical characteristics of the urban environment, most notably urban structures and street canyons. This study examines the effect of various types of urban buildings on solar and net radiation levels in Kent, Ohio. Solar and net radiation readings were taken at three different building types and an open control site during late fall and winter. Results indicate that urban geometry does influence radiation levels around the buildings. The late afternoon and nocturnal surface temperatures adjacent to the highest structure are greatest, contributing to higher nighttime air temperatures

than at the open control site. These differences, however, vary depending on local weather conditions. Urban/rural radiation differences are less distinct on days with considerable cloudiness than on clear days. These findings are generally consistent with the results of other studies of urban/rural radiation budgets.

9:45 ENVIRONMENTAL VERSUS POLITICAL CONCERNS IN THE LOCATION AND PLANNING OF LANDFILLS: A CASE STUDY. Henry Moon.

Department of Geography & Planning, The University of Toledo, Toledo, Ohio 43606.

Community waste management is a fact of municipal life which must be planned in a legal, rational, and timely manner. Current expectations placed on solid waste officials exceed the initial tasks of removal and disposal, and extend to an understanding of the history, current status, and future of landfill sites. All too often the location and planning of solid waste landfills become matters of environmental versus political concern. This is a case study of such a conflict - that involving Toledo's Hoffman Road Landfill. In this case, a relatively large solid waste facility is centrally located in the metropolitan region and the subject of much debate, concern, public outcry, and conflict. Located alongside the Ottawa River just a few miles from the Maumee Bay, the facility operates in an environmentally sensitive area. The controversy over the continued operation and expansion of the landfill has escalated political concerns such as neighborhood sentiment and city-county relationships ahead of those involving the physical environment.

10:00 MANUFACTURING FORMATION RATES AMONG OHIO'S COUNTIES: 1979-1988. Bruce W. Smith and John Hiltner, Department of Geography, Bowling Green State University, Bowling Green, OH 43403

Locational patterns of manufacturing has been a traditional subject of geographic investigation. This paper examines the geographic pattern of formation rates of new manufacturing plants opening in Ohio between 1979 and 1988. Suburban MSA counties possessed the highest formation rates followed by rural and central MSA counties respectively. Regression analysis showed that variations in the formation rates were related to counties' plant size structures, occupational structures, and employment growth. Although not included in the regression analysis, industrial mix may also be an influential variable.

10:15 A COMPARATIVE ANALYSIS OF ECONOMIC/EMPLOYMENT TRENDS OCCURRING IN OHIO COUNTIES 1964-1986. Hans Rosebrock, 4630 W. Central Ave., Toledo, OH 43615.

With the advent of extraordinary economic and employment shifts occurring in the United States over the last two decades, continued economic development has ceased to exist in many regions. While some regions have waned economically, others have enjoyed substantial economic growth. In addition, the economic landscape within these national regions has changed and reflects a wider range of spatial heterogeneity.

Counties within the State of Ohio have exhibited economic/employment transformations during the last two decades. Spatial variation in employment growth has been demonstrated across Ohio counties in two-digit SIC grouped industries. A shift-share technique was implemented to isolate the key factors associated with these changes. These changes can be attributed to differences in comparative advantages within and between urban, suburban, and rural counties. Differences in comparative advantages are a result of changing geographic orientations in transportation modes, population, and labor characteristics.

10:45 OHIO'S PREHISTORIC INDIANS: A GEOGRAPHIC FOCUS. Jeffrey J. Gordon. Department of Geography, Bowling Green State University, Bowling Green, OH 43403.

Ohio has a rich pre-Columbian heritage. Aboriginal occupation occurred during all major culture stages from Paleo-Indian to Late Woodland. Ohio was also the center of activity for the Mound Builders who reached the zenith of aboriginal cultural florescence. Their abundant and magnificent earthworks were very impressive and a mystery to subsequent area inhabitants, both Indian and white.

Although archeologists, prehistorians and others produce excellent site analyses, artifact typologies and chronologies, geographers are especially well-suited to present the dynamics of pre-Columbian Ohio in a spatial

perspective. Concepts commonly used by historical geographers such as culture region, cultural diffusion, cultural ecology, cultural integration, and cultural landscape are also appropriate themes for Ohio's prehistoric geography. Understanding the Mound Builders, for example, with their monumental architecture, domestication, social classes, and long-distance trade is enhanced with a spatial framework: religious cults diffused from the more highly developed societies of Mexico up the Mississippi and Ohio River valleys and were superimposed on the local cultures. Even urban planning and settlements specialized in the export of a single local resource resulted in Ohio.

SECTION F. Geography

Only Afternoon & Business Meeting at 1:30 p.m. Saturday, April 28, 1990 070 Rike Thomas W. Schmidlin, Presiding

2:00 STRUCTURAL VARIATION IN URBAN, SUBURBAN, AND RURAL ECONOMIC RESTRUCTURING
Jerold R. Thomas, 220½ S. Williams, Paulding, Ohio 45879

In the past decade the social sciences have witnessed a flourishing of literature on economic restructuring. This data has been extremely biased in that it almost exclusively focuses on urban areas, as can be seen with the often interchangeable usage of economic restructuring with urban restructuring. While the literature has shown that this restructuring has taken place on a national, state, and urban level, there has been little attention paid to the rural areas. This has produced an important void, as manufacturing is a major sector of employment in most northwestern Ohio rural counties. Furthermore, rural areas are less diversified, and are therefore severely handicapped in a restructuring that draws upon alternative services, many of which are specialized and available only in urban areas. If this restructuring is taking place in urban areas and not in rural areas, will the rural areas become more polarized and left behind? Can any difference be ascertained between rural and urban areas based upon their economic structure? These questions are the focus of the paper.

2:15 ECONOMIC RESTRUCTURING AND THE SPATIAL MISMATCH: INDIANA'S CHANGING EMPLOYMENT AND DEMOGRAPHIC CHARACTERISTICS, 1970-1980. J. Matthew Shumway and Thomas J. Cooke. Department of Geography, Indiana University, Bloomington, IN 47406.

In this paper we examine the changing employment and demographic characteristics of Indiana between 1970 and 1980, with particular reference to changes in the location of employment and population. The theoretical impact of economic restructuring on the location decisions of firms and people are addressed along with the resulting locational inconsistencies in the labor market; known as the spatial mismatch. Although the spatial mismatch has been examined regionally and for large metropolitan areas there has not been an empirical investigation of the mismatch at the local scale. This research investigates the existence of the mismatch in Indiana localities and concludes that the spatial mismatch exists even at the smallest scale of the urban system.

2:30 SPATIAL ANALYSIS OF THE BLACK BUSINESS PATTERNS IN SELECTED LARGE SMSA'S OF THE UNITED STATES by Angelique Martin and Charles B. Monroe, Department of Geography, The University of Akron, Akron, OH 44325-5005.

Blacks in American business are not represented in proportion to their number in population. This paper is an analysis of patterns of Black owned businesses in selected large SMSA's in the United States. Using SIC codes to classify employment by business sectors, spatial patterns of Black ownership are examined. Black business patterns are investigated through comparing the number of Blacks in industry sectors to their proportion in the population. The findings of

the study show that the larger the Black population, the larger the number of Black-owned business. Also, the data reveal that Blacks are generally more underrepresented in manufacturing than in other business sectors.

2:45 CHINA AND THE ECONOMIC FUTURE OF HONG KONG
Stephen S. Chang, Department of Geography,
Bowling Green State University, Bowling Green,

OH 43403

Hong Kong will be returned to China in 1997 in accordance with the Sino-British agreement. In spite of the apprehensions people have about their futures under Chinese rule, economically Hong Kong is increasingly integrated with China, especially the southern part.

There is a growing economic relationship between China and Hong Kong. In the future, this will increase and with it Hong Kong's dependence on China for its economic well-being. This paper intends to put forth the idea that, political confidence aside, the future economic prosperity of Hong Kong is very much reliant upon the Chinese hinterland. The growing importance of the service economy is because of its function to provide for the needs of the hinterland. The reason for this thesis will be explored and discussed.

3:00 EMPIRICAL IDENTIFICATION OF KEY SECTORS IN THE SRI LANKAN ECONOMY by H. Kumari Navaratne,
Richard W. Janson, Department of Geography,
Kent State University, Kent, Ohio. 44242-0001.

In the context of the national economic development literature the notion of key or critical sectors has become an accepted component of development strategy.

This paper is an attempt to determine the sectors with the highest potential for structural change using the Sri Lankan input-output table for 1983. This criterion for sector appraisal is based on the Leontief static input out-put inverse matrix.

The paper takes the intensity of interindustrial linkages as an indicator of sectors ability to spread growth impulses to its economic environment. Backward and forward linkages are calculated; in addition, spread effects are computed via the inverse matrix. Using linkages key sectors are identified and correlation analysis are performed to examine the various relationships present among various types of macro-multipliers.

These empirical results provide insights to policy makers for allocation of scarce resources to maximize the output and income effects linkages and spreads in the economy.

3:15 A SURVEY BASED ON BUILDING CONDITIONS IN POLAND, 1988 by Dr. Anna Achmatowicz Otok, Kent State University, Kent, Ohio
44240, Dr. Ashok Dutt and Angelique Martin, The University of Akron, Akron, Ohio 44325-5005.

Poland is a socialist country with cultural influences formed by countries with which it shares boundaries. This study is confined to building conditions in Poland. It is a unique study, the first of its kind, based on findings from a survey done by Warsaw University and funded by the Polish Government. The study was conducted by students in Poland, using a technique to assess building conditions. Students were paired in different regions for the survey. A total of 38 villages and 21 cities picked at random, were examined over the entire country; 1,790 sample buildings were surveyed. Frequency counts, cross tabulations and Pearson's Correlation were used. Results reveal that 60% of the buildings in Poland were in the sound category, 25% deficient and 15% substandard. Regional differences occurred in the conditions of buildings. For Poland as a whole, 51.2% of the buildings have brick foundations, while 18% are built of concrete and 11% of stone. Regional differentiations shows that 50% of buildings in the Austrian-influence region have brick foundations, while 36% of the structures in the Russian-influence region have concrete foundations.

3:30 BLACK AFRICA: A SPATIAL CONSISTENCY IN THE BELIEF OF A SUPREME BEING by
Maurice Carney, The University of

Much has been written about the African and his religion. Unfortunately, most of the literature is negative and derogatory. Africans are re-

garded as men without beliefs, whose lives are dominated by superstitions.

The purpose of this paper is to examine the widely held tenet that the African was void of a belief in the Supreme Being before the coming of the Europeans. It will do so by demonstrating the spatial consistency in the belief of the Supreme God in African traditional religion. Peoples in West, Central, Southern and East Africa are examined in order to substantiate the existence of a belief in the Supreme Being throughout Africa. A sample will be taken from those tribes for which there is a wide availability of literature. This sample has been chosen to be a representation of the population of each region.

The paper will relate theories of creation, and pious practices through prayers, songs and proverbs by a group from each of the four regions.

3:45 A SPATIAL ANALYSIS OF THE MIGRANTS TO A CENTRAL CITY SLUM IN CALCUTTA by Dr. Ashok Dutt, Anupa Mukhopadhyay, The University of Akron, Akron, Ohio 44325-5005.

India is a developing country and its cities are attraction points. In the case of Calcutta, rural-urban migration has been a strong factor in the increase in population of the city. Most of the slum dwellers migrated as a result of a strong rural "push factor". Indications of step-wise migration was noticed within the city. The slum dwellers migrated from less favorable slums to a relatively more favorable slum. These migrants are predominantly Hindi-speaking people, who are very social among their clan groups because they form the minority population in the city. In the process of settlement, non-Bengali minority linguistic groups tend to segregate in particular slums. An early concentration of Hindi speaking people, Tangra, attracted kin and village acquaintances of early settlers for later settlement. The study showed that 53% of the total households in the slum originated in Bihar; 18.8% from different parts of West Bengal and Uttar Pradesh; the number of migrants increased with increase in distance. That is, for up to a distance of 300 miles, the number of migrants increased with increase in distance from Calcutta.

4:00 THE SPREAD OF PERESTROIKA IN LATIN AMERICA.
Thomas D. Anderson, Department of Geography,
Bowling Green State University, Bowling Green,
Ohio, 43403.

Under the leadership of Mikhail Gorbachev, efforts at perestroika have transformed greatly the economic status quo within the Soviet block of countries. Although less publicized, free enterprise approaches to alleviate economic problems recently have been adopted widely in Latin America as well. The role of the state in national economies long has been a feature in the region under a wide range of political ideologies, from right-wing and left-wing dictatorships to popularly-elected democrats. This regional attitude has changed over the past decade and especially since 1987. Recent elections in Mexico, Honduras, El Salvador, Jamaica, Trinidad and Tobago, Peru, Venezuela, Bolivia, Argentina, and Uruguay were won by men whose programs included reduction of state-run industries and of regulations that have hampered small business development. These changes were stimulated by the failures of past approaches, a spread of democracy which allows political expression of the popular mood, and by the economic successes of countries elsewhere in the world that have adopted market economies. The paper examines differences in conditions between countries, including Cuba where Fidel Castro has rejected perestroika, and speculates upon the possible impacts of such economic restructuring if it continues as it has begun.

4:15 EL SALVADOR'S REFUGEE PROBLEMS IN THE 1980's.
Joseph G. Spinelli, Department of Geography,
Bowling Green State University, Bowling Green,
Ohio 43403.

For nearly ten years, the Government of El Salvador has been fighting both a political and military battle with the Farabundo Marti National Liberation Front (FMLN). Historically, many Salvadoreans have lived as squatters in the bordering regions of Honduras, a situation Honduras found unacceptable. Honduras expelled most of them after the brief war in 1969 between the two countries. In the late 1970's and throughout the 1980's, Salvadorean farmers have

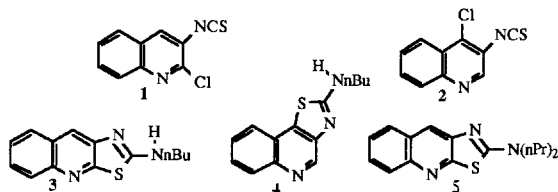
been crossing again into Honduras from their homes in the war-torn departments of Chalatenango and Morazan to flee the fighting between Government forces and the FMLN, which is strongly entrenched in these more remote regions. It has been estimated that between 800,000 and 1,000,000 refugees from El Salvador have been displaced from their homes. As many as 500,000 may be residing in the United States as illegal aliens, while the rest are scattered about in other Central American countries. Many former refugees living outside of El Salvador have been slowly returning to their country, but are living in resettlement centers near their homes or in camps around San Salvador, adding a heavy burden to the Government's efforts to provide minimal services for them.

SECTION G. Chemistry
Only Afternoon at 2:00 p.m.
Saturday, April 28, 1990
140 Health Sciences
Dr. James Y. Tong, Presiding

2:00 A RE-EXAMINATION OF THE SPECTROPHOTOMETRIC METHOD OF ARSENIC DETERMINATION. James Y. Tong, Department of Chemistry, Ohio University, Athens, Ohio 45701-2979

The spectrophotometric method of arsenic determination utilizing the color complex formed between arsine and silver diethyldithiocarbamate in pyridine solutions was re-examined to obtain a better understanding of the method and to optimize the conditions. Some of the variables examined were the concentration and the volume of the silver diethyldithiocarbamate solution, the temperature, the arsenic concentration, the reaction time, and the time between the completion of the reaction and the spectrophotometric measurements. The generally recommended concentration of silver diethyldithiocarbamate could not be much increased and was adequate for the method. Increasing the volume of the silver diethyldithiocarbamate solution would increase the amount of arsine recovered at the expense of decreased sensitivity. Lower temperatures during the spectrophotometric measurement are desirable as the stability of the colored species decreases as temperature increases. Qualitatively, if the color complex is a 1:1 complex of arsine and silver diethyldithiocarbamate, it would have an estimated formation constant greater than one thousand.

2:15 CHLOROISOTHIOCYANATOQUINOLINES AS AMINE DERIVATIZING AGENTS. Stanley C. Bernstein & Kristen Leckrone. Department of Chemistry, Antioch College, Yellow Springs, Ohio 45387



Two new chloroisothiocyanatoquinolines, **1** and **2**, were synthesized. They react readily with *n*-butylamine in acetonitrile to give the expected derivatives, **3** and **4**; and the secondary amine, di-*n*-propylamine reacts with **1** to produce **5**. The UV spectra of the derivatives at a variety of pHs were determined. In this way the pK_a for the first protonation of each derivative to give its fluorescent form could be measured: Compound (pK_a); **3**(2.4), **4**(3.8), **5**(2.0). The pseudo-first-order rate constants for the hydrolysis of the isothiocyanates, **1** and **2**, were measured under basic conditions to study the possibility of interference of the hydrolysis reaction with the derivatizations. These results range from too slow to measure conveniently for **2** at pH=8.00 to $3.1 \times 10^{-2} \text{ min}^{-1}$ for **1** at pH=10.00.

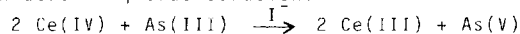
2:45 OLESTRA: A NONABSORBABLE SUBSTITUTE FOR EDIBLE FATS. Ronald J. Jandacek, The Procter & Gamble Company, Miami Valley Laboratories, P.O. Box 398707, Cincinnati, OH 45239-8707.

Olestra is the common name for mixture of hexa-, hepta- and octaesters formed from the reaction of sucrose with long-chain fatty acids from edible oils. Olestra does not undergo enzyme-catalyzed hydrolysis in the GI tract and therefore does not form absorbable digestion products. Olestra's physical properties are determined

by its fatty acid components and are nearly identical to those of triglycerides having the same fatty acid composition. Its nonabsorbability and triglyceride-like properties allow olestra to be used as a zero-calorie replacement for some of the fat in a number of foods. A Food Additive Petition has been submitted to the U.S. Food and Drug Administration seeking approval to use olestra to replace up to 35% of the fat in home-use shortening and oils and up to 75% in commercial frying oils. Extensive animal and clinical testing have shown olestra to be safe for human use. Its inclusion in foods is consistent with guidelines calling for a reduction of dietary fat.

3:15 IODIDE-CATALYZED CERIUM(IV) - ARSENIC(III) REACTION. Suzanne K. Lunsford and Barbara J. Barker. Department of Chemistry, Xavier University, Cincinnati, Ohio 45207.

Many analytical methods for determining trace quantities of iodide have been developed and reported in the literature. The principle reaction of interest has been the iodide-catalyzed reaction of cerium(IV) and arsenic(III) in acidic aqueous solution:



Within the many studies there has been uncertainty about the exact relationship between iodide concentration and reaction rate.

The fundamental kinetics data combined with the applied analytical procedures revealed inconsistent findings in the determination of the reaction order. The present study is a review of the conflicting published literature.

SECTION G. Chemistry
Poster Session at 9:00 a.m.
Saturday, April 28, 1990
Lobby Physical Education Bldg.

Board 0 TRIBUTYL TIN: LIQUID-SOLID EXTRACTION AND ON-COLUMN INJECTION GAS CHROMATOGRAPHIC DETERMINATION IN MARINE WATERS - Otis Evans, Betty Jacobs, Arnold Cohen, and Jeffrey Collins*, U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, 26 West M.L. King, Jr. Drive, Cincinnati, OH 45268. *Technology Applications, Inc. (same address).

A procedure for determining tributyltin chloride (TBTCl) in seawater, in trace amounts, has been developed. The multi-step procedure involves: a) liquid-solid extraction of TBTCl from 200 mL of water using C-18, 25 mm silica enmeshed Teflon extraction disks; b) elution of the analyte with acidified ethyl acetate, pH 4.5; c) on-column injection of 2 μ l of the disk extract; d) separation on a 30 m DB-5 fused silica capillary column; and e) electron capture detection. The procedure allows combined sampling, extraction, and preconcentration in the field, thereby eliminating most contamination and handling problems related to sample collection. On-column injection is an attractive alternative to splitless injection gas chromatography because analytical signal fluctuations as a result of analyte thermal decomposition appears to be minimized.

The combination of liquid-solid extraction and gas chromatographic separation meets the Agency's general method criteria: a) rapid procedure, b) inexpensive, and c) selective for the organotin of interest.

SECTION H. Science Education
First Morning at 9:00 a.m.
Saturday, April 28, 1990
208 Fawcett
Rebecca Stricklin, Presiding

9:00 TRIALS AND TRIBULATIONS OF DEVELOPMENT OF A NON-TRADITIONAL PROGRAM IN AN UNLIKELY ACADEMIC SETTING. Henry H. Smith, Ph.D., Central State University, Wilberforce, Ohio, 45384

Introducing a new, innovative, untried curriculum

into an academic environment with an historical reputation of providing training in fundamental traditional areas was a necessary requirement but presented a series of critical and often unanticipated challenges. Development of the highly unconventional water resources management degree program at Central State University presented problems from within and without for support, funding, recognition and even basic approval. Marketing of the program to students, parents, faculty, funding sources, potential employers and others necessitated utilization of strategies never used before at the University. Accommodating this program with its unique requirements has often required the modification of longstanding policies and practices. Partly as a result of the program, the University's enrollment and staffing profile is undergoing significant changes. The national and international success being enjoyed by this program and to the University in turn has served to justify the trauma of introducing this radical program and may be used as a model by other small institutions with limited resources.

9:15 INTERDISCIPLINARY SCIENCE INTERACTION
Ed Kimmey, Mt. Gilead Schools
145 N. Cherry St. Mt. Gilead, Oh. 43338

Our school system is presently in its fourth year of using junior high students to teach third grade students. The science curriculum guide was used to pick topics already covered by both third graders and seventh graders. Each lesson centered around a lab activity, a worksheet and the use of various science materials. Each junior high student was responsible for teaching a forty minute science lesson to one or two third graders. Third grade teachers then used the science theme to develop projects in reading, writing, spelling and math. Interest centers and bulletin boards were also built around each science topic. The school year ended with an outdoor education field day held at Mt. Gilead State Park. Junior high students involved third graders in eight different classes.

Data show an increased attendance on project days, higher ratings on the Culture-Free SEL, improved class social structure and increased home-school communication.

9:30 AN ECOLOGICAL PARADIGM FOR SCIENCE EDUCATION.
David C. Schmidt, School of Interdisciplinary Studies, Miami University, Oxford, Ohio 45056

While working as a teacher's assistant in a small elementary school, I found that there was a need to spark interest within the students concerning scientific explorations and studies. I feel that it is critical to develop student interest in science at an early age so that they may begin to establish a greater understanding and sensitivity towards environmental issues. It became clear, however, that a straight introduction into scientific nomenclature and scientific methods were not stimulating the interest of the students. In order to generate more interest in scientific studies, I have developed and taught a course on scientific exploration for children in the fourth and fifth grade. This course strongly emphasizes experiential forms of pedagogy and relies on each student's perceptions as a basis for understanding the world around them. The course was broken up into four sections: 1) awareness development 2) understanding ecological principles 3) development of environmental ethics and citizen science or ecological action. In order to evaluate the effectiveness of this program, I have conducted pre- and post-testing using a Likert scale. This measurement was used to evaluate children's attitudes towards environmental/scientific issues. I will be presenting both the methodology and results of my findings.

10:00 EVALUATION OF TEXTBOOKS BY STUDENTS. John F. Gwinn, Biology Department, The University of Akron, Akron, OH 44325-3908.

Student evaluation of textbooks could be useful when a new text is considered; however, such information is seldom systematically collected or controlled for bias and is consequently of dubious value. Four hundred students each identified characteristics personally important for a text used in an anatomy and physiology class. The 45 most frequently mentioned aspects (eg., clarity of labels, non-glare paper, chapter summaries) were grouped into 15 items under three major headings (visual information, text information, and study aids) and developed into a rating survey. Students in a second class who chose to participate in the evaluations were randomly assigned three readings in randomly assigned texts which corresponded in content to the current readings in the regular course text. Only minor differences were found

among the five new texts when rated for visual, text, and study aids when compared with the regular course text. However, there were major differences when students expressed preferences for a new text over the regular text. Overall preference does not seem to be based on the objective factors identified by students as important characteristics for a text. A significant biasing effect was noted depending upon whether the new text or the course text was read first.

10:15 PART-TIME FACULTY POSITION
P. W. Goddard and D. Andrews
College of Education
The University of Akron
Akron, OH 44325-4201

As post-secondary student enrollment numbers have grown, colleges and universities have consistently reported the practice of hiring more part-time faculty members to teach classes. By examining the perceptions of part-time faculty towards their positions, the findings from this P.A.L. (Part-time Assistants in Learning) study can be used in planning a communication network, a professional development program, and a more effective set of procedures for administrators who work with part-time faculty. The subjects for the P.A.L. study were College of Education part-time faculty members (N=108). Qualitative and quantitative statistical techniques were applied. These results suggested specific professional activities as well as common sense amenities.

SECTION H. Science Education

Second Morning at 9:00 a.m.

Saturday, April 28, 1990

210 Fawcett

Robert E. Rohrbaugh, Presiding

9:00 GRADE LEVEL COMPARISON OF STUDENTS' ATTITUDES TOWARD THE USE OF ANIMALS IN EDUCATION AND RESEARCH. Nadine K. Hinton, J. Fredrick Cornhill, Margaret D. Snyder, Victor J. Mayer, and Lynn Edward Elfner, The Ohio State University and The Ohio Academy of Science, 6089 Godown Rd., Columbus, OH 43235.

What do students of different ages think about the use of animals in education and research? Are younger students more concerned about pain and suffering than older students are? How do students at different grade levels perceive the value of dissection in science education? While these are interesting questions for science educators, there has been little research in this area. To address this issue, a 25-item survey of attitudes toward animals was administered to 935 students in grades 4-12. Multivariate analysis of variance indicated significant differences by grade level (4-5; 6-8; 9-12). Univariate analyses showed that students at different grade levels responded differently on 24 of the items. Students' attitudes will be discussed in terms of their cognitive abilities.

9:30 AN ANALYSIS OF CURRENT MODELS OF TEACHING EVOLUTIONARY THEORY.
James G. Osborn, 4229 Allison Circle,
Fairfax, VA 22030

While all recognize the value of the empirical studies associated with the traditional model of evolution, dogmatic science has demanded a teaching of the subject on the primary and secondary levels that takes too little account of its hypothetical status. On the other hand, dogmatic religion advances a creationist model for the origin of species that is entirely incompatible with empirical knowledge. The key problem with the extreme creationist approach is its underlying emphasis on Power from the creative Supreme Being as the motivator of purpose. This focus tends to downplay the absolute nature of the physical laws currently in force. Science, in contrast, tends to ignore the possibility of purpose in the universe. Yet if the simplest of competing theories is the preferred one, then a teleological theory is sustained. A middle ground between the two extremes is desirable both rationally and politically, allowing for the premise of a purposeful origin of the universe while retaining the consistency and logic of empirical study.

Specifically, a purposeful universe focused on a concept of Heart--defined as the impulse to love--rather than Power is suggested that accommodates this constraint.

9:45 TEACHER-DEVELOPED CLASSROOM PROJECTS FOR EXPLAINING GEOLOGIC CONCEPTS TO EDUCATIONALLY-DISADVANTAGED MIDDLE SCHOOL STUDENTS. Robert G. McWilliams, Department of Geology, Miami University, Oxford, Ohio 45056.

Ohio's Education for Economic Security Act program provided the opportunity for 40 Ohio secondary teachers from 11 school districts to study geology at Miami University's Geology Field Station in and near Yellowstone and Grand Teton National Parks during the summer of 1989. Participating teachers developed classroom projects for educationally-disadvantaged middle school students using the integrative viewpoint of geology. This integrative viewpoint incorporates: (1) the study of objects in natural settings; (2) collaborative work in small groups; (3) comparison of unknown phenomena with easily-understood, present-day processes currently taking place; and, (4) use of critical reasoning to collect, sort, cull, and synthesize information from many sources.

Selected classroom projects have been published and are free to Ohio teachers.

10:00 THE CHALLENGE OF BUILDING A MICROCONDUCTIVITY TESTER. Lei-Hsing Lin Wu, 160 Brookside Oval East, Worthington, OH 43085

A palm size conductivity tester can be built by students taking chemistry/physics, in less than two hours; and at a fraction of the cost of commercial products. It was designed to test qualitatively, drops of liquid in microscale procedures. Both brightness and blinking rate of the light emitting diode (LED), increase with the degree of ionization, or the amount of electrolytes (ions) in the solution. The circuit was modeled after Tom Russo's, except for one modification. That is, we used 3-volts power source instead of 9-volts in order to minimize electrolysis. Students were not only to see the device at work with lab. solutions, but also with various beverages and liquid cleaners. Other benefits were gained from this do-it-yourself experience. They include learning about a simple circuit involving resistors, LED, batteries, connecting wires, insulation, and probes; proper soldering and safety. Microconductivity testers, parts and working diagram will be displayed; and open-ended nature of the project will be discussed.

10:30 USE OF THE OHIO SCENIC RIVERS PROGRAM TO ENHANCE THE HIGH SCHOOL BIOLOGY PROGRAM. Peter B. Kain, Marysville High School, 833 N. Maple St., Marysville, Ohio 43040.

The Ohio Scenic Rivers Program provides teachers with a worthwhile project for field study. The program has designated twelve state scenic rivers throughout Ohio. Monitoring a station for aquatic macroinvertebrates provides the Ohio Department of Natural Resources with base data to indicate the health of the stream. Annual reports are sent to the school to report the results of all stations on all state scenic rivers. This activity provides students with experience in aquatic field studies, use of appropriate equipment, a sense of accomplishment while doing schoolwork, and shows the cooperation between the school and community. The method of monitoring water quality will be presented along with information on how to set up a program for your school or community group.

SECTION H. Science Education

Only Afternoon & Business Meeting

at 1:30 p.m. Saturday, April 28, 1990

208 Fawcett

Rebecca Stricklin, Presiding

2:30 APPROACHES TO REDUCING LOSSES FROM THE K - GS SCIENCE EDUCATION PIPELINE. Garry D. McKenzie, Department of

Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210-1398.

Economic competition and effective citizenship in a technologically complex world suggest the need for scientifically literate graduates from all of Ohio's schools and colleges. Interest in and opportunities for

undertaking careers involving science and technology generally decrease with increasing grade level. Suggestions, of varying feasibility, for reducing these losses include:

more appropriate/relevant science and math, hands-on science, better teaching materials and equipment, enthusiastic and qualified teachers (higher salaries?), more hours in school and more homework (a national homework hour?), greater expectations for the students (more hard work), out-of-class experiences at schools, businesses, science museums, traveling exhibits, and colleges after school, on weekends, and in summer camps. The colleges also show drastic losses, where less than 40% of those intending to go into science as frosh actually earn degrees in the field. Reform is needed in college teaching if we are to develop more scientifically literate graduates and better precollege teachers of science.

2:45 THE BFGOODRICH VISITING TECHNICAL WOMEN PROGRAM. Christine K. Martin, The BFGoodrich Company, P.O. Box 122, Avon Lake, OH 44012

Recent surveys of the available labor pool of Americans obtaining undergraduate and graduate degrees in science and technological fields indicate a growing shortage of this resource into the future. The outlook for women and minorities in these fields of study is even more dismal. Those American businesses that rely on a technical basis for competitive superiority will be at a disadvantage with growing global competition. Therefore, it is to the industries advantage to encourage young people to consider science and technology as fields of study. In response, the BFGoodrich Company has established a Visiting Technical Women Program designed to encourage young people in science and mathematics. The objectives of the program are to provide an opportunity for students to meet and interact with technical women as role models, to provide evidence of successful careers, to provide information about job opportunities in technical areas and to provide information about the preparation needed for various technical careers and the importance of keeping options open. This presentation outlines the mechanics and operation of the pilot Visiting Technical Women Program at the BFGoodrich Company from its conception to the final end result, contact with students grades 1-12.

3:15 TECHNOLOGY-BASED CURRICULUM FOR OHIO PUBLIC SCHOOLS: Penny Braat, N.R.C.S., 35895 Center Ridge Rd., N. Ridgeville, OH 44039

The North Ridgeville City Schools' program addresses the national concern of technology education in the public schools. The technology curriculum is the result of collaboration by administration and faculty from math, science, industrial technology and library departments. Recognizing that college success and industry's growth depend on the work done in classrooms, efforts were directed toward changing the scope and training of the future workforce through the curriculum. As a vital first step toward enhancing and expanding excellence in technology instruction, a state grant was used for teacher retraining. Hands-on workshops, visits to districts with technology-based education, and discussions with experts broadened teacher horizons. Through the combined efforts of Lorain County Community College, Cleveland State and Ashland College, graduate courses were designed by N.R.C.S. teachers for N.R.C.S. teachers. Courses included computer and CAD/CAM training and careers for the 21st Century. In July, 1989, funds were again granted. These monies are now being used to introduce and enhance technology-based curricular offerings in medical, environmental, and problem-solving studies.

3:45 TECHNOLOGY IN SUPPORT OF SCIENCE AND MATHEMATICS EDUCATION. Robert E. McNemar, Ph.D., Director, Columbus Public Schools, Columbus, Ohio 43207

With knowledge expanding at an exponential rate in this technological information era, it would be difficult to identify which "science or mathematics concepts" to teach students who are going to be productive citizens in the next century. The important impact that science, mathematics and technology may have on the lives of students is in how concepts are taught and how they are exposed to the processes and basic skills which appear to be important in the present time frame.

Students must be inspired to want to learn and build positive attitudes toward the academic areas in their formative years. Students must be equipped with the art of connecting related concepts; but more importantly, they must learn to connect concepts into the structure

which provides them a significant plan for their learning experiences.

A sequence of events will be utilized to demonstrate examples of current educational technology used to develop experiences for students in science and mathematics education.

4:00

THE STATE OF ADVANCED PLACEMENT
CALCULUS: THE NEED FOR SUPPORTIVE
INSTRUCTIONAL MATERIALS
T. Michael Flick, Ph.D.
Xavier University, Alter 14
Cincinnati, OH 45207

This paper presents the results of an assessment of the availability of printed instructional aids for use in advanced placement and freshman calculus programs. Specifically addressed is the general availability of materials to supplement existing calculus textbooks. Based upon these findings, specific curricular strategies are proposed. The findings are particularly significant to developers of instructional materials.

The results of a survey of Ohio's secondary schools are presented. Based on the survey, it can be concluded that 85% of Ohio High Schools offer a course in calculus. Of the 85%, 35% are of a non-advanced placement type, 47% are advanced placement Calculus AB, and 18% are advanced placement Calculus BC. The predominant textbooks used in these courses are by the author George B. Thomas.

Ohio educators indicate a strong need for the development of printed instructional materials to supplement existing textbooks.

SECTION H. Science Education

Poster Session at 10:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

SCIENCE IS FUN-A PROJECT WHICH EXTENDS SCIENCE EDUCATION AT ALL LEVELS

Board J

@ 10:00 a.m. A. M. Sarquis, Miami University-Middletown
Ed Smyth-Lemon-Morroe High School
Betty Rose Kibbey-McKinley Elementary
1210 S. Verity Parkway, Middletown, OH 45044

The presentation includes goals of the project SCIENCE IS FUN, the three phases which the project contains and specific goals for each phase. Phase I of the project is Super Saturday Science Sessions held on branch campuses of Miami University in the fall. Miami science teachers presented lectures, demonstrations and directed hands-on explorations to high school students and teachers. These challenges would not have been available at local high schools. In the spring Phase II of the project is held in junior high schools and elementary schools. The Science Carnival includes a series of hands-on explorations to excite young students in science. The explorations are designed and directed by the high school students and teachers who participated in Phase I. The last phase is the Summer Science Camps held at Miami campuses and high schools. The week long camps expose students to hands-on science activities, small group work with individual attention and take home explorations. The camps provide training for select high school students and teachers who participated in Phases I and II. 8,800 students and teachers have been 'turned on to science' so far.

Poster Boards PRESENTATIONS BY WINNERS OF 1988-89
BATTELLE AWARDS FOR PROFESSIONAL DEVELOPMENT.

In 1989 The Ohio Academy of Science and Battelle Memorial Institute selected the winners of the Battelle Awards for Professional Development. Battelle Awards for Professional Development -- an educational partnership of The Ohio Academy of Science and Battelle Memorial Institute -- promotes professional development of science and mathematics teachers. The Battelle Award winners who received a total of \$10,000, will summarize their professional experiences this past year and be available to answer questions at the following times:

10:00 a.m. Connie Hubbard
Board K Minerva High School
Minerva
\$2,500 Science Teacher Winner

10:00 a.m. Paul Lenz
Board L Miller City High School
Miller City
\$2,500 Mathematics Teacher Award
Winner

10:00 a.m. Rich Benz
Board M Wickliffe High School
Wickliffe
\$5,000 School Award Winner

SECTION I. Anthropology & Sociology

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

218 Fawcett

Dr. Barry E. Thompson, Presiding

9:30 CHILDREN'S TEMPERAMENT AND THE CLASSROOM: PATTERNS ACROSS CULTURES

Jeanne Ballantine and Helen Klein
Wright State University, Dayton, OH 45435

Cultural ideals provide the context for early socialization in schools. This study assessed ideal and actual temperaments of children as viewed by teachers in the United States, England, Israel, and Japan. Similarities and differences in ideals were found with the United States and England being most similar and Israel being most divergent. The temperament ideals for mood, intensity, activity and adaptability showed the greatest cross-cultural differences. Comparisons of temperament judgments of actual children from the United States, England and Israel found England and the United States to be the most similar. The judgments of the Israeli teachers were different on the dimensions of mood, adaptability and distractibility of children. The results suggest the importance of cultural ideals of temperament for understanding perceptions of children, decisions about classroom environments and individual adjustment patterns.

9:45 CULTURAL INFLUENCES ON WOMEN'S SCIENCE CAREER CHOICES. Anna Bellisari, Department of Sociology and Anthropology, Wright State University, Dayton, OH 45435.

Intensive interviews of a sample of Ohio State University female graduate students revealed cultural differences influencing the selection of academic majors and careers by American and foreign women in the sciences and the humanities. For example, women from Asian and African countries frequently indicated strong parental and societal pressures for specific scientific careers. Women from Europe and the U.S., on the other hand, were more often motivated by personal interest in the subject matter of their selected disciplines, and were more frequently concerned about combining future career and family responsibilities. Other cultural variables relating to career choices will also be discussed. Results of this study contribute to the understanding of women's participation in science and may enhance U.S. educators' efforts to improve science education for women.

10:00 CHILD CARE: AN EVOLVING SERVICE AND SHIFTING EMPHASIS. William F. Laurie, Suite 350 Plaza Nine, 55 Erieview Plaza, Cleveland, Ohio 44114

A picture of child care at various levels of government shows a disorganized system composed of multiple programs often conceived and administered independent of each other. All levels of government--federal, state, and local provide some form of child care through an extensive array of programs. Our study identified over \$6 billion in spending for child care in 1988.

In the last decade, the direction of federal government spending has shifted from low-income families to middle- and upper-income families. The shift from block grants to tax credits means that low-income families may have access to less purchase-of-care assistance than previously.

Federal programs originate in several different Congressional committees and program administration is divided among several federal agencies and between levels of

government. In turn, state and local governments as well as private organizations add their own programs to the federal sponsors. Program fragmentation and lack of coordination result. Because of a lack of a focal point service demand and supply is difficult to determine.

Insights on funding, coordination, quality standards, and services will be provided in the paper.

- 10:15** GENDER-ROLE RESEARCH: A SOCIOLOGICAL PARADIGM
Lena Wright Myers
Sociology and Anthropology Department
Ohio University
Athens, OH 45701-2979

This presentation will focus on the importance of pursuing research on gender role socialization. It is derived from the author's ongoing research: The Effects of Early Gender Role Socialization on Occupational and Familial Role Performances Among Women.

- 10:30** ETHNIC POWER TYPOLOGY
FOUND IN ORAL HISTORY. Joanne
Marchione and Susan Stearns
2629 Greenview Circle N.W.
Canton, Ohio. 44708

Ethnic traditions are considered sources of family power. A proposed new ethnic power typology has emerged from the review of the ethnic related literature and data collected from oral histories. Knowledge of this power typology may assist health professionals in assessing and nurturing power values of families.

- 10:45** A COMPARISON OF HUMAN VERSUS OTHER PRIMATE
ELBOWS WITH IMPLICATIONS FOR LOCOMOTOR
ADAPTATIONS AND EVOLUTION. Forrest J. Smith,
Department of Biology, Wayne College, The University of
Akron, Orrville, OH 44667.

The evolutionary relationship of humans and modern African apes (chimpanzee and gorilla) is a central question of modern biological anthropology. Molecular, anatomical and paleoanthropological studies are unclear and sometimes in disagreement concerning the timing of the evolutionary split and, especially locomotor relationships. Are humans descended from brachiators, knuckle-walkers or plantigrade quadrupeds? This study compares measurements from human distal humeri to those made by Rose on various primates including lesser and greater apes, and Old and New World monkeys. Further studies include a look at the radial head. There is also a critical discussion of adaptations for "stability" and "close-packing" of the elbow joint. Some light may be shed on the evolution of human locomotion in these studies.

SECTION I. Anthropology & Sociology

Only Afternoon & Business Meeting at 1:30 p.m.

Saturday, April 28, 1990

218 Fawcett

George B. DeMuth, Presiding

- 2:00** THE PIG SITE (33-Li-251): LATE PLEISTOCENE
TO RECENT HUMAN OCCUPATION IN CENTRAL OHIO.
B.T. Lepper, T.A. Frolking, P.E. Hooge,
W.A. Dancey, P.J. Pacheco, D.A. Wymer, Newark Earthworks
State Memorials, Newark, OH, 43055

The Pig Site (33-Li-251) is located in a small, south-facing amphitheater-shaped basin which drains into lower Raccoon Creek in central Licking County, Ohio. An oval (8 m x 10 m) topographic high is situated within this basin between two perennial springs. This topographic high is not natural but consists of human-worked deposits. A minimum of four distinct cultural components representing different time periods tentatively are identified at the Pig Site: 1) an ephemeral Historic component; 2) a Woodland occupation; 3) a series of Early Archaic occupations; 4) an Early Paleoindian component. The Paleoindian component, which consists of a fluted point, a scraping tool, and flint chippage, is of special interest because it appears to represent an in situ Early Paleoindian occurrence stratified below subsequent cultural occupations. Therefore, this site may yield evidence for periods of human occupation in central Ohio beginning 11,000 years ago.

- 2:15** THE PREHISTORY OF OWEN ROCKSHELTER
(33GR670). Gavine Pitner, Department of
Anthropology, University of Cincinnati,
Cincinnati, OH 45221.

Archaeological material from Owen Rockshelter in Greene County, Ohio was examined in order to determine its chronology and the prehistoric activities that occurred at the shelter. A debris profile, a count and weight of material by volume, together with radiocarbon dates, typological lithic artifacts, and a faunal analysis were utilized in the study. Over 20.5 cubic meters of earth were excavated and processed for analysis by the Wright State University Archaeology Field Schools between 1982 and 1988. Lithic materials indicated that the shelter was used for more than 4000 years, from the Late Archaic through the Mississippian Period. The radiocarbon dates of charcoal from hearths found in the shelter confirm late prehistoric use. The debris profile also showed usage in the more recent period. Faunal analysis provided evidence the shelter occupants used a broad variety of animals and suggests that a Spring through Fall occupancy was more likely. Therefore, it is most likely the shelter was used as a hunting encampment.

- 2:30** THE SERRAN FORT SITE (33RR85). AN
EARLY WOODLAND SITE IN ERIE COUNTY,
OHIO. George B. DeMuth, Sandusky Bay
Chapter, Archaeological Society of Ohio, 4303
Nash Road, Wakeman, Ohio 44889

The Serran Fort Site is located on a bluff between Hunt Creek and the west branch of the Huron River. Six units were excavated in 1969 by the Sandusky Bay Chapter of the A.S.O. These units have yielded 2 complete Early Woodland house structures, one possible animal cage and penon, 60 Early Woodland pit features. Many pits have yielded knob handled Early Woodland pottery vessels, of a variety similar to the Leitch variety from Lorain County, Ohio, as well as diagnostic Early Woodland stemmed knives and other tools used during this time period.

- 2:45** A CONSTRUCTION SEQUENCE FOR A HOPEWELL
HILLTOP ENCLOSURE. Robert Riordan, Department
of Sociology and Anthropology, Wright State
University, Dayton, OH 45435

Stratigraphic and radiocarbon dating evidence obtained from the Pollock Works, a Middle Woodland hilltop enclosure in southwest Ohio, has made it possible for the first time to document the development of a hilltop site's plan. Construction is believed to have occurred in four stages during the first century A.D., beginning with a simple barrier wall placed across the approach to the plateau summit that was transformed into a more complex edifice incorporating gateways, exterior elements and a second, bluff edge wall. The implications of a phased construction program on the possible roles such sites may have played in the Hopewellian world are discussed.

- 3:00** RE-EXAMINATION OF THE CHILLICOTHE HILL
MOUND ENCLOSURE. Charles R. Wallace,
Mound City Chapter, Archaeological
Society of Ohio, Social Studies Teacher in the
Chillicothe City School System.

The Hill Banks Earthworks consists of a large circular square enclosure. Minimal tools of any one particular era have been located, however, both stone and flint artifacts have been found on the surface, of high detail and quality, from various eras from Mid-Pleistocene to Late Woodland.

- 3:15** RETHINKING WOLF: SOME PRELIMINARY OBSERVATIONS
FROM THE PETERSEN SITE, OTTAWA COUNTY, OHIO.
Tim Abel, Archaeology Program, The University
of Toledo, Toledo, Ohio 43606.

In the past year, The University of Toledo Laboratories of Ethnoarchaeology, in cooperation with many avocational groups, have undertaken extensive subsurface excavations of the Petersen Site, Ottawa County, Ohio. This site has disclosed evidence of over 11,000 years of occupation, from Paleo-Indian through historic Wyandot and Euro-American time periods. Data collected from the site pertaining to the enigmatic Late Woodland Wolf Phase (ca. 1200-1400 AD) of NW Ohio, SE Michigan and SW Ontario has become of particular interest to the author. Preliminary observations of this data suggest a special "ceremonial" purpose for the Petersen site, possible as a traditional

ritual grounds for festivals such as the "Feast of the Dead." The Ceramic assemblage is specifically being analyzed to provide a temporal and typological rethinking of the Wolf Phase and its attendant ceramic hallmark type "Parker Festooned".

3:30 THE TOTONTARATONHRONON: ETHNIC IDENTITY OF THE SANDUSKY TRADITION. David M. Stothers (Ph.D.) Director, The University of Toledo Archaeological Research Program, Toledo, Ohio 43606.

The Indian Hills Site (33-WO-4), the type site for the Indian Hills phase, the terminal phase of The Sandusky Tradition, is a large protohistoric village which has produced an array of European trade goods and late 16th/early 17th century radiocarbon dates. It is postulated that the inhabitants of this village may be distinguished as the Totontaratonhronon, a group identified by Father Le Jeune in the Jesuit Relation of 1640. Their name is believed to be derived from the geographic name Tiotontaraeton, used by LaSalle (1682) to describe a river located at the western end of Lake Erie along its south shore. Authorities such as Margry (1876-1886) and Delanglez (1938) believe this river to be the present-day Maumee. Jesuit Missionary Father Potier (1920) later lists this name in his historic Huron-Wyandot grammar as T'otontaraton and Totontaraton; both references relating to the Riv. des mis, a former name for the Maumee River. According to Robinson (1946), the name is ultimately derived from Totontaraton, which translates to "where the lake disappears." It is suggested that the name Totontaratonhronon refers to the population that inhabited the Indian Hills site. This population represents the terminal developmental phase of the Sandusky Tradition, prior to their military defeat and dispersal in 1643 by their traditional enemies, the Neutral Iroquois.

SECTION J. Natural Resources

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

222 Fawcett

Robert L. Vertrees, Presiding

9:00 AN ETYMOLOGICAL APPROACH TO IMPROVE COMMUNICATION ABOUT WAYS OF APPLYING KNOWLEDGE FROM TWO OR MORE DISCIPLINES. Robert L. Vertrees, Ph.D. School of Natural Resources, The Ohio State University, 2021 Coffey Road, Columbus, OH 43210-1085.

Effective communication in natural resource and environmental professions is hindered by the loose, inconsistent, and divergent use of terms to denote different ways of applying knowledge from two or more disciplines in endeavors such as teaching, research, public service, planning, policy analysis, and field management. This is demonstrated by a review of how the terms "crossdisciplinary", "interdisciplinary", "metadisciplinary", "multidisciplinary", "pandisciplinary", and "transdisciplinary" are used in pertinent formal literature. Meanings explicitly or implicitly given these terms in the literature, and definitions or descriptions for some of them given in dictionaries or encyclopedias of education, are compared among themselves and from the standpoint of how well they agree with what is said in dictionaries of etymology about the origins and histories of meanings for the prefixes "cross", "inter", "meta", "multi", "pan", and "trans". This etymological approach has resulted in a set of definitions that is recommended for use by resource and environmental professionals. In addition, these professionals are urged to pay more attention to the responsibility they have to define the terms they use in a logically sound manner, to require this when reviewing the work of other professionals, and to teach this to students.

9:30 EVALUATING PUBLIC INPUT INTO NATIONAL FOREST PLANNING: SATISFACTION OF PARTICIPANTS WITH A U.S.F.S. CITIZEN PARTICIPATION PROGRAM. Edythe Seehafer, Donald W. Floyd, Ph.D., and Robert L. Vertrees, Ph.D. School of Natural Resources, The Ohio State University, 2021 Coffey Road, Columbus, OH 43210-1085.

All National Forests have developed a forest plan through a planning process mandated by the National Forest Management Act of 1976. This study was of the citizen participation program of one of the last plans to be developed, the Wayne National Forest Plan. The study's basic purpose was to determine the extent to which the citizen participation program succeeded in changing participant attitudes about the plan for the better. The study used two mail surveys; one to a random selection of persons who expressed interest in the plan and the other to persons targeted by the U.S. For-

est Service for inclusion in the citizen participation program. The field-tested surveys included Likert-summed-scale questions designed to measure satisfaction with the citizen participation program and the final plan. The basic analytical approach was to use discriminant analysis to identify the best predictors of plan and program satisfaction and to determine relationships between program participation levels and the satisfaction of various interest groups. Preliminary results indicate that satisfaction varied significantly across the interest group variable.

10:00 THE IMPACT OF TELEVISION ON PUBLIC ENVIRONMENTAL KNOWLEDGE CONCERNING THE GREAT LAKES, Christine C. Brothers, Rosanne W. Fortner, and Victor J. Mayer, The Ohio State University, School of Natural Resources, 210 Kottman Hall, 2021 Coffey Road, Columbus, Ohio 43210

The purpose of this study was to collect baseline information about public knowledge of the opinions toward the Great Lakes and to measure the impact of a television news show in educating adults about the Great Lakes. Survey questionnaires containing multiple choice knowledge items and Likert scale opinion statements were completed by 570 shoppers in two Cleveland, Ohio, shopping malls during April, 1989, to determine the current levels of information and opinions held. This baseline study revealed that knowledge levels about the Great Lakes are generally low while opinions held about the Lakes are generally environmentally positive. In May, 1989, WJW-TV8 in Cleveland broadcast selected questions from the survey, the correct answers, and accompanying explanatory video segments on the station's evening television news show. Following the broadcast, 461 Clevelanders completed the entire survey questionnaire, which was provided at county and city library branches. For both mall and library respondents, environmental knowledge level and environmental opinion were positively correlated and were most strongly associated with education level. Respondents who cited newspapers or lake experiences as their primary source of Great Lakes information were more knowledgeable than those who cited television, however, environmental opinion did not differ by media use. A comparison of knowledge scores on questions that had and had not been broadcast for library respondents who had watched the television broadcast showed that the news show was indeed effective in increasing knowledge levels among those who viewed it. To the extent that the television news show viewership is representative of the general public, it seems that this media format can be an effective way to educate the public about the Great Lakes.

10:30 INTEGRATING MATH AND SCIENCE IN OUTDOOR EDUCATION PROJECTS. Monica L. Harrison and Forrest J. Smith, Wayne College, Orrville, OH 44667. Jim L. Jackson, Environmental Studies, University of Akron.

For some time, outdoor education experiences have been used to introduce field experiments in science. Here, mathematics and science were integrated in projects in which measurements were gathered and analyzed.

The authors worked with inner-city junior high students during their outdoor education experience at the Earthlore Center in the CVNRA. Their adult tutors were trained in a preliminary session.

First, students calculated species diversity. They were introduced to the relevant concepts, then collected data using point-quarter methodology. They analyzed data using percentages, tables, and sigma notation to calculate a diversity index.

After the first field experiment, the adult tutors and students were enthusiastic and requested that the authors return with a second project. In the second project, a month later, the students measured the angle of elevation to the top of a tree with a clinometer and used graph paper, rulers, and protractors to make a scale drawing and determine its height.

10:45 THE RELATIONSHIP OF AN INTEGRATED CORE SCIENCE COURSE ON COLLEGE STUDENT ACHIEVEMENT AND ATTITUDE. David E. Todt, Shawnee State Univ., Portsmouth, OH 45662

During the past decade, there has been a call for reform and renewal of undergraduate liberal arts education in America. A number of these recommendations have been included in the design of the general education core at Shawnee State University. This study examined the relationship of student achievement and attitude in an integrated science/literature approach compared to a traditional disciplinary approach. Attitude was measured with two semantic differential instruments and achievement was measured with 12 objective questions testing a topic that was covered in both courses. Significant differences

were noted in the achievement results and the semantic differential form used. No student attitude differences were found between the integrated and traditional approaches.

SECTION J. Natural Resources

Only Afternoon & Business Meeting at 1:30 p.m. Saturday, April 28, 1990 222 Fawcett Mel Hathaway, Presiding

2:00 ISOLATION, CHARACTERIZATION AND DETECTION OF CYANOBACTERIA (BLUE-GREEN ALGAE) TOXINS FROM FRESHWATER SUPPLIES. Carmichael, W.W.
Department of Biological Sciences, Wright State University, Dayton, OH 45435.

Toxins of cyanobacteria (blue-green algae) continue to be a problem in the maintenance of safe municipal and recreational water supplies for animal and human use throughout several areas of the world. New toxins from the two main groups of toxic compounds--the cyclic hepatotoxic peptides and neurotoxic alkaloids--have been isolated and chemically characterized. Newer methods of isolation and purification are now available for the detection of minor toxins in situations where no or little toxicity was previously identified. In addition preliminary results with immunological detection methods now make it possible to develop rapid test kits to the various toxin groups. These results will be presented within the context of the role of toxic cyanobacteria in water-based disease.

2:30 COMPARISON OF DRASTIC WITH ACTUAL NITRATE VALUES

Thomas Münsterer and Albrecht Stöcklein
Heidelberg College, Tiffin, Ohio 44883

DRASTIC indexes provide discrete numbers which can be used to evaluate groundwater pollution potential. To verify a model like DRASTIC, one must compare it with actual groundwater pollution. The Heidelberg Water Quality Lab has developed a data base containing 16,000 observations of nitrate concentration in private wells of Ohio.

These data offer the possibility to look for correlations between DRASTIC indexes and actual measured NO_3 values. We examined whether correlations that were present among county averages for NO_3 and DRASTIC were also present within individual wells in a single county. The expectation is for increasing nitrate concentrations with increasing DRASTIC scores.

For 171 wells in Pickaway County, there was no correlation whatsoever at this level. One must, therefore, look for correlations on more specific levels. But also the comparison on the level of major hydrogeologic settings showed no correlation. On the contrary, the hydrogeologic region where DRASTIC predicted a higher pollution potential showed significantly lower NO_3 values than the region with the smaller DRASTIC indexes. This might be caused by a response-time effect.

The results imply three possible explanations: 1. The DRASTIC model is faulty on a small scale level; 2. The DRASTIC model works as expected, but the contamination data is in error, due to factors not considered in the model; 3. The DRASTIC model and the pollution data are correct, but DRASTIC gives us a correlation with NO_3 on a far higher level than expected and than reasonable for drinking-water.

2:45 HERBICIDE CONCENTRATIONS IN OHIO'S DRINKING WATER SUPPLIES. David B. Baker,
Heidelberg College, Tiffin, Ohio 44883

To assess the health risks posed by herbicides in Ohio's drinking water supplies, information regarding herbicide toxicity and exposures is necessary. Based on toxicity studies, lifetime health guidance levels have been established for alachlor and atrazine of 2 $\mu\text{g/L}$ and 3 $\mu\text{g/L}$, respectively. These two herbicides are widely used in Ohio and together comprise the bulk of the toxicity threat from herbicide contamination in drinking water.

Analysis of available concentration data for alachlor and atrazine in surface water and groundwater based supplies suggests that statewide average concentrations for alachlor and atrazine are approximately 0.1 $\mu\text{g/L}$ and 0.26 $\mu\text{g/L}$, respectively. Determination of average concentrations are difficult because, in most samples, concentrations are below detection limits and the detection limits vary greatly among laboratories. For water supplies withdrawn from surface waters, average alachlor and atrazine concentrations were 0.15 and 0.42 $\mu\text{g/L}$, while for groundwater based supplies they were 0.036 and 0.05 $\mu\text{g/L}$. In a small number of private, groundwater based supplies, concentrations exceeded the lifetime health advisories. The "bulk" of the exposures occurs in the relatively small number of public supplies withdrawn from rivers draining agricultural watersheds. For the vast majority of supplies, both public and private, concentrations apparently

are less than 1% of the levels that are deemed safe for lifetime exposures. Seasonal treatment to remove herbicides at selected water treatment plants and increased care in the handling of herbicides offer considerable potential to reduce exposures to these compounds for the small proportion of affected supplies.

3:00 CISTERN AS A SUPPLEMENTAL WATER SOURCE FOR DOMESTIC USE IN RURAL OHIO. Henry H. Smith, Ph.D., Central State University,
Wilberforce, Ohio, 45384

The drought of 1988 has raised the consciousness of many in Ohio to the importance of planning for provision for dependable safe and sufficient sources of water. This is particularly true in rural communities and remote dwellings where alternative outside sources of water are often not practical or possible. Rain water cistern systems have been used in the past for water supply in Ohio and may presently serve as a feasible alternative supplemental system for areas removed from distribution networks. Cistern technology is in continual development and usage of these systems have lately been receiving worldwide attention. Analyses of volume requirements are made for various demands and supply conditions to determine their possible applications in Ohio. An examination is made using the historical record to simulate the performance of cisterns during the past drought when serving as the only water source, as a supplemental or supplemented source and using constant or variable demands. Quality considerations, advantages and disadvantages of these systems are also considered.

3:15 CHARACTERIZATION OF BACTERIAL POPULATIONS IN AN IRRIGATION WELLFIELD IN NORTHWEST OHIO
Stuart A. Smith, Nancy R. Quinn^a, and Eric V. Nelson

^aS.A. Smith Consulting Services, Ada, Ohio 45810-0088
^bDepartment of Biology, Ohio Northern University, Ada, Ohio 45810

A two-year study was conducted of the characteristics of microbial populations in wells of a horticultural irrigation wellfield at Ada, Ohio, in the Northwest Ohio carbonate aquifer. The utility of simple sampling and analytical techniques for aquifer microbiological studies was investigated. Sampling methods were limited by geochemical data obtained from the study closely resembled expectations based on area geology, results of other investigations, and observations of biofilm effects. Bacterial enumeration and identification utilized widely accepted standard techniques as well as newly developed nutrient assimilation and presence/absence test kits. Total heterotrophic bacterial numbers varied monthly, with late summer and fall peaks. Eight types of bacteria were identified presumptively to the genus level. A possible linkage between high bacterial populations and reduced iron in pumped well water was identified. Problems encountered in bacterial analyses were inherent to sampling and analytical design and the limitations of analytical procedures, although many of the methods used are commonplace in aquatic microbiological studies.

3:30 VARIABILITY IN THE pH OF THE NEARSHORE WATERS OF THE CENTRAL BASIN OF LAKE ERIE.

Ihor Hlohowskyj, Environmental Assessment and Information Sciences Division, Argonne National Laboratory,
Argonne, IL 60439

I examined the seasonal variability in pH of the nearshore waters (water depth less than 9 m) of the central basin of Lake Erie. Daily pH values for the years 1984-1986 were obtained from the intake water quality records of six municipal water plants located along approximately 153 km of the central Lake Erie shoreline, from Lorain, OH to Conneaut, OH. Mean water depths for the intake structures ranged from 4.6-6.7 m. During 1984-1986, the pH of the nearshore waters was typically greater than 7.5. Among all sites, the pH ranged from 6.7-8.7. In general, pH values were the most basic and least stable in late summer and autumn, and least basic and most stable in winter. Similar seasonal patterns in pH were observed among five of the six sites. At the easternmost location (Conneaut) no repeatable seasonal trend was observed. Maximum values of pH were similar among all sites in all years. In contrast, minimum values decreased in a west to east direction through the study area. Minimum reported nearshore pH values ranged from 7.48 at Lorain (the westernmost site) to 6.7 at Conneaut. The observed differences in nearshore pH values along the central basin may reflect differences in local geology among the study sites. (This work was not funded through Argonne National Laboratory.)

THE AFFECTS OF NO-TILL IN KNOX CO.

3:45

Robert Priddy, Mt. Vernon Nazarene College and Brad Ross, Knox County Soil & Water Conservation District.

Located in central Ohio, Knox County is a rural community of 1,400 farms covering an average slope of six percent in 300 feet. In the 1960's, the average soil loss was eight tons per acre. To reduce soil erosion, no-till farming was started in 1968, and it has become the major farming technique in the County. During the past 20 years, no-till has reduced soil erosion by 50%. Crop yields have been comparable to or have exceeded conventional tillage yields.

Studies show that the seven to eight thousand pounds of mulch per acre buffers the soil temperature and moisture. The high soil temperatures under mulch are cooler than under bare soil. The low temperatures are warmer. Similarly, mulched soil holds moisture and it is less affected under short durations of rain.

Water quality tests of 738 private wells in the County (1988) averaged 1.46 mg/l nitrate concentrations compared to 16,166 private wells tested in 76 counties in Ohio, which averaged 1.32 mg/l nitrate concentrations. Of the 738 wells, 98% tested less than the EPA standards (>10 mg/l) for safe drinking water, 82% had less than 3.0 mg/l nitrate concentrations while 56% had less than 0.3% mg/l concentrations.

4:00 ENVIRONMENTAL IMPACTS OF COMPOSTING: A PROTOTYPE FOR A PRACTICAL COMMUNITY MODEL. Beth E. Waller, 902 Arrowhead Drive, #17, Oxford, Ohio 45056.

Of the waste material that humans send to landfills, 20% is food and yard waste. This material is aptly named for it is going to waste. While we are transporting many tons of these materials on land designated as unfit for any human use, save landfilling, we should be replacing them to other heavily used lands, such as farmland or garden plots. Composted materials provide many nutrients for plants, and they also increase the soil's capacity to retain moisture.

My project is a tool to understand human impact on the environment. It also serves as a way to teach the community about life cycles and about recycling, composting in particular. By participating in a trial composting program, it will be impressed upon residents of my apartment building the amount of material they use within certain periods of time, such as a day or a week. From further research, I will propose programs adaptable to city-wide management of recycling.

4:15 ESTABLISHMENT OF A PRAIRIE ON A BORROW-PIT SITE IN GREENE COUNTY, OHIO. Denis G. Conover and Donald R. Geiger, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221-0006 (DGC) and Department of Biology, University of Dayton, Dayton, Ohio 45469-0001.

Prairie vegetation has been planted on a sand and gravel borrow-pit site at the Bergamo-Mt. St. John Nature Preserve in Greene County, Ohio. Prairie was chosen for reclamation of this area because that type of community is well-suited to the extremes in moisture conditions found on the site. To establish grasses, seeds obtained from Western sources were planted in April of 1986 by hydroseeding on the graded site. Just prior to this, seeds of several forbs obtained from Western sources were broadcast over the area. Subsequently, seeds of grasses and forbs collected locally were broadcast. Forb species which were more difficult to establish were propagated in soil-filled plastic-film cylinders. These, and other plants collected locally from disturbed sites, were transplanted into holes prepared with a soil auger. Despite the severe drought of 1988 over 40 prairie plant indicator species, along with a number of animal species, have become established on the site.

4:30 NUMEROUS HABITATS OF THE BEAVER CREEK WETLANDS. Amon, J.P. Department of Biological Sciences, Wright State University, Dayton, OH 45435.

The wetlands surrounding the Big Beaver Creek in Greene County, Ohio are comprised of a large number of differing habitats. These habitats include sedge meadow, reed marsh, wet prairie, wet forest, ponds, temporary ponds, and streams. The central portion is very wet and easily qualifies as a fen but much of the system is fen-like with typical plant and animal communities. Preliminary field observations suggest that most are linked significantly to the aquifer which intersects the surface. Variations of plant communities seem to be, in part, due to the wetness

of the habitat, but other factors, such as land use history, creek dredging, water source, erosion, deposition and succession also contribute to the variety. The great number of different habitats gives an overall high diversity to the system. Careful investigation of the habitat, its hydrology and biology, will be needed to manage this resource once it has been fully protected.

4:45

BEARS OF THE NORTHERN ROCKIES, Nicholas J. Smith-Sebasto, The Ohio State University, School of Natural Resources, 210 Kottman Hall, 2021 Coffey Road, Columbus, Ohio 43210

Two species of bears, the black bear and the grizzly bear currently inhabit the northern Rocky Mountains in Wyoming, Idaho, and Montana. The black bear is a common game species and is hunted under state regulations in these states. However, the grizzly populations are low and the species is listed as endangered by the federal government. Extremely limited grizzly hunting, often only for nuisance bears, is permitted.

State and federal efforts to increase grizzly populations outside of the National Parks have been hampered by unnecessary grizzly deaths. Some of these have been caused by hunters mistaking a grizzly for a legal black bear and by stockmen killing raiding bears regardless of species. Unfortunate encounters with grizzlies by outdoor recreationists have occasionally resulted in human injury or death and, in many cases, the death of a bear. Some of these incidents may have been caused by incorrect identification of the bear.

There is a need to increase the awareness and knowledge of these publics and others to the behavioral and physical differences of the two bear species. Such an increase may help reduce unnecessary grizzly deaths and potentially dangerous human/bear encounters.

SECTION J. Natural Resources

Poster Session at 10:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board A USED NEWSPAPER FOR ANIMAL BEDDING
Joe E. Heimlich
2120 Fyffe Road
Columbus, OH 43210-1010

Newsprint is a major component of household waste. Recycling markets for newsprint are glutted; concurrently, legislative action mandates reduction in landfilling. One option for using some of the paper is as animal bedding on commercial farms.

Laboratory experimentation, stall trials, field trials and applied research were used in this study. Some results support prior research and are in turn supported by research being conducted elsewhere: paper is at least as absorbent as other bedding materials; paper is more sterile than other bedding materials; paper decomposes less quickly than sawdust but more quickly than other bedding materials; and paper is a more effective insulator than other bedding materials. The results that are not coincided with reported results from prior research are the negative results: paper can be more difficult to manage than other bedding materials; paper "travels" from the stalls and the animals; paper will pack as it is wetted and dried; and paper shred or fine chop do not work as bedding materials.

Other issues examined included ink toxicity and use of farm implements for chopping and baling paper.

Recommendations: locally generated paper be chopped and baled in a central location then used in farms within a close geographic region (closed loop economics); paper in 1-1/2 to 5 inch pieces be used in approximately a 50% mix with current bedding materials for two reasons—the mix 1) allows the positive benefits of the paper bedding while helping reduce the negatives; and 2) the mix promotes current barn management practice to encourage continued use.

Board B CHEMICAL ECOLOGY OF TOXIC FRESHWATER CYANOBACTERIA (BLUE-GREEN ALGAE).¹ Zhang, Q-X.,¹ W.W. Carmichael, and¹ W.R. Demott.
¹Department of Biological Sciences, Wright State University, Dayton, OH 45435, ²Department of Biological Sciences, Indiana-Purdue University At Ft. Wayne, Ft. Wayne, IN 46805-1499.

Cyanobacteria peptide toxins (MCYST-LR and NODLN) and cultures (toxic *Microcystis aeruginosa* PCC7820, nontoxic *M. aeruginosa* UTEX2061 and toxic *Anabaena flos-aquae* NRC-525-17) were used to study toxic effects on *Daphnia pulicaria*, *D. galeata mendotae* and *Diaptomus birgei*. The 96 hr LC50 of MCYST-LR to *D. pulicaria*, *D. galeata* and *D. birgei* was 13.80, 2.50, 0.65 ug/ml respectively and 1.70, 1.65, 0.87 for NODLN in static tests. *D. birgei* was further tested in a static assay and the response times determined. For MCYST-LR (LC50=0.26 ug/ml), 80 percent of the animals died within 12 hr at 2.0 ug/ml and 95 percent within 8 hr at 5.0 ug/ml. For NODLN (LC50=0.60 ug/ml), 75 percent died within 4 hr at 2.0 ug/ml and 85 percent within 2 hr at 5.0 ug/ml. Physiological responses of the zooplankton were expressed as changes in clearance rates for ¹⁴C or ³²P labeled *Chlamydomonas reinhardtii*, at 2, 6 and 18 hr. No significant changes were found except for *D. birgei* after 6 hr treatment. Reduced growth rates and increased mortalities in *D. pulicaria* feeding on PCC7820 and NRC-525-17 were found in life-table studies, but not for nontoxic UTEX2061.

SECTION K. Genetics & Cell Biology

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

203 Health Sciences

Dr. Michael S. Herschler, Presiding

9:00

THE CONTRIBUTIONS OF CHROMOSOMES TO LARVAL COMPETITIVE ABILITY IN *DROSOPHILA MELANOGASTER*
Marvin B. Seiger, Department of Biological Sciences, Wright State University, Dayton, OH 45435.

The purpose of this research is to determine the effects of each major chromosome on larval competitive ability in four isogenic strains of *Drosophila melanogaster*. A breeding scheme was devised to substitute all combinations of chromosomes of one standard isogenic strains with chromosomes of each of the other three isogenic strains while maintaining the integrity of each chromosome. The 18 substituted strains and the 4 parental strains were tested in a single rigorously controlled stress environment in which, on the average, only 50% of the larvae could survive. Ten replicates of each strain were tested in pure culture in which 20 first instar larvae of a strain were put into a vial, and in mixed culture in which 10 larvae of *melanogaster* and 10 larvae of an isogenic strain of *D. nebulosa* were reared together in a vial. After 18 days, each vial was scored for the number of emerged flies of each species. The viability of the larvae of each strain varies significantly among the experiments. Further, the viability of a genotype is influenced by the genotype with which it coexists.

9:15

A GENETIC REVIEW OF THE COYOTE, *CANIS LATRANS*, AND RELATED CANIDS
Patrick J. Thomas and Bonnie L. Lamvermeyer
Department of Biology, Denison University
Granville, Ohio 43023

Even though the coyote, *Canis latrans*, has been the subject of many ecological investigations, few studies have concentrated on the genetic variability of this species and related canids. As the diversity of large carnivores declined in recent years, few opportunities existed to sample such animals as their populations expanded into new or resettled areas. It has been reported that coyotes were absent from states east of the Mississippi River for at least 60 years. Recently the numbers of coyotes has increased in Ohio as is evidenced by escalating predator claims. During 1989-90 blood samples were obtained from Ohio coyotes and domesticated dogs in an effort to examine the genetic structure of resident and invading canids. Horizontal starch gel electrophoresis coupled with specific staining procedures indicated polymorphisms in canine serum albumin and leucine aminopeptidase.

9:30

TAXONOMIC DETERMINATION OF COYOTE-LIKE CANIDS USING ISOELECTRIC FOCUSING OF HEMOGLOBIN
Kevin S. Eaches and Bonnie L. Lamvermeyer
Department of Biology, Denison University
Granville, Ohio 43023

This genetic comparison of the hemoglobin of the coyote, *Canis latrans*, and the domestic dog, *Canis familiaris*, was conducted in a search for a simple technique for distinguishing between the two species. Three groups were examined - coyotes from Utah, coyotes from Ohio, and different dog breeds. Blood samples were assayed through isoelectric focusing on a polyacrylamide gel in the 3-10 pH range. Banding patterns of the hemoglobin required no staining, but the gel had to be preserved using a 15% trichloroacetic acid solution. This left a clear background with brown bands representing the hemoglobin. The Utah coyotes were found to have five banding patterns, four of which were shared with the domestic dog. In addition to these, *C. familiaris* was also found to have six patterns not found in the coyote. The Ohio coyote had a pattern found neither in western coyotes nor in the domestic dog. Hemoglobin appears to be of limited use for distinguishing between *C. latrans* and *C. familiaris* due to the overlap of banding patterns. An examination of the patterns of different dog breeds also failed to find a breed-specific indicator using hemoglobin.

9:45

TEMPERATURE-PROGRAMMED R-GENE EXPRESSION IN MAIZE. Bernard C. Mikula
Defiance College, Defiance, Oh. 43512

The level of paramutated R-gene expression, in

highly Inbred W22 background, was shown in previous studies to be related to light and temperature conditions at the time seedlings initiate tassels. The present report shows temperature alone can program a paramutated R-gene. R-genes of plants grown from seeds supplied by Native Seeds/Search were crossed to a paramutagenic allele, R-1st, in Inbred W22 background. Test-crosses of resulting heterozygous, RR-1st plants, grown at 22^o or 28^oC. for 21 days before transplanting to field conditions, showed paramutated R-genes with significantly more pigment resulting from the lower temperature (22^o) treatment.

Since tassel tissue has not yet formed at the time of treatment, the temperature effect must be "remembered" and passed on to cells to be later differentiated into pollen grains. The temperature effect is pollen-transmitted and expressed in the testcross kernels of females grown under field conditions. This "memory" effect can be called genetic programming.

10:00

MOLECULAR ANALYSIS OF A SPONTANEOUS AMPLIFICATION OF ADH2 IN *SACCHAROMYCES CEREVISIAE*.
Michael Dorsey, Scott Crable and Charlotte Paquin, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio, 45221.

An amplification of the alcohol dehydrogenase (ADH) gene ADH2 in *Saccharomyces cerevisiae* was characterized with Southern and sequence analyses. Approximately 4 copies of the normally glucose repressed ADH2 gene were found inserted into ribosomal DNA (rDNA) sequences. Each extra copy of the ADH2 gene replaces most of the 37S transcript in one of the approximately 200 copies of the rDNA. One of the joints between the rDNA and ADH2 DNA is located 7 nucleotides downstream of 20 thymidine residues in the normal copy of ADH2. At this junction, 16-29 adenines in the rDNA is expanded to 57-59 adenines in the DNA sequence in which the extra copies of ADH2 are located. The other novel joint is located in a 24 base pair region of 70% homology between ADH2 and the rDNA. These results suggest that the amplification was a two-step process: first, the ADH2 gene was inserted into the rDNA, then multiple copies were generated within the rDNA by unequal crossing over or gene conversion.

SECTION K. Genetics & Cell Biology

Only Afternoon & Business Meeting

at 1:30 p.m. Saturday, April 28, 1990

203 Health Sciences

Dr. Michael S. Herschler, Presiding

2:00

TRANSFORMATION OF *E. COLI* WITH THE ENVIRONMENTALLY SIGNIFICANT ABILITY TO GROW IN THE PRESENCE OF PARACHLOROPHENOL. Robert J. Stupi and Martha M. Kory, Univ. of Akron, Akron, OH 44325.

Two members of the Actinomycetes Line which degraded parachlorophenol and utilized it as a sole carbon source were isolated from an aerobic digester. At least 100 mg/L parachlorophenol was degraded by the isolates in 24-32 hours. To investigate this degradative ability, the cells were lysed and the DNAs isolated. Before lysis, the cells were sonicated and grown in 1-1.5% glycine. The sonication broke the mycelial fragments; the glycine prevented reformation of the mycelia and made the cell walls more susceptible to lysis. The DNA of the isolates was analyzed to determine the location of the parachlorophenol degradation gene(s). Several plasmid isolation procedures were performed; however, no plasmids were obtained from either isolate. Subsequently, chromosomal DNA was obtained from each isolate and digested with several restriction enzymes. Each of the digested DNAs was transferred into competent *E. coli* HB101 cells. The HB101 cells previously could not grow in minimal medium containing parachlorophenol nor degrade parachlorophenol. Transformants of the Hind III digested chromosomal DNA of one of the isolates were able to grow in medium containing parachlorophenol. The characteristic of growth but no degradation supports the hypothesis that more than one gene is necessary for complete parachlorophenol utilization and degradation.

2:15

Glucose Metabolism by *Mycoplasma hyopneumoniae* Membranes, Monica Ngu and K.P. Klatt, Dept. of Biology, Denison University, Granville, Ohio 43023

Members of the bacterial genus *Mycoplasma* are tiny prokaryotes that have no cell wall. *Mycoplasma hyopneumoniae*, the member of the genus that causes enzootic swine pneumonia, has an interesting outer membrane that is responsible for attachment of the microbe to swine respiratory epithelium. In the process of isolating the outer membranes of *M. hyopneumoniae*, we assayed the membranes for hexokinase. We found the membranes rapidly metabolize glucose to form three anionic products, none of which are glucose-6-phosphate.

The three anionic products, which can be separated on PEI cellulose, are polar, do not absorb UV light, and are quantitatively converted to gaseous materials after brief boiling in 0.05 M sulfuric acid. The formation of the anionic products is dependent upon the presence of Mg²⁺ and adenosine 5' triphosphate (ATP). Phosphoenolpyruvate and adenosine 5' diphosphate will substitute for ATP in the metabolism of glucose, but guanosine 5' triphosphate cannot.

The significance of this membrane dependent metabolism of glucose by *M. hyopneumoniae* will be discussed in light of what is known about carbohydrate utilization in the metabolically noncomplex mycoplasmas.

2:30 AN ULTRASTRUCTURAL STUDY OF THE EFFECTS OF MAIZE DWARF MOSAIC VIRUS ON ZEA MAYS

C. Hickey and M. Rudzik. Department of Biology, Westminster College, New Wilmington, PA 16172

A study is in progress to examine maize dwarf mosaic virus (MDMV) and its effects on the ultrastructure of corn. A non-resistant strain of sweet corn (*Zea mays*), Oh28, and a resistant strain, Ky61:2335, were manually inoculated with MDMV strain A. Samples were taken from the infected Oh28 and Ky61:2335. Healthy plants were used as controls. Samples are being viewed with a transmission electron microscope to observe subcellular progression of disease in leaf tissue.

2:45 INSECTIVORY AND SOCIAL DIGESTION IN *DROSOPHILA*. GREGG, T.G., A. MC CRATE, G. REVEAL, S. HALL, and A.L. RYPSTRA.

Department of Zoology, Miami University, Oxford, Ohio 45056.

It has long been believed that *Drosophila* larvae feed almost entirely by ingesting yeast and possibly other micro-organisms that are associated with fermenting fruits or other vegetable matter. However, we have discovered that the larvae of a number of *Drosophila* species can also consume insect tissues, including the exoskeleton, and that they can do so directly without the assistance of micro-organisms. This discovery, coupled with several other independent observations led tentatively to the twofold conclusion that not only do *Drosophila* larvae produce enzymes enabling them to digest a wide variety of substrates including chitin and cellulose, but also that these enzymes are egested onto the substrates so that at least some digestion, especially of large polymers, takes place externally.

3:00 HOMEOSTATIC ANTIOXIDANT CONTROL IN *DROSOPHILA MELANOGASTER*

D. Campbell and P. McCarthy. Department of Biology, Westminster College, New Wilmington, PA 16172

A series of experiments was conducted with *Drosophila melanogaster* to determine the validity of a homeostatic antioxidant control model, an extension of Harman's free radical model of aging. Research into the life-extending properties of individual antioxidants has yielded mixed results. One possible explanation for the failure of a single antioxidant to increase lifespan in a number of studies is that an organism has a fixed level of free radical scavengers and providing a dietary antioxidant with overlapping capabilities only decreases the level of free radical scavengers with no net effect on lifespan.

In this set of experiments vitamin C was used as a reference antioxidant because it proved to significantly increase lifespan in all studies. Among antioxidants with capabilities which overlap those of vitamin C, biotin inhibited and sodium hypophosphite had no effect on the life-extending properties of vitamin C. Vitamin E, an antioxidant with non-overlapping capabilities to vitamin C, was found at highly specific concentrations to interact with vitamin C to synergistically increase lifespan. All of these observations provide considerable support for a model of homeostatic antioxidant control.

3:15 MEAN LIFESPAN'S DEPENDENCE ON DEVELOPMENTAL TEMPERATURE AND ECLOSION TIME IN *DROSOPHILA MELANOGASTER*

J. McDonald and P. McCarthy. Department of Biology, Westminster College, New Wilmington, PA 16172

Many aging studies using *Drosophila melanogaster* have included temperature variations, both in imaginal and preimaginal environments. Few, however, used temperature during developmental periods (Lints and Lints, 1971; Economos and Lints, 1984; and Economos and Lints, 1986), and findings in those studies were used to determine if temperature affects the developmental period's length. An optimal developmental period length for each temperature has yet to be determined.

In this study the temperature variation occurs during the egg, larval, and pupal stages, and returns to standard temperature upon eclosion. The temperature variation will show if the effect of developmental period on lifespan is temperature dependent and, if so, what the optimum developmental period is for different temperatures. If eclosion time is shown to be an integral factor in life expectancy for *Drosophila melanogaster*, it will be another variable that must be controlled in future studies and might be part of the reason for so many discrepancies in past studies.

3:30 THE EFFECTS OF CALCIUM SUPPLEMENTATION ON BONE DEVELOPMENT OF SHELL-LESS CHICK EMBRYOS

J. Baron and M. Rudzik. Department of Biology Westminster College, New Wilmington, PA 16172

The effects of calcium deficiency on developing embryos can be easily observed using cultured, shell-less chick embryos. A lack of bone calcification, deformities of the bone, and eventual death are just some of the documented results of this culturing technique. Rocky Tuan (1983) showed that the addition of a piece of eggshell with the attached membranes was able to reduce the severity of some of the known results. This system provides many opportunities to study the process of bone calcification and the specificity of the process.

In order to study the uptake of calcium in bone development, various sources of calcium are being added to shell-less cultures and the total levels of calcium in the embryos are being measured. The tibia from the chicks are being stained with Alizarin Red S stain, which only colors the calcium present. The sources of calcium other than eggshells being used include sea shells, bone, and inorganic calcium sources other than calcium carbonate. These sources are powdered and mixed with agar, autoclaved, and poured into thin sheets. Pieces of these sheets are added to the culture and the resulting levels of calcium measured.

3:45 CHARACTERIZATION OF A DEVELOPING BASEMENT MEMBRANE IN A HUMAN BILAYERED SKIN EQUIVALENT *IN VITRO*. M. Dana

Harriger, and Barbara E. Hull. Biological Sciences Department, Wright State University, Dayton, OH 45435.

The human skin equivalent (HSE), produced by layering a suspension of epidermal cells over a collagen-fibroblast matrix, is a convenient model to study differentiation of skin. After the addition of epidermal cells, the HSEs were grown submerged in medium for one week followed by three weeks at an air-liquid interface. The HSEs were then fixed in buffered formalin or glutaraldehyde for morphological examination. Electron micrographs of the epidermal-dermal junction showed formation of a linear lamina densa together with hemidesmosomes. Immunofluorescence was used to detect the basement membrane specific markers, collagen IV and VII. Punctate staining was observed along the epidermal-dermal junction, indicating construction of a basement membrane and confirming the electron micrographs. The HSE thus is a good model to study development of basement membranes *in vitro*.

4:00 AMYLASE IN A MARINE PROTIST. Amon, J.P., and L. Culley. Department of Biological Sciences, Wright State University, Dayton, OH 45435.

A marine protist, tentatively an *Ulkenia* sp., produces large quantities of extracellular amylases. The three amylases appear to have molecular weights of about 110 Kd, 90 Kd, and 60 Kd and digest potato starch readily. Products of digestion are primarily glucose and maltose. Attempts at molecular cloning are not yet complete but it is clear that the DNA of the protist has little homology

with bacterial, yeast or mammalian amylase DNA used as probes. The marine source of the organism, the activity of the enzyme in seawater, and the apparent uniqueness of its DNA suggest that the enzyme may be a novel one.

SECTION K. Genetics & Cell Biology

Poster Session at 10:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board C GENETIC MAPPING OF A RIBOSOME EDITOR MUTATION
@ 10:00 a.m. IN E. COLI. Rod Anderson, Department of
Biological Sciences, Ohio Northern University
Ada, Ohio 45810.

A mutant of *E. coli* was examined with respect to amino acid polymerization rate and misreading of translation *in vivo* and *in vitro*. In completed proteins the mutant increased the missense error frequency only, without altering the rate of amino acid polymerization. The behavior of the mutant was that expected for a strain which contains a defective ribosome editor. The wild type allele of the ribosome editing mutation has been linked to within 0.1 min of a tetracycline-resistance insertion induced by transposition from Tn10. The tetracycline-resistance insertion cotransduced with *rpsL* and *rpsE* at a frequency of 0.63 and 0.50, respectively, placing it at 73.1 min on the genetic map. This location indicated that the insertion and the ribosome editing mutation lie within the S10 ribosomal protein operon. Complementation studies using plasmids containing fragments of the S10 operon indicated that the ribosome editing mutation is located in either L22, S3 or L16. The erythromycin-resistant nature of the ribosome editing mutant and the apparent increase in affinity of peptidyl-tRNA for the ribosome leads me to speculate that the mutant ribosomal protein affects either translocation of peptidyl-tRNA, the structure of the ribosomal P site, or both.

Board D PREFERENTIAL REPAIR OF THE BETA-ACTIN GENE IN
@ 10:00 a.m. HUMAN CELLS. L. S. Barsalou and G. J. Kantor,
Department of Biological Sciences, Wright
State University, Dayton, Ohio 45435.

Normal human diploid fibroblasts are maintained in culture as nondividing cells to mimic the cell cycle condition found in most normal tissue *in vivo*. Cells in these populations efficiently repair damage in DNA. For example, cells exposed to ultraviolet light (UV, 254 nm) or sunlight repair about 75% of the pyrimidine dimers in 24 h. We have examined the repair rate of some specific genes to determine if some parts of the genome are repaired more efficiently than others. We find that the beta-actin gene is repaired rapidly, with about 75% of the pyrimidine dimers removed in 8 h following exposure to UV. We also find that the transcribed strand of the genomic DNA comprising the beta-actin gene is repaired more rapidly than the nontranscribed strand. Thus, there is heterogeneity of repair in different parts of the human genome in nondividing cells and it extends not only to specific genes but to the specific DNA strands comprising those genes. These results are consistent with the results of others obtained using proliferating cells and the dihydrofolate reductase gene and with the hypothesis that preferential repair of any genomic region may depend on the transcriptional activity of that region.

Board E INHIBITION OF HERPES SIMPLEX VIRUS TYPE 1 RE-
@ 10:00 a.m. PPLICATION BY 6-DIAZO-5-OXO-L-NORLEUCINE (DON).
Gerald Goldstein, Botany/Microbiology Dept.
Ohio Wesleyan University, Delaware, Ohio, 43015.

The effects of 6-diazo-5-oxo-L-norleucine (DON) on the replication of herpes simplex virus type 1 in cultured green monkey kidney (BGMK) cells were examined. DON is an analogue of the amino acid glutamine and inhibits the synthesis of glycoproteins and nucleotides. The kinetics of HSV-1 replication in BGMK cells exposed to 20 mcg DON/ml indicate that DON inhibits virus replication to an extent greater than 99% and delays replication of the virus 2-4 hours. The addition of DON to cell cultures 1 hour prior to infection produces the greatest inhibition whereas addition 4 hours post infection yields virtually no inhibition. Concentrations of DON above 0.5 mcg/ml all produce inhibition of virus replication greater than 99% and a concentration of 0.1 mcg/ml inhibits HSV-1 replication 50%. At 1.0 mcg/ml, DON inhibits incorporation of radioactively labelled thymidine, uridine and mannose into the viral DNA, RNA, and glycoproteins by 25%, 30%, and 20%,

respectively. When continuously exposed to DON at a concentration of 0.1 mcg/ml, which inhibits HSV-1 replication by 50%, BGMK cell replication is identical to control cells for at least 5 passages of 3 days each. DON inhibits herpes simplex virus replication at a concentration which does not inhibit BGMK cellular growth and may prove to be an effective anti-viral drug *in vivo*.

Board F ROLE OF LANGERHANS CELLS IN THE
@ 10:00 a.m. REJECTION OF MURINE SKIN-EQUIVALENT
GRAFTS. Barbara E. Hull and Mary
Lerner-Tung. Biological Sciences Department,
Wright State University, Dayton, OH 45435.

The bilayered skin equivalent, constructed by layering a suspension of epidermal cells over a collagen matrix populated by fibroblasts, provides a convenient system for investigating the cellular mechanisms of graft rejection. The Langerhans cell, an antigen-presenting cell which bears class II (Ia) membrane antigens, has been postulated to play a role in the rejection of allogeneic skin grafts. Skin equivalents constructed using epidermal cells from Brown Norway rats were rejected by Lewis rats. The epidermal cell suspension was incubated in mouse anti-rat Ia antigen antibodies followed by magnetic Dynabeads® coated with goat anti-mouse IgG antibodies. A magnet was then used to remove the Ia antigen+ cells from the epidermal suspension. Skin-equivalent grafts constructed using the Ia antigen-depleted epidermal cells were rejected at the same rate as the grafts containing untreated allogeneic epidermal cells. These results suggest that the Langerhans cell does not play a critical role in the rejection of murine skin grafts.

Board G
@ 10:00 a.m. AMPLIFICATION OF ADH2 AND ADH4 IN
Saccharomyces cerevisiae. Charlotte E. Paquin, Scott
Crabbe, Michael Dorsey. Department of Biological Sciences,
University of Cincinnati, Cincinnati, OH 45221.

Primary gene amplification, the change from one gene copy per genome to two or more copies per genome, is a significant, yet poorly understood, mutational event. We are using the alcohol dehydrogenase (ADH) system of the yeast *Saccharomyces cerevisiae* to isolate ADH2 and ADH4 amplifications in a single selection step and estimate primary amplification rates for ADH2 and ADH4. An amplification of ADH2 and five amplification for ADH4 have been isolated. Amplifications of the ADH2 and ADH4 genes are identified on the basis of their ability to confer antimycin A resistance on yeast strains lacking ADH1. The ADH2 amplification is an insertion of the ADH2 into the repeated ribosomal DNA of yeast. Four of the ADH4 amplifications are extra-chromosomal linear palindromes of about 40 kilobases. The fifth amplification appears to be an intra-chromosomal amplification which increases the size of chromosome VII where the ADH4 gene is located by at least several hundred kilobases.

Board H CELL DENSITY ALTERS SECRETION OF PEPTIDE REGU-
@ 10:00 a.m. LATORS OF ATP CITRATE LYASE IN HEPATOCYTES.
K. Smith, C. Tu AND K. Roehrig. Dept. Food Sci. and Tech.,
Ohio State University, Columbus, OH 43210

Density dependent growth of cells in culture is well established. Previous work from this lab demonstrated density dependence of ATP citrate lyase (CL), the enzyme which provides substrate for lipogenesis. Activity of CL in isolated rat hepatocytes was elevated at low cell density and decreased at high cell density. Conditioned medium (CM) collected from hepatocytes incubated at high density (HD) or low density (LD) contained a heat labile inhibitor(s) and a heat stable activator(s), respectively. Both the inhibitor and the activator had Mr>10KD. The inhibitor proved to be more potent than the activator and masked activation of CL in HD, an effect overcome by boiling HD (BERC 149:118, 1987). HD and LD CM was subjected to SDS-PAGE, and distinct peptide patterns were observed. At least two bands were specifically found in LD CM and one band was unique to HD CM. Multiple peptides were secreted into both HD and LD with some being more prevalent in one CM or the other. In addition, HD and LD CM from hepatocytes from fasted rats caused slight inhibition of CL and the capacity of LD to stimulate CL was blunted. Thus, cells respond to various conditions by altering the secretion of autocrine/paracrine regulators. Supported in part by Hatch Grant 823.

**SECTION L. Mathematics &
Computer Science**
Only Morning at 9:30 a.m.
Saturday, April 28, 1990
140 Health Sciences
Dr. James Y. Tong, Presiding

9:30 NEW CONSTRUCTIONS OF GROUP DIVISIBLE DESIGNS.
Susan Harris, Department of Mathematics and
Statistics, Wright State University, Dayton,
Ohio 45435

A group divisible design (GDD) with parameters $(m, n, k, \lambda_1, \lambda_2)$ consists of mn points split into m point classes (called "groups") of n points each, together with blocks (i.e. subsets of the point set) of cardinality k satisfying: Given any two distinct points p and q , the number of blocks containing both points is λ_1 if p and q belong to the same point class and λ_2 otherwise. These designs are useful in agricultural, genetic and industrial experiments. In this paper we provide algebraic constructions for three families of GDD's studied by Freeman (1976) and Bush (1979). We also generalize a construction of Arasu, Haemers, Jungnickel and Pott (1989) and obtain new families of GDD's. More specifically we obtain GDD's with parameters $(4t+1, v, 2tv+k, 4tv+2\lambda, (2t-1)v+2k)$ whenever $4t+1$ is a power of a prime number. These new designs admit a regular abelian automorphism group. The method of construction would use a finite field with $4t+1$ elements. Two initial blocks will be explicitly described. The remaining blocks can be generated from the initial blocks. Our description of the Freeman/Bush designs is much simpler and can be effectively used by statisticians to construct designs for experiments.

9:45 OPTIMAL BOUNDARY CONTROL OF THE NAVIER-STOKES EQUATIONS. Thomas Svobodny, Department of Mathematics and Statistics, Wright State University, Dayton, Ohio 45435

An optimal control problem for the Navier-Stokes equations of incompressible fluid flow in a bounded domain is presented. The control is Dirichlet (that is, control is effected by specifying the velocity field on all or part of the boundary) and can be of the 'slip' type (tangential) or of the 'mass-transfer' type (normal). These controls, which may or may not be explicitly constrained, are discussed in the context of admissible input operators for the control system. The cost criteria are expressed in terms of Sobolev norms of the state. The existence of an optimal control is shown and a necessary condition for optimality is derived; this latter requires the use of abstract duality products, which can be thought of as extending certain singular integral equations. Regularity of the optimal solutions is studied and applications to drag minimization and flow stabilization are outlined.

10:15 BUFFON'S NEEDLE PROBLEM -- VARIATIONS AND APPLICATIONS. H. J. Khamis. Department of Mathematics and Statistics, Wright State University, Dayton, Ohio 45435.
In 1733, Georges Louis Leclerc, Comte de Buffon (1707-1788) submitted a memoir to the Proceedings of the Paris Academy of Sciences in which he considered the now famous Needle Problem: what is the probability that a needle randomly tossed onto a grid of equidistant parallel lines touches a line? This is considered to be the oldest problem in geometrical probabilities, and its solution involved an exciting new method called integral calculus. In fact, this was the first time that integral calculus was used in the history of probability. This famous experiment and its variations continue to yield amusing and educational applications of statistical theory as well as providing an important method for solving practical problems. The solution to the classical Buffon Needle Problem will be derived completely and solutions without the derivations will be presented for some of the variations; for instance, suppose we randomly drop the needle onto a grid of congruent rectangles, or a grid of radial lines, or a grid of concentric circles, or . . . It will be seen that in some cases the solution can be expressed in closed form while in other cases a closed form expression is not possible. Also, certain of the variations are more practical when a Bayesian approach is used; that is, when a prior distribution is imposed on the needle's location.

SECTION M. Psychology
Only Morning at 9:00 a.m.
Saturday, April 28, 1990
067 Rike
Dr. Robert N. Gandee, Presiding

9:00 THE EFFECTS OF A TEN-WEEK LOW INTENSITY AEROBIC EXERCISE PROGRAM UPON SELECTED PHYSICAL AND MOTOR FITNESS COMPONENTS OF ELDERLY, MINORITY FEMALES. A.J. Casenhiser, M.S., B. Hollering, Ph.D., B. Gandee, Ph.D., The University of Akron, Akron, Ohio 44325.

This study investigated physical and motor fitness components of twenty-one minority elderly females ages 60-88 yrs ($\bar{X}=75.4$ yrs) participating in a ten-week aerobic exercise program. The volunteer subjects were pre-tested for body composition, weight, flexibility, grip strength, muscular endurance, coordination, and agility. Following the pre-test subjects participated in a ten-week low impact chair exercise program performed to music. The program was comprised of range of motion, light muscular endurance, strength, and agility exercises in which the subjects sat on chairs and progressed to a standing position. After the program subjects were post-tested using the same variables. Significant differences were found between the mean pre- and post-tests for flexibility, muscular endurance, coordination, and agility. Flexibility increased from 24.5 to 25.8 inches. Muscular endurance improved from 13.9 to 17.2 repetitions. Coordination time demonstrated improvement from 13.6 to 10.9 seconds. Agility times decreased from 13.09 to 10.64 seconds. These results suggest that low intensity exercise programs improve selected motor and physical fitness abilities of elderly women.

9:15 EYE-HAND RESPONSE TIME AMONG AGING MINORITY WOMEN. R. Gandee*, B. Hollering, M. MacCracken, J. Slater, A. Gromley, R. Hurley and L. Ferris. The University of Akron, Akron, Ohio 44325 and *Slippery Rock University, Slippery Rock, PA 16057.

The purpose of this investigation was to examine the response time of eighteen independent-living, minority women (\bar{X} age=74.2+6.9 yrs) using the Nelson Reaction Timer. The time required to stop the free-falling calibrated timer between the index finger and the thumb constituted the subject's response time trial. Upon completion of twenty trials, the five fastest and slowest trials were omitted and the remaining ten times were averaged to establish the subject's composite response time. The mean time for all subjects was 187.3+51 msec. Subjects were subgrouped into three age-groups of six subjects each: 60's (\bar{X} age=65.8+2.5 yrs), 70's (\bar{X} age=74.5+2.4 yrs), and 80's (\bar{X} age=82.2+1.4 yrs). The mean response times for these groups were 181.4+22.3, 184.6+23.3 and 196.1+13.7 msec., respectively. Statistical analysis did not indicate significant differences among the three group means. These values are of importance to physical educators and recreational therapists working in promotion and maintenance of the physical functioning of older adults. The Nelson Reaction Timer provides an inexpensive and practical means of quantifying eye-hand response time.

9:30 THE EFFECTS OF COGNITIVE WORK ON SOCIAL JUDGMENT AND SOCIAL MEMORY. John J. Skowronski, Nanette Romine, and Donal E. Carlston, The Ohio State University at Newark, Newark, Ohio, 43055

Research has indicated that the cognitive work required by difficult judgments leads to enhanced recall for facts contributing to the judgments. However, judgments from well-learned procedures or schemata require little cognitive work, yet should also be associated with enhanced recall. In our experiments examining these possibilities, subjects read behavioral descriptions that varied in extremity and implicational consistency, then made timed trait judgments. The exact trait term used in these judgments varied in familiarity, but the underlying dimension was the same for all subjects. Later, subjects recalled the original behaviors. Results indicated that the relationship of judgment difficulty to stimulus memory varied. Consistent with the cognitive work hypothesis, the difficult judgments produced by inconsistent behaviors led to enhanced recall for these behaviors. However, moderate items were less well recalled than extreme items, though moderate stimuli required more cognitive work (as reflected in longer processing times). The familiarity of

the trail judgment terms also affected processing time, but had no impact on stimulus memory. These results suggest that the relationship between judgment response times and stimulus memory depends on the nature of cognitive work involved in the judgment.

9:45 EPISODIC MEMORY AFFECTS DATING ACCURACY: EVIDENCE FROM SELF AND OTHER DIARIES. John J. Skowronski, Laura Shannon, Drew Betz and Charles P. Thompson, The Ohio State University at Newark, Newark, Ohio, 43055

In many aspects of life, such as casual conversation or courtroom testimony, we are often asked to assign dates to events. Researchers interested in event dating have recently begun to explore the factors that affect dating accuracy. One of the factors that should directly affect dating accuracy is the strength of the episodic memory trace. In comparison to poorly-recalled episodes, episodes that are well-remembered should provide memory cues that aid in the reconstruction of the event's date. We investigated this hypothesis using a diary memory procedure in which people kept diaries for both themselves and for a person close to them. At the time of recording, people recorded the pleasantness, typicality, and memorability of the event. At the end of the quarter, subjects were given the events in a scrambled order, one at a time, and were asked to date each event. Multiple regression analyses indicated that episodic memory plays a significant role in event dating: Self events, recent events, memorable events, and both highly pleasant and highly unpleasant events were associated with increased dating accuracy. Furthermore, females were more accurate than males. The practical and theoretical implications of these data will be discussed.

10:00 PRIMING EFFECTS IN SOCIAL MEMORY: EVIDENCE ON THE ISSUE OF SPONTANEOUS INFERENCE. John J. Skowronski, Margaret Van Balen, and Donal E. Carlston, The Ohio State University at Newark, Newark, Ohio, 43055

Recently, some researchers in the area of social cognition have proposed that people frequently make spontaneous inferences from observed behaviors. We investigated this hypothesis using a priming paradigm. Subjects read pairs of stories that described different actors. Some pairs implied the same personality trait, while others did not. After each pair of stories, subjects were presented with 4 behaviors, one at a time. Subjects were asked to decide whether each behavior came from the story pair just read (some did not), and the response time to each behavior was recorded. Subjects completed the task under one of three instruction conditions. Subjects were asked to either memorize the stories, to form impressions of each of the actors in the stories, or were given no instructions. Results indicated that priming effects (faster response times) generally occurred when subjects responded to a trait-related behavior immediately after responding to a behavior that pertained to the same trait, but that the amount of priming observed was lower for the memory conditions than for the impression or control conditions. These results may indicate that people do frequently access the trait implications of a behavior when encoding that behavior, and that memory set instructions inhibit this encoding mechanism.

10:15 DRUGS, SUICIDE, AND ROCK AND ROLL
I. Newman, G.J. Marchant, M.L. Newman and R. McMorrow

A number of variables have been associated with adolescent suicide and drug use. The intent of this study was to test the relationships among high risk suicidal tendencies, drug/alcohol use (with peers and in isolation), music preference, and locus of control with religiosity and parent and social relationships serving as mediating variables. Adolescent subjects (N=100) from Christian, Jewish, and public school institutions were surveyed. A Q-factor analysis established typologies of high risk of suicide in adolescents. Gender was also analyzed as a discriminating variable among types.

10:30 CONSTRUCT VALIDATION AND DISCRIMINATE VALIDITY OF AN ADOLESCENT SUICIDE MEASURE.
I. Newman, G.J. Marchant, D.O. Newman, J.R. McMorrow.

Subjects (n=50) from a large Christian counseling center were asked to complete a set of instruments which measured the constructs of: suicidal risk, religiosity, locus of control, social support, and family and peer relationships. To establish discriminant validity, the subject ranging in age from 13 to 18 years old, were identified by counseling center counselors as being either at high or low risk for suicide. High risk subjects were identified,

as such, based on their diagnosis upon entering the center, or as determined through counseling. Discriminate analysis procedures were conducted using a multiple regression approach to determine which variables best discriminate between high and low risk groups. In addition, a variety of descriptive statistics, reliability coefficients, and factor analysis were used to examine the psychometric properties of the measures.

10:45 THE INTERACTION OF GENDER, TEACHING FIELD, AND HUMOR OF COLLEGE INSTRUCTORS: THE RELATIONSHIP TO PERCEIVED PROFESSIONALISM AND EFFECTIVE TEACHER RELATIONSHIPS. Adria Karle-Weiss and Isadore Newman, The University of Akron, Akron, OH 44325

In this study 100 sophomore level college students were surveyed. The students rated the effectiveness of the instructor and rated their perceptions of the instructors' overall use and sense of humor in presentations. Professionalism was also rated.

In addition this study investigated the relationship between the students' teaching fields, gender, and perceptions of the effectiveness of the use of humor in instruction.

The rationale was that humor in our society may be gender linked and certain disciplines may be more sensitive to this effect.

These findings were then intergrated with the current literature in the area of humor and instruction. Implications for training, and possibly selection, were suggested.

SECTION M. Psychology

Only Afternoon & Business Meeting at 1:30 p.m. Saturday, April 28, 1990 067 Rike Robert Deitchman, Presiding

2:00 Academic Evaluations, Professional Licensure, Program Accreditation and Unionization: How Compatible are they in a University Setting?
R. Deitchman, Ph.D., The University of Akron, Akron, OH 44325-8001

During the past several years there has been an increase in the demand for faculty performance evaluations. Several models used will be presented. It is clear however, that institutions are interested in evaluations for reasons that go beyond improvement of education in the classroom. The ultimate end use of the evaluation will to a great extent determine its effectiveness. Some evaluations are derived from the academic faculty themselves. Professional Licensure is another method used to evaluate the ability of individuals in a particular field. Unfortunately professional licensure and professional identity are sometimes confused. The inter-relationship between academic evaluations and professional licensure will be discussed. A third method sometimes used to evaluate faculty are program accreditation by outside agencies. In a real sense this method of evaluation creates the greatest problem for universities. For years the relationship with regard to the impact on the faculty has been ignored. The most effective model, consistent with the mission of universities is the accountability and evaluations resulting from faculty establishing collective bargaining units - unionizing. The data supporting this conclusion and the position that unionization is the best insurance for preserving academic freedom will be presented.

2:15 EDUCATIONAL REFORM AND TEACHER EVALUATION
Ralph F. Darr, Jr., 301A Zook Hall, The University of Akron, Akron, Ohio, 44325-4205

The call for educational reform by the Reagan administration the 1989, National Governor's Conference and certain educational authorities has placed increased emphasis upon evaluation of teachers and teaching. Many states have responded to the educational crisis by enacting omnibus educational reform legislation. Most of this legislation mandates some form of evaluation of teachers and teaching. Teacher evaluation has taken many forms. For many years, student evaluations of teachers and teaching have provided most of the data on teacher effectiveness. As part of their educational reform packages several states have had special observational scales developed for outside observers to employ when assessing teacher effectiveness in the classroom. The Teacher Performance Assessment Instrument in Georgia and the Florida Performance Measurement System are typical of such instruments. Several states have instituted complex teacher evaluation systems often labelled career ladders.

Such systems employ a variety of measures. Georgia has mandated that all of its teachers pass a broadly based standardized content examination in their area of teaching certification in order to retain their license to teach.

2:30

HOPE, ACTIVITY LEVEL, AND QUALITY OF LIFE.
Sara Staats and Virginia Gregg,
The Ohio State University at Newark,
Newark, Ohio 43055.

The Hope Index defines hope as an affective cognition and measures hope as the interaction between wishes and expectations. Hope is seen as a precursor to action and, therefore, as a necessary precursor to increased success of goal attainment and, in turn, an improved quality of life. In a study of 152 non-institutionalized persons fifty years and older ($\bar{X} = 64.4$), hope correlated with number of activities of the past week ($r = 0.18$, $p < 0.06$) and with estimated success of obtaining individually expressed goals within the next five years ($r = 0.32$, $p < 0.0001$). Participants reported their quality of life on the nine rung Cantril ladder. Measures ranged from $r = 0.32$, $p < 0.0001$ for quality of life in the past five years to $r = 0.36$, $p < 0.001$ for expected quality of life five years in the future. Three experimental procedures designed to increase hope, activity level and, therefore, quality of life are discussed.

2:45

ABSOLUTE VS. RELATIVE FACTORS IN QUALITY OF LIFE ESTIMATES
Christie Partlo, and Dr. Sara Staats
The Ohio State University at Newark,
University Drive Newark, Ohio 43054

Is satisfaction with life and self-reported quality of life related more to what a person has or to what they have in comparison to their friends and similar other persons? Industrial models of satisfaction as well as quality of life models of satisfaction are often based on comparative or relativistic considerations rather than actual considerations (Lawler, 1971; Campbell, Converse, & Rogers, 1976). However, a purely relativistic view can not be sustained because rich differences are reported between workers in different organizations and in ratings of satisfaction across countries. In the present research we compared an aggregate of three absolute variables (income level, highest grade level completed, and lack of health restrictions with an aggregate of three relativistic variables (income in comparison to friends, education in comparison to friends, and health in comparison to friends) as predictors of satisfaction with life and quality of life. Our results show that for a group of 138 persons over 50 years of age, absolute variables correlated significantly with life satisfaction, present, and expected quality of life ($r = .21$, $.20$, and $.29$, respectively, $ps < .05$) while comparative variables correlated significantly with negative emotions. Age trends in the relationships are discussed.

3:00

FACETS OF INTENT TO GET A DEGREE AND PERCEIVED QUALITY OF ACADEMIC LIFE.
Sara Staats and Robin Butler. The Ohio State University: Newark Campus. Newark, Ohio, 43055.

Attrition of undergraduates continues to afflict colleges and two-year institutions and non-traditional students in particular. Recently, the attention has focused on reasons for remaining in college rather than reasons for leaving. In a review of this literature Bean & Metzner (1985) propose a model with intent to leave as the last variable before the occurrence of dropping out of college. However, there has been little direct measurement of this variable excepting for a study by Johnson (1987), who used a single yes-no item. Specific facets of the intent variable have not been investigated. We measured global intent to get a degree and six facets of intent to get a degree in 145 students at a computer institution. Global intent to get a degree correlates with perceived quality of academic life ($n_{138} = .25$, $p < .01$). Considering various facets of intent, reveals that commitment to major but not commitment to a particular location (i.e. transfer intent) are predictive of satisfaction with academic life.

3:15

WIDOWHOOD: POSITIVE AFFECT IN UNEXPECTED PLACES.
Sara Staats, Ph. D, Lovinia M Plimpton. The Ohio State University at Newark. Newark, Ohio 43055.

Marriage is widely recognized as a buffer against distress and certainly widowhood is a catastrophic event that is usually associated with loss of social support, decreased income, and loss of positive affect (Argyle, 1987). As part of a larger study on quality of life, 55 married women and 42 widowed women over 50 were surveyed and interviewed. The survey instruments measured hope, satisfaction with life, positive and negative affect. The interview protocol included questions relating to quality of life, social activities, interactions with friends and membership in

social organizations. Results indicate that although widows had significantly less income ($t=4.14$, $p < .0001$), satisfaction with life, present self-rated quality of life, and several measures of affect did not differentiate between married women and widows. Widows actually did more things with friends than did married women ($t=2.68$, $p < .01$), tended to belong to more social organizations and tended to have participated in more social activities during the past week. Type of activity and social organization membership by marital status will be discussed with an aim to improving interventions for widows.

3:30

PERCEIVED PHYSICAL HEALTH AND EXPECTATIONS
Sara Staats and Deborah Miller
Department of Psychology
The Ohio State University at Newark
Founders University Drive
Newark, Ohio 43055

Perceived physical health is an important correlate of affect and of ability to function (Reker & Wong, 1984). In fact, perceived physical health may be a better predictor of life quality than actual measures of physical health. The present study investigates the predictors of perceived physical health in a non-institutionalized population of persons aged 50 to 91 years. The research participants responded to a questionnaire that included measures of hassles, uplifts, expectations, and wishes. Interview questions produced information on income, grade level, activities, and other variables. Perceived health was modeled using a stepwise multiple regression analysis. Expectations, uplifts, hassles, satisfaction with life, and grade of school completed yielded an R^2 of .288, with expectations being the best single predictor of perceived health. The number of self-reported doctor visits per year did not correlate with perceived physical health. The results are discussed in terms of locus of control theory.

3:45

GRADE COMPLETED, INCOME, AND AFFECT IN ADULTS
Presenters: Dr. Sara Staats and Jean K. Stewart,
The Ohio State University at Newark,
University Drive, Newark, Ohio 43055

Education is a personal resource that is related to income and makes a small but consistent contribution to quality of life (Campbell, Converse, & Rodgers, 1976). The present research extends our knowledge of the effects of education on a non-institutionalized population of adults ranging in age from 50 to 91 years of age. The 39 male and 114 female participants were asked to indicate the highest grade level completed and then to compare their education to their friends on a five point scale. Education correlated significantly with income for both the males and females ($r = .32$ and $r = .36$, respectively). Differences in quality of life and affective variables between males and females were most pronounced in the group that had a high school education. Type of preferred activity as a function of grade level will be discussed.

4:00

GENDER DIFFERENCES IN SELF-RATED DEPRESSION BY ADOLESCENT PSYCHIATRIC INPATIENTS,
Kathryn Gruebmeier and John F. Wing, Wittenberg University, Springfield OH 45501 and Henry V. Soper, Neuropsychiatric Institute, Camarillo State Hospital, Camarillo, CA 91030.

Twenty-seven adolescents composing 93% of a psychiatric inpatient unit (13 males and 14 females) were given the Beck Depression Inventory (BDI) and also were rated by their social workers on a 5-point Home Quality Scale (HQS). It was predicted that depression scores would be lower for males than females and across gender they would be inversely related to quality of home environment. Results confirmed both predictions: first, male BDI scores were positively skewed whereas female BDI scores were negatively skewed with medians of 12 and 31, respectively. The Mann-Whitney test yielded $U=13.5$ ($p < .001$) showing the distribution of male scores was significantly lower than the distribution of female scores. Second, the rank order correlation of the BDI and HQS scores was $r = -.377$ ($n=27$, $p < .05$) showing that across gender depression was higher for adolescents from poorer home environments. However, this effect was due entirely to female patients for whom the rank correlation was $r = -.389$ as compared to $r = +.124$ for males. Several possible explanations are given both for the well-established gender difference in self-rated depression and for the apparent gender difference in the effects of home environment on depression.

4:15

DIFFERENTIAL EFFECTS OF SELF-CONCEPT, COPING STYLES, AND LOCUS OF CONTROL IN TREATMENT VS. NONTREATMENT GROUPS OF EATING DISORDERED PATIENTS
Cynthia Boone. Department of Educational Foundations, University of Akron, Akron, OH 44325-0001.

This paper will examine characteristics predictive of success in treatment programs for eating disorders. A group of 50 subjects, self diagnosed as eating disorders, will be examined. Self diagnosis will be determined by subjects' membership in OA, a 12 step program of recovery for compulsive overeaters, similar in form to AA. Twenty-five subjects are members of OA and have undergone hospitalized treatment for their eating disorder. Twenty-five subjects are OA members who have never been through a clinical treatment program for their eating disorder. Both groups will be given a series of tests measuring self concept, internal-external locus of control, and coping styles. Demographic characteristics of the sample will also be collected. Relationships will be examined for those characteristics most predictive of success in recovery from the eating disorder.

SECTION N. Junior Academy

First Morning at 9:00 a.m.

Saturday, April 28, 1990

204 Fawcett

Melissa Beuerlein, Presiding

9:00 ATOMIC SPECTRA-MEASUREMENT OF THE RYDBERG CONSTANT
Jeremy Riddell, 3254 Ferry Rd, Bellbrook, Ohio 45305

Atomic spectroscopists first discovered the laws of the regularly spaced lines in the Balmer series of the hydrogen spectrum late in the 1800's. Rydberg derived rules to express wavelength in terms of z , n , and R , the Rydberg constant. The purpose of this experiment was to calculate the Rydberg constant by determining the wavelengths of the visible hydrogen lines with a home-built apparatus. A spectrometer was constructed using a 30mm x 30mm diffraction grating with 1200 lines/mm, blazed at 500 nm. A lens focused the incident light onto a thin slit, which is imaged by a second lens. This lens acts as a collimator and illuminates the diffraction grating with a dense beam of light. A rifle scope is angled off to one side of the grating and receives the diffracted light. The scope's crosshairs are aligned with a spectral line and the angle between the incident and diffracted light is measured. The Rydberg constant was measured in two ways with a hydrogen Geissler tube source generating four Balmer lines. First, the grating equation was solved for wavelength using the angle measurement and the Rydberg constant was computed from $\lambda^{-1} = R(1/n_1^2 - 1/n_2^2)$. A value of $109,479 \text{ cm}^{-1}$ was derived, an error of 0.5%. Second, Ne, Kr, and Hg Geissler tubes were used to calibrate the apparatus, resulting in a measurement error for R of only 0.18 percent.

9:15 THE OPTIMUM TEMPERATURE OF UREASE ACTIVITY
Chandana Reddy, Perkins High School, 3714 Campbell Street, Sandusky, Ohio, 44870

This study determined the effect of temperature on urease in its hydrolysis of urea. Urease is an enzyme found in jack bean seed, *Canavalia ensiformis*. Urease catalyzes the decomposition of urea into ammonia and carbon dioxide. It was hypothesized that the urease enzyme would have an optimum temperature. A known quantity of urea was reacted with a known quantity of urease for 20 minutes at desired temperatures. To stop the reaction, lead nitrate was added, denaturing the enzyme. Ammonia production was determined by titrating the urea with hydrochloric acid. As the reaction temperature was increased, ammonia production increased, but beyond 80 degree Celsius, ammonia production dropped off sharply. This study showed that the optimum temperature of the urease enzyme is approximately 80 degrees Celsius, with rapid enzyme inactivity above this temperature, probably due to thermal denaturation.

9:30 COSMIC X-RAY PRODUCTION BY INTERDIMENSIONAL COLLISIONS
Albin R. Jones
Rt. 3 Box 50683, Beallsville, Ohio 43716

The purpose of this project is to establish an adequate theory to explain the production of cosmic X-rays by black-

holes. As it is known a blackhole is an anomaly in the barrier of time and space created by the collapse of a star. The phenomena of the blackhole is supposed to absorb all forms of electromagnetic radiation. But according to present day theory a blackhole is the major source of cosmic X-rays. In my research I believe that I have come up with a hypotheses which can explain this.

According to an accelerator experiment performed at Brookhaven National Laboratory, an X-ray of a certain energy value can decay into its two subparticles, an electron and a positron. By utilizing this data we can establish that a high energy collision of these two would result in the production of an X-ray pulse. This type of collision occurs when an electron enters a blackhole and its antiparticle, the positron, enters the antimatter white-hole. When the two collide in the center, they go through a complex quantum reaction. This reaction has been called the Θ -e,p,x series. The X-ray then exits and disperses throughout the accretion disk.

9:45 ELECTRONIC INDUCTANCE SCALE
Matt Heston 8072 Mark Rd. N. E.
Kensington, OH 44427-9610

An Inductor-Capacitor-Resistor(LCR) circuit, powered and tuned by a wave generator, can be utilized as an electronic inductance scale to determine the weight of an unknown mass. Each mass will stretch the inductor, or spring, directly varying the inductance as the weight of each additional mass increases the pull on the spring. This inductance shift of the spring from normal to extended position directly varies the voltage measured across the inductor because the capacitive reactance, which remains constant, and the variable inductive reactance become unbalanced. This voltage shift can be measured on an oscilloscope, then divided by the total original voltage to determine the fractional voltage difference. The fractional voltage differences for a set of weight masses with known five gram increments can be plotted against the corresponding mass in grams. The weight of an unknown mass can be determined by obtaining the fractional voltage difference which is compared to the graph of known masses plotted against their fractional voltage differences. The LCR circuit can be connected to an Analog to Digital Converter(ADC), which converts the measured voltage to the binary code. The ADC will link the LCR circuit to a computer through a serial port where the information can be processed as before and the weight predicted by the computer.

10:00 THE CONVERSION OF ORGANIC WASTES TO COMBUSTIBLE GAS (PRIMARILY METHANE) BY THE USE OF RUMINANT BACTERIA

Mark Myers
25772 Brittany Rd.
Perrysburg, OH 43551

Methane (CH₄) is a gas that is used widely as a source of heat and energy. Methane can be produced in the decomposition of organic materials, such as manure, when anaerobic bacteria are present and active. In this experiment, the control group consists of 200 g. of cow manure mixed with 200 g. of water in five individual Erlenmeyer flasks. These flasks are submerged in water and heated to 35° C. The gas produced by the bacteria is bubbled through water into graduated cylinders, where the gas can be measured and analyzed. The collected gas ranged from 75-80% methane. In a period of seven weeks, approximately 13 ml. of gas was produced per gram of manure. Currently this experiment is being conducted with a mixture of grass clippings and solutions containing ruminant bacteria from the control experiment.

10:15 COULD EARTH PLANTS SURVIVE ON MARS?
Carol Palochko, 1132 Westgate Road, Toledo, Ohio 43615

An experiment was conducted to determine if Earth plants could survive in an environment like Mars'. To simulate Mars and as a control, Earth, I used two 19 liter jars; one with Martian and the other with Earth soil & atmosphere. To simulate Mars' atmosphere I used carbon dioxide, CO₂, & a vacuum pump. I heated the Martian soil electrically. I placed 4 plants & 200 seeds into both jars. These were; a pachysandra(P. procumbens), a parlor palm(C.elegans), a cactus(N. concinnus), a succulent(A. variegata), & rye grain seeds(S. cereale). Martian jar was kept cold, as were identical plants for comparison. Earth jar was kept at room temperature. Both were monitored 60 days. Plants grew slowly in the Mars jar & flourished in the Earth jar. The cold duplicate plants were dying. After 2 months all the Mars plants were dead. I began a new, identical experiment, placing the Mars jar next to the Earth jar. One month later the Mars plants were dying.

I determined the Mars plants died from one or more of three causes; amount of water, air pressure, or atmosphere. I believe that if Earth plants were to live on Mars they would need substantial protection from the Martian environment.

10:30 MCF-7 OR NOT MCF-7?: THE USE OF ISOZYME ANALYSIS AND DPA FINGERPRINTING TO DETERMINE THE ORIGINS AND GENETIC FINGERPRINTS OF VARIOUS MCF-7 BREAST CARCINOMA CELL CULTURES. Ilea A. Mathis, 6491 Tassel Court, Westerville, Ohio 43081.

Through the years, cell culturists who have grown cells for experimental purposes have been plagued with problems. Contamination and growth difficulties are only two of many problems that stunt the growth and quality of cell lines.

One of the latest problem cell lines is MCF-7, a human breast carcinoma line started in 1973 by Soule, Vazquez, Long Albert, and Brennan from a pleural effusion derived from a breast carcinoma. In the past few years, demand for those cells has become selective. Several isolated MCF-7 cultures from across the nation have demonstrated differences in (a) morphology, (b) growth characteristics (c) hormone receptor combination, and (d) antibiotic resistance. In this project, four cultures will be analyzed to determine the origin and genetic fingerprint of each:

1. MCF-7/ATCC (American Type Culture Collection)
2. MCF-7/NCI (National Cancer Institute)
3. MCF-7/ADR (Adriamycin Resistant)
4. MCF-7/MCF (Michigan Cancer Foundation)

I believe the cultures are, indeed, different genetically, and possibly, in origin. If this is proven true, the future and the past of the MCF-7 line should be seriously questioned by the scientific world.

10:45 HELP TAKE A BITE OUT OF CRIME.
Jennifer Costello 300 Harris Street
Newport, Ohio 45768

There are many aspects of criminology. Scientists and policemen use the methods of fingerprinting, ballistics and footprinting to unravel crimes. Fingerprinting allows the police to compare fingerprints discovered at the scene of the crime with records of fingerprints kept in police computers. If a suspect is available, police will compare the suspect's fingerprints with the prints discovered. Assuming that the prints match, the police have their culprit. Ballistics open the doors to other avenues of criminology. This science permits police and scientists to trace a bullet to the gun from which it was fired. The barrel of the gun will embark grooves on the bullet. If scientists can match the bullet and the gun they are one step closer to solving the crime. Footprinting is another exciting countenance of criminology. This method permits scientists to cast a shoe print that was discovered at the crime scene. The aforementioned method can determine the type of shoe the assailant wore and help to eliminate suspects. Scientists and detectives need to search a crime scene in order to uncover clues not associated with fingerprinting, ballistics or footprinting.

SECTION N. Junior Academy

First Afternoon & Business Meeting

at 1:30 p.m. Saturday, April 28, 1990

204 Fawcett

Melissa Beuerlein, Presiding

4:00 THE EFFECTS OF AN ELECTRICAL FIELD ON
BRASSICA RAPA
Daniel Sherman
1939 Princeton Drive
Toledo, OH 43614

The main focus of this project was to determine if an electrical field has a definite effect upon Brassica raps, the common mustard plant. In my study, I looked at three aspects of the plant's growth. First, I measured the percent of planted seeds that sprouted. Second, daily height measurements were taken, and the results plotted on a graph. Finally, I cut off all leaves, and dried them out so that they could be weighed in order to establish a definite numerical value for total leaf mass.

4:15 UREASE: A SEARCH FOR THIS ENZYME IN VARIOUS LEGUME SPECIES
Vivek Narain, 2828 Hinde Avenue,
Sandusky, Ohio 44870.

It is known that urease can be derived from the Jack Bean, Canavalia ensiformis. This project tested various other beans in a search for an alternate source of urease. These were the legumes Field Pea (Sativum arvense), Lentil (Lens culinaris), Lima Bean (Phaseolus lunatus), Pigeon Pea (Cajanus cajan), Kidney Bean (Phaseolus vulgaris), and others. Urease was detected only in the Pigeon Pea. Powdered Pigeon Pea was dissolved in water, mixed with a urea solution, and left to react at room temperature. The presence of urease was tested by titration for resulting ammonia. The activity of Pigeon Pea urease was compared with that of Jack Bean and found to be less active, although this may have been caused by insufficient processing of the raw Pigeon Pea compared to the commercially available Jack Bean meal.

4:30 EXOGENOUS SINGLET OXYGEN
Sameer Rohatgi, 408 Madison Court, Bowling
Green Ohio 43402

Singlet oxygen, the lowest energy excited state of molecular oxygen has numerous biological effects including reactions with cellular components initiating degenerative processes such as DNA damage, promotion of tumors, induction of cancers, heart disease and aging. The hypothesis was that singlet oxygen is sufficiently cytotoxic to account for pathology in cancer, heart and aging problems. A Separated-Surface-Sensitizer System, working on the principle of photosensitization was used to externally generate singlet oxygen and to observe its effects on Sarcina Lutea (colorless). The experiment had two parts. A bioassay was performed to observe the cytotoxicity on bacteria. Varying the spacer distance between sensitizer and bacteria (from .05cm - .21cm) gave different survival rates. The second part was a statistical computation to determine the gas-phase lifetime of the agent responsible for cell killings. Since this gas-phase lifetime matched the gas-phase lifetime of singlet oxygen known from cited sources it proved that only singlet oxygen was generated. This lifetime data is essential in photoradiation treatments of various diseases. Determining the mechanism of singlet oxygen cytotoxicity is necessary for finding ways to minimize pathology in heart attacks, cancer and aging.

4:45 THE EFFECT OF VARIATIONS IN ANGLE OF ATTACK OF A CLARK-Y AIRFOIL ON ITS LIFT CAPACITY
Steven S. Brack, 2021 Roanwood Drive,
Toledo, Ohio 43613-1605

In this series of experiments, I set out to determine what correlation could be found between angle of attack, the angle of the airfoil to the inflowing air. I constructed a wind tunnel by building a chamber and connecting it to a tank-type vacuum cleaner. This eliminated torsional accelerations from the air flow, thus helping to reduce diversions from static values. I also chose to construct a Clark-Y airfoil for the primary reason that it is used around the world as a benchmark for the testing and comparison of other airfoils, and for the secondary reason that the Clark-Y, having a simply curved upper surface, and a flat lower surface, is easiest to construct and to study. The airfoil was hung in an inverted position, and balanced to neutral mass. Thus, lift could be directly measured by the triple-beam balance which was attached to the airfoil. As the experiment progressed, and new angles were tried, I discovered that the relationship between angle of attack and lift capacity was not linear, as I had expected, but fell in a more complex path. The graph of the data fell in a pattern resembling a skewed polynomial. Its equation is that of: $y = 1.955x^5 - 0.0002x^4 + 0.082x^3 - 1.370x^2 + 13.75x + 28.33$, where x represents angle of attack, in degrees, and y represents lift capacity, in centigrams. From these results, I deduced that lift capacity changes faster closer to the 0° angle of attack, and when approaching 32°, the stall angle of attack. Stall angle is determined by the peak lift capacity value. Between these points, its value increases in a near-linear fashion. Experimental errors were held to within 1° of pitch angle, and ±5cg of lift capacity.

SECTION N. Junior Academy

Second Morning at 9:00 a.m.

Saturday, April 28, 1990

206 Fawcett

David M. Weaner, Presiding

9:15 METHODS OF VALIDATING DISTRIBUTION RECORDS FOR AMPHIBIANS AND REPTILES. Douglas W. Hair and Louise A. Brogan. Northwest High School
10761 Pippin Road Cincinnati, Ohio 45231.

Seven new locality records for reptile and amphibian species in north central Hamilton and south central

Butler Counties, Ohio were reported during a recent study. Documentation of these records is essential if they are to be considered a genuine addition to the knowledge of Ohio's herpetofaunal distribution.

Three methods of validating new distribution records were used. We discuss and illustrate the pros and cons of reporting personal observations, photo documentation, and preservation of specimens, as well as the decisions involved in choosing the most appropriate method of documenting each species.

9:30 DOES PSYCHOLOGICAL STRESS AFFECT THE ANTIBODY LEVEL FOR THE EPSTEIN-BARR VIRUS? Jennie Evenson 147 East Oakland Avenue Columbus Ohio 43201

The purpose of this project is to determine if the immune system, specifically antibodies, are affected by stress. This was done by measuring the antibodies when the subjects were under stress. The theory is that the body enters a state of immunodepression (in which the immune system activity level is greatly reduced) when under intense psychological stress. The experiment used ten third-year medical students, who were proven to have the Epstein-Barr virus, to draw blood four weeks before final exams, during exams, and two weeks after exams to demonstrate the stages of psychological stress. The blood was tested in an assay called the Enzyme Labelled Immunosorbent Assay. This assay uses virus specific antigens which bond with the antibodies. The amount of antibody bonding with the antigen can then be measured on an Enzyme Labelled Immunosorbent Assay Reader. The results showed that the antibody level was substantially decreased during and two weeks after the final exams. These results imply that psychological stress induces limited production of antibodies, therefore causing the body to be more susceptible to active infection of the Epstein-Barr virus.

9:45 ELECTROPHORETIC BIOTYPING OF THE YEAST CANDIDA ALBICANS USING ENZYME PATTERNS Sandesh Dev, St. John's HS, Toledo, and Department of Microbiology, Med. Coll. of Ohio, P.O. Box 10008, Toledo, OH 43699-0008

Candida albicans is a pathogenic yeast that can cause invasive infection and lesions known as thrush in certain immunocompromised people. Because of its virulent nature, it would be useful to follow the spread of the yeast in clinical settings. This study reports the use of polyacrylamide gel electrophoresis to biotype or "fingerprint" the yeast strains. Furthermore, the electrophoretic biotypes are compared with the serotypes of the strains in order to determine if a correlation exists between the two methods of "fingerprinting." A total of 78 strains were biotyped using the following four enzyme systems: alpha-glucosidase, phosphatase, malate and glucose-6-phosphate dehydrogenases. After cluster analyses of the strain biotypes, initial results suggest little correlation between the electrophoretic biotypes of the strains and their respective serotypes. (This study was performed in the lab of Dr. Paul F. Lehmann.)

10:00 A STUDY OF THE EFFECTS OF NaCl AND HCHO ON THE FERMENTATION PROCESS Steven C. Schenk 53 Back Bay Rd. Bowling Green Ohio 43402

This project studies the effects of NaCl and HCHO on the fermentation process. The idea behind it is to discover the general effect of pollutants on biological functions. Thus a knowledge of similar pollutants' effects on the environment is gained.

The experiment is conducted in the following way. An erlenmeyer flask is filled with water and sucrose. Yeast is added to the solution. Four such apparatuses are set up with identical amounts of water, sucrose and yeast. Three of the flasks also have different percentages of NaCl or HCHO added to them. The CO₂ given off is measured in graduated cylinders. Curves of gas generated versus time were plotted and compared.

Complete analysis of the data is now in process. A hypothesis has been formulated that both the NaCl and the HCHO will slow down gas generation.

10:15 SYNTHESIS AND ANALYSIS OF A COORDINATION COMPOUND, COBALT (III) CHLORIDE HEXAMINE. Chris Tweney. 114 Liberty, Bowling Green, Ohio, 43402.

This experiment explores the synthesis and analysis of a coordination compound. The compound is prepared by the

reaction of cobalt (II) chloride hexahydrate, ammonium chloride, ammonia, carbon, and hydrogen peroxide. Four samples were prepared for analysis. Chloride was determined by the Mohr's method and cobalt was determined spectrophotometrically. Percent ammonia was determined by using a specially designed apparatus to collect the ammonia given off upon heating of the unknown and bubbling it into hydrochloric acid. The amount of hydrochloric acid left unreacted was determined by titration with sodium hydroxide. As an additional experiment, an attempt will be made to determine cobalt (III) directly by dissolving the unknown in hydrochloric acid and finding concentration of cobalt spectrophotometrically. As a known cobalt (III) compound is unavailable, a cobalt (II) compound will be oxidized with hydrogen peroxide to transform it to cobalt (III) and provide the needed absorbance versus concentration curve. Percents of cobalt, ammonia, and chloride will be used in determining the experimental empirical formula of the unknown. The theoretical empirical formula of the unknown is $CoCl_3 \cdot 6NH_3$.

Designing A Computer Interface For A Robotic Arm

10:30

Paxton R. Cooper Jr., IV
152 Arklow
Toledo, Ohio 43615

The Purpose of this project was to investigate the interfacing of computers with robotic arms. Numerous industrial robots were studied, and several programs were written to control the Rhino XR-3 robotic arm via an IBM microcomputer. Further research in this project included the interfacing of a Commodore 64 personal computer with an Armatron toy robotic arm. The arm was redesigned; six 24 volt solenoids were used as mechanical actuators. The solenoids require a 20 volt at 100 milliamp analog signal. A digital, analog converter was constructed so that the solenoids could be controlled via the computer. A switching circuit was designed to power the 6 solenoids alternately.

10:45

THE CONVERSION OF WASTE CARBOHYDRATES TO ALCOHOL. Presented by Dana E. Jensen
3614 Rosetree Court Toledo, Ohio 43606

In this project I investigated the conversion of waste carbohydrates to alcohol. The main interest is in the turning of waste to a usable product. Because the purpose is to save money the emphasis is on efficiency. In my own research I tried to obtain the maximum possible efficiency as inexpensively as possible. The following are some ideas on increasing the efficiency of the conversion: The use of a weak acid to weaken the carbon-hydrogen bonds in the carbohydrate increases the alcohol output. The use of a solar still to preheat the large volumes of liquid then minimizes the need for energy-wasting open flames. The use of distillation columns packed with marbles or lined with spikes increases the efficiency of the distillation process. Finally the use of drying agents such as Sodium Sulfate, or "Molecular Sieve" on higher percentage alcohol eliminates the need for distillation.

Using these and other tactics I set out to obtain an efficient and cost effective conversion, and I feel it is entirely possible to put the process to practical use, thereby benefiting the consumer and industry alike.

SECTION N. Junior Academy

Second Afternoon at 1:30 p.m.

Saturday, April 28, 1990

206 Fawcett

David M. Weaner, Presiding

4:00

HOLOGRAMS IN DIFFERENT TYPES OF LIGHT
Gregory Dante Roulette
15700 Van Aken #3 Shaker Hts., Ohio 44120

Problem: In which type of light will boys or girls most frequently view a hologram?

Hypothesis: Both boys and girls will view the hologram in fluorescent light the greatest number of times.

Experiment: The purpose of the experiment was explained to subjects. Subjects were instructed to view the hologram in

the 60 watt light control box. Subjects were then asked to fill out a questionnaire. If the hologram was viewed then "yes" was checked on the questionnaire. Subjects then completed trials on seven other lights. The test box contained the following lights: fluorescent, ultraviolet, incandescent 100 watt, incandescent 40 watt red, yellow, green and blue.

Results: Of the twelve girls tested, five out of six saw the hologram under the fluorescent light. Of the twelve boys tested, five out of six saw the hologram under the fluorescent light.

Conclusion: The subjects most frequently saw the hologram in the fluorescent light as predicted and there was no gender difference.

THE EFFECTS OF COCHLEAR DAMAGE ON MORPHOLOGY IN THE GUINEA PIG COCHLEAR NUCLEUS.

4:15

Ahan Newman, 5512 Bentwood, Toledo, Ohio 43615

The purpose of this research was to determine the morphological changes in the various cell regions of the nucleus of the guinea pig after the animals were subjected to several types of damage to the cochlea. There were four groups of animals. A control group consisted of healthy guinea pigs with nothing done to the cochlea. The second group was comprised of animals which had been injected an ototoxic drug which did extensive damage to the cochlea. Of a third group the animals were subjected to extreme noise levels which are known to damage the stereocilia of the receptor cells in the organ of Corti of the cochlea and produce hearing impairment. The fourth group consisted of animals whose hearing was damaged and a prosthetic device was implanted in order to provide artificial stimulation of the auditory system. Regional volumes in the cochlear nucleus of all these animals were then measured in order to determine any changes. In order to prepare the cochlear nucleus for examination, the brain was removed from each guinea pig after sacrifice and frozen. The part of the brain containing the cochlear nucleus was mounted in a cryostat at -20°C and sectioned transversely using a microtome with sections 20 micrometers thick. One group of every section was stained with thionin to show locations of nerve cell bodies. Another third group was stained for acetylcholinesterase activity to mark some of the synaptic regions in the tissue. The last group of sections was transferred into racks and freeze dried so that chemical assays could be done at a later date.

4:30

EFFECTS OF OLFATORY IMPRINTING IN RATTUS NORVEGICUS. Amy Jo Roy, 817 Edgehill Avenue, Ashland, Ohio 44805.

Newborn Sprague-Dawley rats were exposed to Mr. Clean liquid lemon detergent, men's British Sterling cologne, or pine shavings to see if they showed a preference to one of the scents. Odors were mixed with the bedding in each of the rearing cages for the first 16 days of life and then the rats were tested between the ages of 29-31 days old. Four males and four females were tested alone from each of the three rearing cages for 30 minutes. Most rats spent the majority of the time in the pine shavings test chamber and the least amount of time in the cologne chamber. The subjects showed no preference for the odor they were raised with in their cages. Some factors that might have influenced the results are: length of time spent in test chamber, amount of odor present in test chamber, the length of time exposed to scent in rearing cages, and the strength of the odors in the rearing cage and test chambers.

4:45

RECYCLING ENERGY WITH SOLAR CELLS.

Stanley Dickerson
P.O. Box 93
Scio, Ohio 43988

The purpose of my research was to see if energy could be recycled. To test my hypothesis, I used seven solar cells and an incandescent light bulb. I placed the solar cells around the light bulb so that they could make electricity from it. Then I wired the solar cells into the circuit with the light bulb and two ni-cad batteries used as the power source for the light bulb. With the light on, the electricity made by the solar cells was then added to the circuit to recycle the energy.

I found that energy can be recycled. In my research there was an increase of 0.2 volts. The total cost was about five dollars per solar cell. If the price of solar cells goes down, it might become more profitable. My research indicated other possibilities to increase the efficiency of recycling energy. Some such possibilities would be a different type of light source (e.g. a fluorescent light) and the use of fiber optics.

SECTION N. Junior Academy Poster Session at 2:30 p.m. Saturday, April 28, 1990 Lobby Physical Education Bldg.

Board A **ROLE OF ENDOTHELIUM IN NITROGLYCERIN INDUCED DESENSITIZATION TO VASODILATORS**
@ 2:30 p.m. JoAnn Beck, 295 Campbell Drive, Hamilton, Ohio 45011

The role of endothelium in glyceryl trinitrate induced desensitization to vasodilators will be investigated in the pig coronary and the rabbit thoracic aorta. The tissues will be hung in organ baths and tissue tension measured with a Grass Polygraph. After pretreatment with glyceryl trinitrate, tissues will be contracted with histamine or U44109. Nitroglycerin, 8-Bromo cyclic GMP, Sodium Nitroprusside, Forskolin, Thrombin, Substance P, and Calcium ionophore A23187 will be used to determine whether relaxation to vasodilators is independent or dependent of endothelium.

Board B **THE GREENHOUSE EFFECT: DOES TEMPERATURE AFFECT CO₂ ABSORPTION IN THE OCEAN?** Greg
@ 2:30 p.m. Clemons, 5700 Sulphur Springs Road, Brookville, OH 45309

This experiment was conducted to discover if temperature affects the ocean's ability to absorb and hold carbon dioxide. The hypothesis was that the temperature would affect the ocean's ability to absorb the carbon dioxide. To elaborate further, it was thought that the coldest water could best absorb the gas of the three temperatures tested.

To test this, three aquariums containing ten gallons of synthetic ocean water were set at three different temperatures. The three controlled temperatures were 62, 72 and 82 degrees Fahrenheit. For five consecutive days, one pound of dry ice (CO₂ source) was placed in each tank. The PH levels were measured at five different times of day. These times were: before adding the ice, while it was dissolving, after it had dissolved, one hour after it had dissolved, and the next morning.

The recorded data proved the hypothesis to be correct. Temperature does affect how well the ocean absorbs and holds the carbon dioxide. As the temperature rises, the ocean's absorption ability of the gas decreases.

Board C **THE EFFECTS OF DIFFERENT CULTURE MEDIA ON THE GROWTH OF A LICHEN SYNTHESIZED FROM SEPARATE ALGA AND FUNGUS SYMBIANTS.** Amy M. Elfner. 29
@ 2:30 p.m. Darlington Road, Delaware, OH 43015.

A lichen is a symbiotic partnership between an alga and a fungus. According to Lynn Margulis (1988) there are some 25,000 species of lichens based on the fungal partners. Usually the individual species of algae and fungi are morphologically and physiologically different when growing as a symbiotic partnership than when they grow as separate species. When lichens develop, certain chemicals such as acids and pigments are produced. Lichen acids, many of which have been identified, affect the substrate such as soil, rocks or tree bark. As a photosynthetic organism the algal partner produces sugars which may be used by the fungus. The objective of this project is to determine which culture media will produce the best growth of a lichen species. Growth trials will be conducted using both commercially available algae and fungi and algae and fungi isolated from native Ohio species of lichens collected in Delaware County. The hypothesis is that when the alga and fungus are combined they will grow together as symbionts best on agar with no aiding nutrients. Analysis will be conducted using a compound light microscope with results recorded by color and black and white photographs.

Board D **AN ARCHITECTURAL EXPERIMENT: ROOF DESIGN VS. STRAIN CAPACITY**
@ 2:30 p.m. Robin Evans
16405 Maple Lane
Minerva, Ohio 44657

I hypothesized that a change in the design of a roof would change its strain capacity. I proved this idea by building three models of different roof styles with balsa wood: post and beam, common rafter, and truss roofs. I tested their strengths with an electronic strain gage connected to a voltage monitor which was connected to an

Apple computer. With Vernier's "Project Programs" disk the computer determined the strength by reading the voltage change from the bending of a metal bar that was placed between the beam and the center rafter. When weight was applied the results showed the post and beam model with a .563 voltage change, the common rafter model with a .232 change, and the truss model with a .023 change. I also tested the designs with the deflection method. I tied a string with a lead sinker from the center rafters. When weight was applied the post and beam deflected five mm, the common rafter deflected two mm, and the truss roof deflected one mm. Both tests proved the truss design was the strongest and most practical of the three.

Board E GENDER DIFFERENCES IN THE INTERPRETATION OF AFFECT. Melissa Hagen. 3 Linwood Drive, Chillicothe, OH 45601.

The purpose of this research is to determine whether females or males were best able to identify 5 nonverbal emotional expressions--happiness, anxiety, depression, anger, and "neutral"--each acted out individually by one male and one female. It also set out to determine whether age was a factor in the ability to identify emotions. The hypothesis was that females would be more capable of determining the emotions because of societal stereotypes. 59 subjects (33 female, 26 male) viewed the videotape and subsequently identified four things: What emotion was the character expressing? What are some possible reasons they are feeling this way? How did you personally feel as you viewed the video? What are some clues that gave away this emotion to you? The hypothesis was proven correct, with females identifying more correctly than males, and female adults proving to be the best overall.

Board F CHOLESTEROL IN CHILDREN
Nisha Kuttothara
327 Oak Court
Loudonville, Ohio 44842

Twenty students were studied by a seventh grader for total cholesterol, high density, low density lipoproteins, tryglicerides as well as dietary habits and physical activities. The group was divided into ten Amish and ten non-Amish children of equal gender. The results revealed that the non-Amish children had more total cholesterol level as well as low density lipoproteins. The Amish children not only had more high density lipoproteins but also amazingly low trygliceride levels. The author attributes the difference in the findings to a difference in dietary habits and lifestyles of the two groups. The results suggest the need for further and larger studies to explain this dramatic difference seen in this very first study comparing the Amish and non-Amish children.

Board G Pneumatically Controlled Casting of Polymer Composites
Jack Singh Repler
@ 2:30 p.m. 418 Mill St.
Lockland, Oh. 45215

The paper to be presented at the 99th Annual Meeting of the Ohio Academy of Science is the final one following the completion of my experiment, in which I pneumatically control the casting of polymer composites in a specially designed apparatus, and test those composites in another apparatus. This paper hopes to make known to the science and engineering world the important knowledge gained through this experiment.

For the experiment, I have used gears. The gears have been reproduced as polymer composites by casting them into a mold. During casting, all factors have been set to remain steady, but one factor which has been varied during the casting as part of the experiment. This is known as the experimental factor. The experimental factor in this project is the pressure of air around the liquid polymer resin as it is being cast. A specially designed apparatus has been built to cast the composites such a controlled pneumatic pressure, which is measured in pounds per square inch.

After a gear has been cast, it will be placed onto another apparatus, which will apply to the polymer composites a certain test load, which will be measured in pounds per cubic inch. This will be applied to the gear being tested for a specified duration, measured in hours.

The gears will be tested under this load to measure tooth wear, which occurs when a gear experiences certain pressures. These pressures are the same factors being controlled and applied during the test loads!

After the completion of the experiment on 3/2/90, I will complete a paper on my findings and present it at the 99th Annual Meeting of the Ohio Academy of Science.

Board H TESTING THE EFFECTIVENESS OF VARIOUS COMMONLY USED LIQUID HANDSOAPS
@ 2:30 p.m.
N. Reid Perala
600 Eastwood St.
Geneva, Ohio 44041

I tested five commonly used liquid handsoaps to determine

their effectiveness as antimicrobial agents by culturing bacteria in petri dishes before and after washing with each test soap and comparing the amount and type of bacteria that grew.

The soaps tested were 1) Liquid Dial Antibacterial Soap 2) Anti-Bacterial Softsoap 3) Jergens Liquid Soap 4) Liquid Ivory and 5) Dispenso Sanitizing Liquid Handsoap. Soaps 1-4 are sold for household use in retail outlets. Soap 5 is sold wholesale for institutional use.

The procedure used included sterilization, contamination, inoculation, disinfection, reinoculation and incubation using strict controls.

The resultant growth of bacteria was compared as to type and amount. The chemical composition of the soaps was analyzed. I concluded that washing with any soap significantly reduces bacteria growth, however the soaps that contain an antimicrobial agent perform markedly better.

Board I THE EFFECTS OF DIFFERENT AGENTS ON GRAM-POSITIVE BACTERIA VERSUS GRAM-NEGATIVE BACTERIA.
@ 2:30 p.m.

Corie Piechocki 14715 Infirmiry RD, Wapakoneta OH 45895

My project is on the effects of different agents on gram-positive bacteria versus gram-negative bacteria. I took 8 different common household products and 2 antibiotics and tested them on 4 different types of bacteria. I wanted to see if the agents would affect bacterial growth. The bacteria I chose was 2 gram-positive organisms, Streptococcus pneumoniae and Streptococcus pyogenes, and 2 gram-negative organisms, Klebsiella oxytoca and Pseudomonas aeruginosa. I took 2 of each of the groups so my experiment would be balanced as far as the bacteria was concerned. The reason I chose this particular project is because I had an interest in bacteriology and I thought it would be interesting to see if companies were right or wrong about their products, since some say their products kill bacteria or accomplished certain goals.

In my experiment I soaked paper discs with the respective agents and put them on blood agar plates which contained the smeared-on bacteria. I then placed the plates in a 37 C. incubator for 24 hours. After that time, I was able to read the plates for results.

Board J INCIDENCE AND TYPES OF BULK TANK MASTITIS BACTERIA IN HERDS WITH HIGH AND LOW BULK TANK SEMATIC CELL COUNT. Rebecca A. Spore 1332 Carriage Hill Court, Ashland, Ohio 44805

Fourteen dairy herds were evaluated to determine a correlation between bacterial colony forming units (ml) and bulk tank SCC. Incidence and types of mastitis causing organisms in the bulk tank of these herds were identified by standard milk culturing techniques. Each herd's mastitis milking hygiene and mastitis control program was evaluated by observation of milking techniques and completion of a survey by the farmer. A recommendation was then submitted to the farmer to encourage maintenance of LSCC.

Board K ASPIRIN: ITS RELATION TO BLOOD CLOTTING
@ 2:30 p.m. Louis Susi, 7682 Whitewood Court
Columbus, Ohio 43235

The experiment consisted of two participants who were cleared of any aspirinated medication. Then their blood was drawn and a Prothrombin Test (PTT) was used. Starting the following week, they took an aspirin a day for three weeks. At the end of the experiment, the results proved that the aspirin caused the blood of one participant to clot slower and the other's to clot quickly. This proved and disproved my hypothesis which was aspirin will indeed cause the clotting rate of blood to decrease.

Board L CRYOGENICS
Chris Tucker
@ 2:30 p.m. 200 Kennedy Drive
New Lexington, Ohio 43764

The purpose of this investigation was to determine if there was any difference in freezing larger fish than medium and smaller size fish. My hypothesis, based on my research, was that, under certain ideal conditions, was that if three groups of goldfish were frozen differing in mass, in a dry ice and ethanol solution, then hopefully they would revive. Then compare the results

from the three groups which then should have the same survival rates. The mass of the group of goldfishes were determined by a tripe-beam balance and then they were placed in three separate groups of relatively close mass. Then the fish were frozen in the solution. They were thawed in a pan of cool water with a heat lamp fixed on the fish. Then the results were recorded. The hypothesis was rejected because the medium sized fish had the best survival rate. Taking all the variables into account such as the health and age of the fishes you cannot safely say that there is a difference in the survival rates.

Board M THE EFFECTS OF DECREASED WATERING ON PLANT GROWTH, PRODUCTION, AND NUTRITION. Dan Woodard, 11412 T.R. 100, Kenton, Ohio 43326.
@ 2:30 p.m.

In a greenhouse, 4 rows each of carrots, sweet corn, lima beans, and green beans were grown, each receiving .3, .5, .7, or .9 inch of water weekly. Hypothetically, plant growth and yield would decrease significantly between .3 and .5 inch, as would plant uptake of nutrients. Although this drop off point was not found, plants did produce less when less water was applied. Corn watered the most produced twice as much as corn watered the least, carrots 1.24 times, lima beans 1.66 times, and green beans, 1.14 times accordingly. Plant analysis showed only calcium, magnesium, and iron levels reacted as expected, with amounts being directly proportionate to the amount of water which was supplied. Copper and zinc levels were invariant. Nitrogen, potassium, and manganese levels were erratic. Phosphorus and boron levels were unexpectedly higher with reduced watering. Since the drop off point had not yet been found, 10 rows of kohlrabi were planted and watered at 0, .05, .1, .2, .3, .5, 1, and 2 inch increments. The greatest drop off was discovered to lie between 0 and .05 inch according to average plant tissue weight results. Kohlrabi leaf analysis results have not yet arrived, so the project is not yet completed.

Board N CAN A LOSS OF HEARING BE COMPENSATED BY ANOTHER SENSE
@ 2:30 p.m. Scott M. Yano, 2-18118 US20, Fayette, Ohio 43521

A literature survey was conducted and revealed that deafness is one of the most common physical handicaps. There are several existing aids that help the deaf. The goal of this Science Project was to build a unique aid to help the deaf lead safer lives.

The hypothesis of this project was, "Can a Loss of Hearing Be Compensated By Another Sense?". The basic function of the aid developed in this project was to detect a sound and then alert a person of that sound by activating a device attached to the person's skin.

The original circuit for this device was a sound-activated microphone whose output was amplified and sent to a DC motor. The necessary components were purchased and a prototype assembled. Many modifications were made to the original circuit before the device became operational. Considerable development work was then expended to make the device small enough to be worn on a person's wrist - like a watch.

Two unique features were incorporated into the device. They were: First, a sensitivity control, which allows a person to choose the sound level needed to activate the device. This ranges from ordinary speech to an emergency alarm. Second, a timer control, which allows a person to choose the length of time the device stays activated.

Actual testing has shown that this new aid can help deaf people lead more productive lives. Therefore, in conclusion, and in answer to the original hypothesis, yes, a loss of hearing can be compensated by another sense.

SECTION O. Engineering

Only Morning at 9:00 a.m.

Saturday, April 28, 1990

108 Fawcett

Tom Hartley, Presiding

9:00 NEURAL FEEDBACK MODEL FOR SPEECH PRODUCTION
Timothy J. Talty
University of Toledo
Department of Electrical Engineering
Toledo, Ohio 43606

Stuttering is a speech disorder that affects approx. one percent of the U.S. population. Many possible causes of stuttering have been proposed. One possible cause is defective neural feedback loops. A new neural feedback model of speech production will be presented.

Added features of this new model include; adjustable error limits in each closed neural feedback loop and a noise/reconstruction filter in the auditory neural loop.

The new model is flexible and easily applied to a wide variety of speech impaired individuals.

9:15 RF SURFACE COIL DESIGN FOR IMPROVED MR IMAGING OF HUMAN EYE ORBITS. Yong-Gab Park and James B. Farison, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606-3390.

This paper presents results of a design project involving a special surface coil for MR imaging the pair of human eye orbits. A specially designed surface coil may give better images; imaging both orbits simultaneously permits direct comparison of healthy and suspected regions for the same patient. Improved tumor detection capability may result.

From its introduction less than 20 years ago, the clinical use of magnetic resonance imaging has grown rapidly. Although the units are expensive, MRI provides high quality medical images without ionizing radiation. MR scanners involve the interaction of applied magnetic fields with the atoms of the body. In the standard design, an RF signal is transmitted and the response received by the same RF coil. One way to gain further improvement in the signal-to-noise ratio of MR images is through the use of surface coils, in which the RF signal response from a near-the-surface body region is received by a special coil designed to match the anatomy of the region of interest.

This paper reviews surface coil design criteria, which include both electrical (mutual inductance decoupling, impedance matching and frequency tuning) and geometrical factors. Two potential coil designs, a curved coil and a loop-gap resonator, are evaluated for this purpose.

9:30 OPTIMAL FILTERING OF SPATIALLY-INVARIANT IMAGE SEQUENCES. Young-In Shin and James B. Farison, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606-3390.

This paper presents a general derivation for the weighting vector representing the optimal filter for processing (filtering) a spatially-invariant image sequence to produce one composite image in which a desired feature or process in the image sequence is emphasized while the interfering features or processes in the image sequence are suppressed. An explicit form for the filter vector, which provides data compression of the sequence into a single image, is given in terms of the desired and undesired feature signature vectors/matrices.

A spatially-invariant image sequence is a sequence of images in which the physical location of image features does not change in the successive images of the sequence. Such images occur in medical imaging applications such as magnetic resonance (MR), in which a sequence of patient images is taken with different MR parameters. Different regions image differently due to their different physical/biological compositions.

The new results are based on forming a vector and a matrix signature of each process or feature, and maximizing an energy ratio of desired-to-interfering processes. They follow earlier work by Miller, Windham, Abd-Allah, Farison, et al, at UT, Medical College of Ohio and elsewhere.

9:45 ON THE DESIGN AND PERFORMANCE ANALYSIS OF SYSTOLIC ARRAY ARCHITECTURES. M.Y. Niamat and R.G. Molyet, Dept. of Electrical Engineering, The University of Toledo, 2801 W. Bancroft St., Toledo, OH 43606.

Systolic Arrays are networks of processors that rhythmically compute and pass data through systems. These arrays feature the important properties of modularity, regularity, local interconnections, and a high degree of pipelining and multiprocessing. In this paper, a general methodology for the design and performance analysis of systolic arrays is described. In the design phase, a three-step procedure for the systematic derivation of systolic arrays is proposed. These steps can be outlined as follows: (1) Extracting parallelism from the algorithm, (2) Pipelining the computations, and (3) Modifying the dependence graph of the pipelined computations so that it satisfies the systolic properties. The resultant 'systolic graph' is then directly mapped onto an array of processing elements and 'synchronized' by incorporating an appropriate number of 'latches' or 'delay elements' in the interconnection buses and/or the processing elements.

The performance of systolic arrays is analyzed in terms of the 'computational time', 'pipelining period', and the 'utilization rate' of the processing elements. A method using the classical concepts of 'space-time diagrams' and 'time-snapshots' is described for this purpose. Parameters which reflect the cost of systolic arrays in terms of the 'array size' and the I/O (input/output) lines are also discussed.

Finally, the complete design and performance analysis of systolic arrays is illustrated by means of an example. The systolic arrays proposed in this illustration include the linear, the mesh, and the triangular type of arrays.

10:00

University of Toledo, Toledo, OH 43606.

This paper investigates the cost estimates of two different computer components from physical and performance viewpoints. It is shown that performance measures, data storage capacity and data transfer time are better cost predictors than physical cost drivers.

When these performance characteristics are used to estimate unit costs, the type of storage device used becomes transparent. This reinforces the concept that a functional description of a device is a better and more direct cost-estimating tool than physical parameters.

This functional concept and the fusion of optical technology with electronics leads to a discussion of the advantages of optical switching devices over complex electronic integrated circuits. Optical devices offer potential solutions to interconnection, signal interference and propagation speed. Extrapolating performance with cost-decay and complexity growth curves, the paper predicts when cost-effective optically driven chips will take their place alongside the more conventional electronic chips.

EVOLUTION OF HYPERCUBE AND HYPERNET, Devinder Kaur, Dept. of Electrical Engineering, The University of Toledo, Toledo, OH 43606-3390

10:30

The paper surveys the earlier attempts of connecting processors in parallel and distributed environment. It describes the various multistage interconnection networks emphasizing the thread of commonality in them along with the subtle differences. A generalized hypercube structure based on mixed radix number system is described for a given number of processors N , which results in a variety of hypercube configurations. It is shown how a Boolean n -cube hypercube is a special case of generalized hypercube topology. The various network parameters of hypercube are described.

Another modular network, called hypernet, which combines the positive features of both hypercubes and tree based topologies and maintains a constant node degree is described. The principles for constructing hypercubes and hypernets are analyzed. The architectural potentials of these networks are manifested by mapping some of the algorithms onto them, to illustrate their capability to support parallel processing and the gains achieved in terms of speed up and fault tolerance.

SECTION O. Engineering

First Afternoon & Business Meeting
at 1:30 p.m. Saturday, April 28, 1990

108 Fawcett

Tom Hartley, Presiding

2:00

COMPUTER AIDED SELECTION OF FREE MACHINING
STEELS TO INCREASE SCREW MACHINING
PROFITABILITY. Miles Free, Plant

Metallurgist, Bliss & Laughlin Steel Co., 900 West Smith Road, Medina, Ohio 44256.

A computer model of the multiple spindle screw machining process has been developed. This model permits the rapid evaluation of proposed changes in the material being machined, as well as changes in other operating parameters such as feed rate, speed, and depth of cut. Using process information specific to the part being manufactured, the model rapidly determines if the machining cost savings exceed the increase in material cost, thereby justifying the change in material grades.

By allowing the parts manufacturer to objectively evaluate the material's cost compared to its machining performance, the model enables the manufacturer to become more competitive, reducing the cost of each part produced, minimizing the time required for manufacture, and increasing productivity and profitability. Field studies have demonstrated the validity of the model and verified the savings achievable through its application.

2:30

THE DYNAMICS OF NET IMPACT. Daniel C. Deckler, Loral Defense Systems, 6703 Nicklaus N.W., Canton, OH 44718 & Tom T. Hartley, The University of Akron, Akron OH, 44325-3904.

The dynamics of a net that has been impacted by a constant thrust projectile are examined. The net is modeled using the lumped parameter method in which the mass and drag

characteristics are concentrated at specific nodes. The elements connecting the nodes then become massless, unbendable, axially elastic links. To further simplify the problem, the analysis is restricted to the scenario where the projectile impacts the center of the net. Doing this, symmetry can be used to reduce the number of dynamic states by about half. With these assumptions, the nodal equations of motion are obtained using Lagrangian mechanics. A set of second order nonlinear differential equations results. These equations are linearized and put in the form $\dot{x}'=Ax$, where A is system Jacobian. A Fortran simulation using a fourth order Adams-Bashforth integrator can then be applied to the system equations to study its dynamics. Each nodal position and velocity as well as the eigenvalues of A can be found as a function of time for various values of element spring constant, element length, nodal mass, and nodal drag coefficient. With this information, it is possible to determine how each characteristic affects the net dynamic response. The eigenvalues of A also give an indication of the maximum allowable simulation timestep for a given integrator in order to obtain a faster simulation environment while maintaining accuracy.

2:45

DELAY-TIME MODELING OF E/D NMOS INVERTER. S. R. Vemuru and A. R. Thorbjornsen, Department of Electrical Engineering, The University of Toledo, Toledo, Ohio 43606.

The delay-time modeling is one of the important problems in the timing and design verification of digital VLSI circuits. Though SPICE, a circuit level simulator can be used to predict the delays, the computer time and memory requirements become prohibitive to simulate VLSI circuits. A number of models have been developed with varying degrees of accuracies to predict the delays of the basic building blocks of VLSI circuits like inverters, NAND, NOR and transmission gates.

The model presented in this paper includes the shape of input waveform (assumed to be of pulse type), currents of both the enhancement and depletion transistors and the capacitive load. One or more of the above parameters were excluded in most of the previous models. The currents are estimated based on the Shichman's and Hodges model for the MOSFET transistors. The load capacitance can be obtained from a circuit extractor. The operation of inverter is subdivided into different regions, based on whether the enhancement and depletion devices are in the linear, saturation or in the cutoff regions. The differential equations are set up for each of the operating regions and either analytical solution or approximate power series solution [1] are obtained for each region of operation. The delays obtained from the model are compared to that of SPICE for their accuracy as well as computational speed.

[1] A CMOS inverter model for propagation delay evaluation, presented in the 1989 Midwest Symposium on Circuits and Systems.

3:00

ON THE MODELING OF PROPAGATION
EFFECT FOR THE LAND MOBILE
SATELLITE SYSTEMS. Junghwan Kim, The

University of Toledo, Dept. of Electrical Engineering, 2801 W. Bancroft St. Toledo, OH 43606

Various aspects of modeling procedures of fading effects on the land mobile satellite systems are investigated and simple model based on the empirical data is proposed. Because the major problem in Mobile Satellite System is the propagation induced fading, satellite link under low signal margin will experience path outages mainly caused by the vegetative shadowing. We tried to find the propagation mechanisms for vegetatively shadowed case at first, then find out the total fade statistics for the mixed shadowed/unshadowed mobile path. For the mixed case, the total distribution can be obtained by combining the distribution of unshadowed case, characterized by the Rayleigh distributed multipath component, with the fraction of vegetative shadowing. To decide the fraction, experimental data were used for the validity of the developed model. Simulation result showed good agreement with the empirical data.

3:15

REAL TIME SIMULATION OF AN 80197 MICRO-
CONTROLLER FOR SYNCHRONOUS MACHINE
CONTROL. M.E. Brihoum, Student MIEEE; A. A.

Ghandakly, Senior MIEEE, Dept. of Electrical Engineering, The University of Toledo, Toledo, Ohio 43606

This paper will focus on the simulation procedure for testing the real-time controller interface for a laboratory size generating unit, consisting of a 5 KVA synchronous generator connected to a large system through a short transmission line. A direct current motor is used as a prime mover. The system software is designed to perform the digital controller algorithm as well as the I/O interface tasks. The microcontroller used is the INTEL 80c196 processor which is assigned to perform some specific tasks. First, it samples the plant variables. Second, it reads the speed encoder word. Then it places this information in an output buffer. Finally, it transmits all this information out to the host computer at 9600 baud. The main difficulty in using microcontroller is getting the

program written for the EPROM to work. In this project a simulation procedure precedes that final step. This is accomplished by using the INTEL In Circuit Emulator (ICE-196pc) unit, which is a special development system peripheral plugged into the microcontroller socket in the actual hardware. From the target's point of view, the ICE is a processor running at full speed. From the user's perspective the ICE provides many of the features of a simulator, along with the ability to run programs at full speed using the real hardware.

3:30 A PARAMETRICALLY OPTIMIZED SELF-TUNING REGULATOR FOR SINGLE MACHINE POWER SYSTEM

STABILIZATION. Ahmad M. Farhoud, Adel A. Ghandakly
Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606

A parametrically optimized self-tuning regulator is proposed to autotune a power system stabilizer of a single-machine power system. Although the well known double-zero double-pole power system stabilizer works reasonably well over a limited range of operating conditions, the system configuration and load levels may change, which demands autotuning of the stabilizer over a wide range of operating conditions by identifying the system operating conditions and providing the required control action. The proposed self tuning regulator consists of a parameter identification scheme which identifies the nonlinear power system with a predictive model and a control design scheme which utilizes parameter optimization in deriving the control. The control design procedure consists of choosing a regulator structure then tuning the regulator parameters. The flexibility of specifying the order and the structure of the regulator offers advantages in autotuning well known simple controller structures. The proposed method outperformed the fixed parameters stabilizer and the minimum variance self tuner when applied to a computer simulated single machine power system example.

3:45 ON FUZZY STABILIZERS FOR SYNCHRONOUS GENERATORS. J. J. Dai and A. A. Ghandakly, Dept. of Electrical Engineering, The University of Toledo, Toledo, Ohio 43606

The paper presents a novel design of synchronous generator stabilizer using fuzzy control. The algorithm forms a look-up table based on a set of linguistic decision rules which could be easily established from machines's inherent characteristics. When applied, the look-up table is stored in the computer's (or microprocessor's) memory. The sampled generator shaft speed error, its first derivative and second derivative are quantized and then used as entries to the look-up table to find proper control signals. Both exciter and governor fuzzy stabilizers are described in this paper. Computer simulation studies with results compared with conventional double lead-lag exciter stabilizer show that the performance of fuzzy stabilizers is comparable to that of conventional one. It is concluded that the fuzzy stabilizer has the advantages of more straightforward design procedure and easy implementation while it performs as well as the conventional stabilizer.

4:00 AN EXPERT SYSTEM FOR REAL AND REACTIVE POWER DISPATCH OF POWER SYSTEMS. W.M. Refaey, Department of Electrical Engineering, University of Toledo, Toledo, Ohio 43606; M.M. Azzoz, University of Helwan, Cairo, Egypt; O.H. Abdalla, University of Helwan, Cairo, Egypt; I.H. Khalifa, University of Helwan, Cairo, Egypt; A. A. Ghandakly, University of Toledo, Toledo, Ohio 43606

This paper describes an expert system which assists the optimal real and reactive power dispatch for the economic operation of power systems. The expert system continuously checks the power system operating conditions on the basis of voltage magnitudes and line power flows. If abnormal operation is detected, the expert system displays possible control actions to be chosen by the operator. The Control actions include the generator real power outputs for the real power dispatch; and shunt capacitors and/or reactors, transformer tap settings and generator bus voltages for the reactive power dispatch.

The proposed expert system utilizes a linear power flow model to obtain the controller sensitivity functions with respect to the controlled variables. The expert system is effectively incorporated into a conventional language, such as QuickBasic on an IBM PC. Example results are presented.

SECTION O. Engineering
Second Afternoon at 1:30 p.m.
Saturday, April 28, 1990
112 Fawcett
Yung-Tse Hung, Presiding

2:00 EVALUATION OF EFFECTIVE FACTORS IN BATCH TREATMENT OF MILK WASTEWATER, CONTAINING Cr(vi) AND LIMO. Majid Zarrinafsar, Yung-Tse Hung, Cleveland State University, Cleveland, Ohio, 44115

The effects of various concentrations of Cr(vi), LIMO and TOC(Total Organic Carbon) of milk wastewater on the aerobic batch treatment of milk wastewater was studied in these experiments. The factors: TSS (Total suspended solid), VSS (Volatile suspended solid) and TOC were determined in 48 hours. Orthogonal Regressive method was used to evaluate the data. A mathematical model was developed to show the effective factors treatment of milk wastewater in presence of LIMO and Cr(vi). The developed mathematical model was used to generate several data points. The calculated data were in close agreement with the experimental data.

2:15 EVALUATION OF EFFECTIVE FACTORS IN BATCH TREATMENT OF MILK WASTEWATER CONTAINING O-CHLOROPHENOL AND LIMO. Majid Zarrinafsar, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

The effect of high and low concentrations of the three factors, O-Chlorophenol, LIMO and milk wastewater TOC(Total Organic Carbon), on Bio-Augmentation was studied in eight batch, aerobic completely mixed Reactors. The factors TSS(Total suspended solid), VSS(Volatile suspended solid) and TOC were determined in 32 hours. Using Orthogonal Regressive method, the results of these experiments were evaluated and formulated. A mathematical model was developed to show the effective factors in Bio-Augmentation of milk wastewater. Using the developed model, some data points were generated. The calculated data points were in close agreement with the experimental data.

2:30 APPLICATION OF BIOAUGMENTATION IN WASTEWATER TREATMENT. Tong Yu and Yung-Tse Hung Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

This paper is a detailed review of the currently available literature of bioaugmentation. The application of bioaugmentation has a history of more than 10 years. Its first application was in 1977. In the initial stage bioaugmentation was used to solve some urgent operational problems in the water pollution control plant and achieved some good results. Then many research studies were conducted both in the fields and in the laboratories for a better understanding of bioaugmentation in this decade and different opinions were developed from these researches. Also a hypothesis of extracellular enzyme(exo-enzyme) was advanced to try to illustrate why the bioaugmentation is effective more recently. In this paper the different opinions and the experimental results which support the opinions were summarized. And also the author's opinions on the researches which should be made in the future were given.

2:45 ROLE OF BIOCATALYTIC AUGMENTATION ON BATCH ACTIVATED SLUDGE TREATMENT OF POTATO WASTEWATER. Abdul M. Javaid, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

A study was conducted to determine the effects of bioaugmentation in the activated sludge treatment of potato wastewater. Synthetic potato wastewater using potato juice was used as reactor feed. The nine reactors were operated by the addition of different dosages of LLMO(Live

liquid microorganisms). The parameters TSS (total suspended solids) VSS (volatile suspended solids) TOC (total organic carbon) were examined at different detention time ranging from 0 hour to 24 hour. The TOC removal efficiency was close and initial MLSS concentration dependent, with a maximal effect seen at a concentration of 3000mg/l and a dosage of 3ml/l. The TOC removal efficiency was 73,86,92% at 2, 4, 6 hours. No significant additional TOC removal occurred after initial 6 hours.

3:00 EVALUATION OF A FULL SCALE MUNICIPAL ROTATING BIOLOGICAL CONTACTOR PLANT UNDER TROPICAL CONDITIONS. Aik Heng Lee*, Yung-Tse Hung*, Nik Faud Nik Abillah**, *Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115, ** School of Housing, Building and Planning, University of Malaysia, Malaysia.
A study was conducted to evaluate an existing, full scale municipal wastewater plant using rotating biological contactor (RBC) as a secondary treatment process. The plant was operated under tropical climate condition with a designed flowrate of 13,600 GPD (gallons per day). Operating parameters including BOD (biochemical oxygen demand) and SS (suspended solids) were evaluated. For the period of 28-month study, the overall BOD removal efficiency of the plant was 86.27%. The BOD of raw influent, primary secondary effluent and final effluent was 131.144, 85.14, 36.64, and 18.0mg/l, respectively. The overall SS removal efficiency was 78.26%. The SS concentration was 155.15, 82.08, 37.38, and 33.73mg/l, for raw influent, primary effluent, secondary effluent, and final effluent, respectively. The data were employed to determine two linear equations, BOD loading versus effluent BOD, and SS loading versus effluent SS.

3:15 ROTATING BIOLOGICAL CONTACTOR FOR MILK WASTEWATER TREATMENT WITH BIOAUGMENTATION PROCESS. Aik Heng Lee, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

Two four stage laboratory scale rotating biological contactor (RBC) were employed to study the feasibility of bioaugmentation in RBC process treating milk wastewater. The two units were operated at a different organic loading strength ranging from 350 to 75 mg/l of TOC (total organic carbon). Synthetic milk wastewater was used as feed. The bacterial culture product used in the bioaugmentation process was type N-1 of LLMO, manufactured by General Environmental Science Corp., Cleveland, Ohio. The overall carbonaceous substrate removal efficiency measured in term of TOC concentration ranged from 82.14 to 87.71% and 80.99 to 88.67% for the RBC reactor with and without bioaugmentation, respectively. A major removal was occurred in the first stage for both reactors. There was no significant difference in carbonaceous substrate removal between the bioaugmented and non-bioaugmented reactors due to the anoxic condition in the reactors.

3:30 EFFECT OF MEDIA ADDITION AND BIOAUGMENTATION ON THE TREATMENT OF MILK WASTEWATER BY A TWO-STAGE ANAEROBIC/AEROBIC LAGOON PROCESSES. Jerry R. Taricska and Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

A laboratory study was conducted to determine the feasibility of using a two-stage anaerobic/aerobic lagoons on the treatment of milk wastewater, to examine the effects of bioaugmentation on the anaerobic/aerobic lagoons and to examine the effects of media addition to 50% of the anaerobic lagoon volume. The experimental set-up consisted of two sets of anaerobic/aerobic lagoons. The first set consisted of three pairs of parallel trains of two-stage lagoon units. Bioaugmentation was applied to one train of each parallel train. The second set of lagoons had media added to 50% of its volume and bioaugmentation was applied to one train of each parallel train. Media addition improved anaerobic unit with both media and bioaugmentation

was improved by 12.12%. The two-stage TOC removal was 97.145 and 97.08% with and without bio-augmentation, respectively.

3:45 THE INFLUENCE OF SOME ENVIRONMENTAL FACTORS IN YEAST ANAEROBIC FILTER SYSTEM. Nian-Fa Tang, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

Three factors, temperature, initial TOC, and initial yeast concentration were chosen as effective factors in this test. The test was conducted in 8 anaerobic filters according to a regression-orthogonal design plan. The results of the test is calculated by statistical method. TOC removal, TSS and PH are chosen as evaluation items. The influence of the factors has been found and explained by some mathematic equations. TOC removal efficiency of the filters is affected by temperature. TOC removal of filter #1 (40°C) is 16.5% higher than that of filter #5 (20°C) at 12th day, and 8.3% higher at 2nd day. In the first two days, main TOC removal is caused by temperature. Almost no effectiveness is caused by initial TOC concentration and initial yeast concentration in the test range: (TOC)=1,750-3,053mg/l, (Yeast, TSS)=794-1,625mg/l. In the first 2 days period, TSS was increased with high temperature. Between 2nd day and 18th day, more TSS is reduced under high temperature condition. The PH of mixture in different filters was reduced from 6.9-7.1 to 4.7-5.1 in the first 2 days.

4:00 MILK WASTEWATER TREATMENT WITH FOUR-STAGE ANAEROBIC FILTERS. Frank C. Mbachu*, Yung-Tse Hung**, *polytech, Inc., Cleveland, Ohio, ** Civil Engineering Department, Cleveland State University, Cleveland Ohio, 44115

A laboratory experiment was conducted to investigate the treatability of milk wastewater using four-stage anaerobic filters in series. The effect of bioaugmentation on different stages of treatment was also examined. The media used for primary and secondary filter has a specific surface area of 27ft²/ft³ while the tertiary has a media surface area of 140ft²/ft³. The fourth stage consisted of activated carbon and charcoal media with porosity of 0.64 and 0.44. The biokinetics determined show that the substrate removal and gas production follow a first order plug flow kinetics very closely. Within the range of substrate concentration tested (276-4004 mg/l TOC), there was no noticeable effect of inhibition on substrate utilization. The obtained data show a slight effect of bio-augmentation on the hydrolysis. The result showed that an influent TOC concentration of 574mg/l, a 97.8% removal.

4:15 A LABORATORIAL STUDY OF THE EFFECTIVENESS OF BIOAUGMENTATION. Tong Yu and Yung-Tse Hung Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115

A laboratorial study was conducted to investigate the effects of bioaugmentation on the insoluble, particulate and macromolecular organic materials in wastewater and sludge into soluble, small molecular organic materials. Batch of 34, 132, and 147 hours, respectively, were conducted in this study. Starch wastewater and primary settling tank sludge were taken respectively as the representatives of the macromolecular and particulate organic materials. LLMO, a liquid mixed culture bacteria system, was used as the bioaugmentation product. For starch wastewater the TOC concentration raised significantly after 60 hours as the VSS concentration decreased relatively in the same period. And the higher the concentration of the starch, the higher the TOC concentration raised under the conditions of the experiments. (For the primary settling tank sludge it is difficult to determine whether there is a significant difference between the experimental reactors and the controlled reactors.

4:30 ANAEROBIC BATCH TREATMENT OF MILK WASTEWATER IN PRESENCE OF LIMO AND PHENOL. Majid Zarrinafsar, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Ohio, 44115

Anaerobic Batch treatment of milk wastewater was studied in presence of various concentrations of Phenol and LIMO in both stirred and nonstirred conditions. The effects of the three factors, LIMO concentration, Phenol concentration and stirring condition on the Bio-augmentation were determined and compared. Orthogonal Regressive Method was used to formulate data and a mathematical model was developed to show the effective factors in anaerobic treatment of milk waste water under the experimental conditions.

SECTION R. Ecology

First Afternoon & Business Meeting at 1:30 p.m. Saturday, April 28, 1990

068 Rike

R.J. Garono and J. Runkle, Presiding

2:00 THE CURRENT EELGRASS SITUATION (1985-89) AND THE FILLED SALT-MARSH SUCCESSION REVISITED (1980-89) AT CAPE ANN, MASSACHUSETTS. Ralph W. Dexter, Dept. Biological Sciences, Kent State University, Kent, Ohio 44242.

Since the latest epidemic of eelgrass disease at Cape Ann in 1984, *Zostera marina* virtually disappeared throughout the Annisquam Tidal System. By 1989 a dozen or so small patches (less than 1 sq. m. each) appeared in Goose Cove and scattered seedlings have increased along the low water line at Wingersheek Beach, both at the northern end of the Annisquam Tidal River. Eelgrass has persisted in a series of coves along the eastern shore of Ipswich Bay, increasing generally each year, and a large patch has developed off Niles Beach in Gloucester Harbor.

The filled salt-marsh succession initiated in 1958 by deposits of sand has continued to develop and by 1989 the restored salt-marsh and the beach grass have been almost obliterated by an overgrowth of reed grass throughout the area and over the slopes of the dykes, with sumac dominating the top of the dykes, and cottonwood and red cedar encroaching from the adjacent land.

2:15 TIMING OF RELEASE AFTER DISTURBANCE IN TWO SPECIES OF SOUTHERN BEECH (*NOTHOFAGUS*) IN NEW ZEALAND. Runkle, James R. Department of Biological Sciences, Wright State University, Dayton, OH 45435, USA.

Two *Nothofagus* species coexist as canopy trees in many old-growth forests of New Zealand but differ in several aspects of their life histories. *N. fusca* (Hook.f.) Oerst. is more shade intolerant, growing faster, getting larger, but not surviving as well in the understorey as *N. menziesii* (Hook.f.) Oerst. I sought to determine if differences in the timing of their response to disturbance affected their relative success. I selected stems of each species close together (and thus having the same disturbance history) and similar in height. Ages and annual diameter increments at several heights for each stem were measured. *N. menziesii* spends more time suppressed but after a disturbance begins faster growth sooner than *N. fusca*. The rates of height growth were very similar after release although *N. fusca* usually became taller eventually, probably in response to a later disturbance. Few suppressed *N. fusca* were found.

2:30 THE PROBABLE ROLE OF FIRE IN THE GENESIS OF THE 10-YR WILDLIFE CYCLE, John P. Wing and Mark B. Dallas, Wittenberg University, Springfield, OH 45501.

Woody and herbaceous plants evolved in northern biomes with fire frequency and fire gradients in their history (Heinselman, 1973); and patterns of post-fire regeneration create habitat patchiness as an underlying dynamic of population cycles (Wolff, 1980; Finerty, 1980). But does fire directly generate 10-yr cycles? This study re-examines the 20th century fire chronology of a 54000km² area of northern Quebec (Payette et al, 1989) to assess its role in regional wildlife cycles. Every half-century 50% of the area is burned intermittently, creating numerous patchy habitats. Periodogram analyses (Legendre et al, 1981) of detrended fire series show statistically significant ($p < .05$) cycles of 18-19 yrs, 20-23 yrs and 30 yrs, but no clear and significant 10-yr cycles. Results fail to support Grange (1949, 1965) and Fox (1978) who suggest fire

and plant succession may directly drive the 10-yr cycle; but they do support Keith (1974) in assigning fire an important longer-term role, perhaps predisposing populations to cycles and playing a role in synchronizing the longer cycles.

2:45 MICROBIAL METABOLIC ACTIVITY IN SOILS OF OLD-FIELD COMMUNITIES FOLLOWING ELEVEN YEARS OF NUTRIENT ENRICHMENT Susan D. Sutton, Gary W. Barrett, and Douglas H. Taylor Department of Zoology, Miami University, Oxford, Ohio 45056

Studies were conducted during fall, 1989, to determine the effects of long-term nutrient enrichment on microbial metabolic activity in soil samples collected from contrasting types of old-field communities at the Miami University Ecology Research Center. Experimental plots either received applications of fertilizer or sludge for eleven years or were left as untreated controls. During the 1989 growing season plots were left undisturbed or were manipulated by tilling and/or liming to evaluate mechanisms of ecosystem recovery. The metabolic activities of soil microorganisms from subplots of each treatment type were determined by measuring dehydrogenase activity. The amounts of 2,3,5-triphenyltetrazolium formazan formed during incubation by the reduction of 2,3,5-triphenyltetrazolium chloride were used to evaluate dehydrogenase activity. Subplots receiving long-term applications of sludge or fertilizer had significantly lower microbial activity ($p < 0.05$) than those left as controls. Fertilizer and sludge plots treated with lime to restore soil acidity to $pH > 5.0$ had significantly higher microbial metabolic activity ($p < 0.05$) than those not receiving lime. Thus, microbial activity was significantly reduced as a result of eleven consecutive years of nutrient enrichment. Liming stimulated microbial activity to near control levels, whereas tilling did not significantly effect microbe activity.

3:15 CLASSIFICATION OF OHIO WETLAND PLANT COMMUNITIES WITH SPECIAL EMPHASIS ON A NEW SURVEY METHOD. R.J. Garono, Department of Biological Sciences, Kent State University, Kent, Ohio 44242 and J.G. Kooser, Ohio Department of Natural Resources, Bldg. F-1 Fountain Square, Columbus, Ohio 43224.

In 1982 a plant community classification system was developed for Ohio by D. Anderson. Anderson recognized and described 45 natural plant community types, of which 19 (42%) were wetlands. The ODNR, DNAP have used Anderson's classification system as a guide in natural area inventory efforts. Quantitative data have been collected from over 175 examples of these community types since 1982. Most of these data come from work done in forested upland communities. Recently, as awareness of the importance of wetland habitats has grown, it has become necessary to quantify the composition and structure of non-forested communities. Presented here are the community classifications currently in use by the State of Ohio, a new quantitative method for surveying non-forested plant communities, and an empirical evaluation of Anderson's classification system. The efficacy of the new sampling method was tested through the use of a computer model and field tests in several Ohio wetlands. Results indicate the new method correctly identifies dominant plant species and estimates percent cover of dominant plant species to within 5% of traditional percent cover methods. Furthermore, the new method is more efficient in terms of time, energy, and money than line transect or macroplot methods.

3:30 A STUDY OF THE VASCULAR FLORA OF SELECTED AREAS OF THE BEAVER CREEK WETLANDS. Lehar, Victoria. Department of Biological Sciences, Wright State University, Dayton, Ohio 45435. During the 1989 growing season, a natural wet area bordering the Beaver Creek in Greene County, Ohio, was surveyed to determine if the area met the criteria for wetlands established by Federal agencies and to amass a catalog of the area's vegetation to serve as a baseline for future studies. A transect was established across a twenty hectare section of the wetland, and fourteen plots representative of different habitat types were marked. Weekly species lists were made from April through October for each plot. Voucher specimens were collected and identified with dichotomous keys. Woody stems were counted and their diameters measured. Observations regarding dominant plant species were made. The twelve interior plots met the Federal criteria for wetlands. Approximately 190 species, representing 128 genera and 56 families, were identified. The general habitat types present were sedge meadow, wet prairie, reed marsh, wet forest, field/hedgerow, and closed forest. Dominant herbs were *Acorus calamus* L., *Typha latifolia* L., *Impatiens capensis* Meerb., *Lysimachia nummularia* L., *Carex stricta* Lam., *Equisetum arvense* L., *Leersia oryzoides* (L.) Sw., and *Eleocharis erythropoda* Steud. Dominant trees were *Populus deltoides* Marsh., *Maclura pomifera* (Raf.) Schneid., *Salix nigra* Marsh., *Salix exigua* Nutt., and *Acer saccharinum* L.

3:45 THE PLANT COMMUNITIES OF LAKE KATHERINE STATE NATURE PRESERVE. J.H. Adams, F.A. Bryan, Department of Botany, Ohio University, Athens, Ohio 45701. J.G. Kooser, Ohio Department of Natural Resources, Columbus, Ohio 43224, and R.J. Garono, Department of Biological Sciences, Kent State University, Kent, Ohio 44242.

The purpose of this study is (1) to collect quantitative, baseline data from the plant communities of Lake Katherine State Nature Preserve, and (2) to compare the age, composition, and diversity of these communities to similar communities on a local (Jackson County), regional (Southeastern Ohio), and state-wide basis. Three types of forested plant communities were targeted for this study: hemlock, Appalachian oak, and mixed flood plain. More than 80 person-hours were spent at this preserve during this study. Five, 20 point, BQM [Basic Quantitative Method (a modified point-centered quarter sampling method)] data sets were taken in five separate areas: two ridge-tops, two mesic coves, and one flood plain. Results from these BQM transects will be presented and comparisons will be made with data collected from other plant communities in Jackson County, southeastern Ohio, and state-wide. Efficacy of the BQM in locating rare elements will also be presented.

4:00 INBREEDING IN TRIODANIS PERFOLIATA, A CHASMOGAMOUS/CLEISTOGAMOUS SPECIES. Finley Bryan, Department of Botany, Ohio University, Athens, OH 45701

Triodanis perfoliata (Campanulaceae) is an annual which produces potentially outcrossing, chasmogamous flowers (CH), and obligately self-crossing cleistogamous flowers (CL). Although CH flowers are available for cross-pollination, they could practice inbreeding, either by selfing or by mating with relatives. I wanted to judge how much CH flowers are inbreeding. If they are inbreeding, then CH progeny should show levels of heterozygosity similar to those of the CL progeny. I compared the levels of heterozygosity of CH and CL progeny of 25 individuals from one population of Triodanis perfoliata, using starch gel electrophoresis. Also, since a history of inbreeding can cause heterogeneity in the distribution of alleles across populations, I analyzed the distribution of genetic variation among progeny from nine populations of Triodanis in southern Ohio.

4:15 POLLEN LIMITATION AND NATURAL FRUIT PRODUCTION IN MAYAPPLE COLONIES (Rodophyllum peltatum L.) Sandra L. Whisler and Allison A. Snow, Botany Dept., The Ohio State Univ., Columbus, OH 43210

Seed production may be pollen limited in many plant populations, but few studies have demonstrated this conclusively. We determined natural levels of fruit set for 156 mayapple colonies at two sites in central Ohio. There were no significant differences in natural fruit set between sites. Fruit set was generally low, and many colonies produced no fruits. Although there was no significant increase in percent fruit set as colony size increased, small colonies were likely to have zero percent fruit set while larger colonies usually produced at least one fruit. To determine whether seed set was pollen limited, we compared levels of fruit and seed production from hand- and naturally-pollinated plants from the same colony. Fruit set was much higher following hand-pollination at both sites. Seed set per fruit also appeared to be pollen limited, although not as severely as fruit set. Experimental crosses indicated that most colonies were self-incompatible and some were composed of more than one genotype.

4:30 HIGH POLLINATION RATES AND NONRANDOM FERTILIZATION IN HIBISCUS MOSCHEUTOS. Allison A. Snow and Timothy P. Spira, Botany Dept., Ohio State Univ., Columbus, OH 43210; Dept. of Biology, Georgia Southern College, Statesboro, GA 30460

High rates of pollen deposition can lead to pollen tube competition and nonrandom fertilization based on the pollen donors' identity. In natural populations of Hibiscus moscheutos, anthophorid bees delivered surplus pollen to receptive stigmas within a

few hours of anthesis. This resulted in competition among pollen tubes for a limited number of ovules. Direct observations of pollen tube growth rates showed that significant differences between pairs of outcross donors were common, as were differences between self and outcross pollen. We used an electrophoretic marker (PGI) to examine the relationship between pollen competitive ability and the proportion of seeds sired by a given donor. The evolutionary implications of this process will be discussed, with an emphasis on variation among individuals in the male component of reproductive success.

4:45 EFFECTS OF DIVERSIFICATION OF THE Zea mays AGROECOSYSTEM ON POPULATIONS OF PHYTOPHAGOUS, PREDACEOUS AND PARASITIC ARTHROPODS.

Daniel M. Pavuk and Benjamin R. Stinner, Department of Entomology, The Ohio State University, The Ohio Agricultural Research and Development Center, Wooster, OH 44691 U.S.A.

A continuing debate in ecology is whether or not diversity leads to stability in ecosystems. This study was undertaken to determine the effects of diversification of the Zea mays agroecosystem on populations of phytophagous, predaceous and parasitic arthropods. Four treatments were examined: corn grown without weeds, corn grown with principally broadleaf weeds, corn grown with principally grassy weeds, and corn grown with both broadleaf and grassy weeds. Four replications of each treatment were set up in a completely random design. Pitfall traps and a sweep net were used to sample soil and foliar arthropods, respectively, during 1988 and 1989. In general, phytophagous, predaceous and parasitic arthropods were more abundant on weeds than on corn. Activity of carabid beetles was often greater in the no weeds treatment than in the weedy treatments. Diversity of predaceous foliar arthropods was greater in weeds than in corn.

SECTION R. Ecology

Second Afternoon at 1:30 p.m.

Saturday, April 28, 1990

072 Rike

Horton Hobbs and David MacLean, Presiding

2:00 WHY DO LISTRONOTUS APPENDICULATUS WEEVILS PREFER TO LAY EGGS ON MALE RATHER THAN FEMALE INFLORESCENCES OF SAGITTARIA LATIFOLIA? D. Bryan Bishop and Gayle Muenchow, Botany Dept., Ohio University, Athens, OH 45701.

The weevil, Listronotus appendiculatus, uses Sagittaria latifolia plants as hosts. The plants have separate genders. The weevils lay some eggs on leaves, but most eggs on inflorescences. We found that they do not distinguish between the plant genders with respect to the leaves, but that they lay significantly more eggs on male than female inflorescences. Male inflorescences have fewer abortive buds at the tip. The number of eggs laid is negatively correlated with the number of abortive buds at the tip, so this difference in inflorescence morphology may be influencing the weevil behavior. We have also studied the relative survivorship and growth of weevil larvae on inflorescences of different genders.

2:15 POSSIBLE 10-YR CYCLE IN THE CANADIAN BREEDING POPULATIONS OF THE WHOOPING CRANE, CRUS AMERICANA (L), John F. Wing and Donald F. Glazier, Department of Psychology, Wittenberg University, Springfield, OH 45501.

Johnsgard (1983) reports fall counts for juvenile and adult whooping cranes which wintered annually at Aransas National Wildlife Refuge, TX from 1938-1982. These two 45-yr records show upward trends. Both with and without removal of trends the juvenile crane count exhibits significant ($p < .05$) 10-yr and 20-yr cycles using the contingency periodogram (Legendre et al, 1981), whereas the adult count does not show significant cycles. Since the population breeds on the border of NWT and Alberta, CANADA, it is possible that breeding, breeding site mortality, and/or fall migration mortality is affected by the boreal 10-yr cycle. Since Moran (1953), Wing (1987) and, to a limited

degree, Meslow & Keith (1971) have implicated weather as an important cause of the 10-yr cycle, we examined weather patterns at several regional stations. We found lows in juvenile counts coincided with years of high June rainfall at nearby sites including Ft. MacMurray, ALTA ($r = -.434$, $n = 39$, $p < .01$), a factor which is known to flood nests (Kuyt, 1976); and these lows also coincided with cool July temperatures (e.g., $r = .354$, $n = 44$, $p < .05$ at Athabasca, ALTA), a factor which might affect onset and success of breeding (both directly and via the food chain). A number of these sites showed significant ($p < .05$) 10-yr cycles in their weather series.

2:30 DEVELOPMENT AND DURATION OF INDIVIDUAL DOG URINE RECOGNITION BY WOLFDOG HYBRIDS

by L. Woods & D. Waller, Department of Biological Sciences, Kent State University, Kent OH 44242

In particular mammals, chemical signals in urine may communicate information not only about species and gender identity and behavioral and physiological state but also individual identity. It is implied that animals may learn to recognize and respond to individuals based on encounters only with scent marks. At Cedar Point Park, Sandusky, in late winter 1988, the behavior of 3 captive hybrid canids (WolfxDog, 2 males, 1 female) in response to urine of dogs (all neutered females) was observed. Just before each of 4 study sessions, urine was collected from source dogs housed far from the site. Individual subjects were put one by one in a separate enclosure and presented with urine of 4 sources. Each urine sample was sprinkled on a cleaned brick and placed with the subject in a random order. Each set included 2 repeated sources (familiar), 1 new source (unfamiliar) and 1 untreated (control) brick. Study of animals' responses to each preparation were observed for 10 min. The animals spent significantly more time investigating unfamiliar urine (180 sec) than familiar (80 sec) or control (75 sec). Unfamiliar urine became familiar after only 1 encounter and remained familiar even at 3-week intervals. The female subject showed more pronounced responses than did males. Evidently individual scents were quickly learned and remembered over a behaviorally meaningful time period.

2:45 DISCRIMINANT ANALYSIS OF LEPIDOPTERAN PREY CHARACTERISTICS AND THEIR EFFECTS ON THE OUTCOME OF BIRD-FEEDING TRIALS. David B.

MacLean and Bonnie K. MacLean. Department of Biological Sciences, Youngstown State University, Youngstown, Ohio 44555.

Discriminant analysis was used to analyze the results of 348 bird-feeding trials conducted from 1982 to 1985 for four size classes, seven appearance categories, and five larval host types of species of moths and butterflies used as prey. Discriminant analysis of individual feeding trials correctly classified 97.5 percent of prey taken and ranked the predictor variables according to their relative importance in determining prey acceptability. Prey characteristics most acceptable to birds were: (1) large size, (2) bark-like appearance, (3) warning coloration, (4) woody generalist, and (5) dead-leaf-like appearance. Characteristics least acceptable to birds were: (1) small size, (2) mimetic appearance, (3) butterfly appearance, (4) herbaceous specialist food type, (5) black-and-white appearance, and (6) extra large size. A multiple regression analysis of prey taken revealed that size alone and larval host type combined with other prey characteristics were the most important variables in determining the selection of prey regardless of their abundance in the trials.

3:15 THE ATTENTIVENESS OF THE MALE AMERICAN GOLDFINCH TO THE INCUBATING FEMALE.

Amy K. Harth & David W. Waller. Department of Biological Sciences, Kent State University, Kent OH 44242.

The male American Goldfinch (*Carduelis tristis*) visits the incubating female at the nest and feeds her by regurgitation. The female spends most of her time on the nest and emits "begging" calls in connection with the male's visits. The influence of "begging" on the male's feeding is not clearly established. Six nest sites of breeding pairs were located near Kent, Portage Co., Ohio and observed during incubation in July and August of 1988 and 1989 for a total of 37 hours in 20 sessions. Visits by the male, both feeding and non-feeding, were recorded, as well as "begging" by the female during visits. The male visited an average of every 27 min whether the female was present or not. Of 86 visits with the female present, only 28% resulted in feeding, and the male fed the female an average of every 82 min. Feeding alternated with non-feeding in a non-random pattern. The female "begged" during 73% of the visits. No feeding occurred without "begging", but "begging" did not insure feeding. Unrequited "begging" on one visit did not predict feeding on the next; but non-feeding on one visit did predict "begging" on the next. Excess visits by the

male may prevent cuckoldry, or insure that his genetic investment in the eggs is protected. It appears the male controls the feeding schedule, and the female initiates the act.

3:30 COARSE FILTERS VS. FINE FILTERS: A COMPARISON OF TWO APPROACHES TO FINDING POTENTIAL NATURAL AREAS.

J.G. Kooser, Rettew Associates, Inc., 5010 Ritter Road, Mechanicsburg, PA. 17055, and R.J. Garono, Department of Biological Sciences, Kent State University, Kent, Ohio 44242.

Heritage programs typically use two approaches to find and evaluate potential natural areas. The search for high quality plant communities provides a "coarse filter" for screening areas, while a survey for populations of state listed taxa provides a "fine filter". The two approaches are optimally used together. We asked can a heritage program afford to abandon one approach entirely, focusing perhaps only on a search for rare plants? We examined data and recommendations from a rare plant survey conducted in Carroll County, Ohio in 1983 and an plant community survey conducted in 1989. The community surveyor knew of the existence of the rare plant survey, but was not made aware of the results. The rare plant survey consisted of attempts to update known locations of state listed taxa, and to find new locations based on geology, topography, and soil types. The community survey was conducted using standard heritage program methodology, and included aerial photo interpretation, overflights, land owner and local expert contacts, and ground surveys. Results of the two surveys were compared to determine how many sites were selected by both types of survey, and how many were ignored by one survey or the other. Advantages and disadvantages of both survey types will be discussed.

3:45 A MARINE THRAUSTOCHYTRID HAS A POSITIVE PHOTORESPONSE. Amon, J.P., and K. French.

Department of Biological Sciences, Wright State University, Dayton, OH 45435.

A marine protist, tentatively identified as an *Ulkenia* sp., shows a positive swimming response of its zoospores to white or blue light. Among thraustochytrids, only the meiospores of a *Labyrinthula* sp. have been shown to have a positive photoreponse. To demonstrate the response it is important to assure that most zoospores are released from the sporangium in a three hour period and that no more than 25% are nonmotile during the experiment. Thraustochytrids, like this one, may be ecologically similar to previously described marine zoosporic chytrid fungi which are positively photoreponsive to blue light and are chemoattracted to the variety of nutrients presumably available in the coastal marine environment.

4:00 THE IMPORTANCE OF DECOMPOSING LEAVES AND MACROPHYTES AS SOURCES OF TRIHALOMETHANE PRECURSORS.

Angela Martin, Dept. Biological Sciences, Kent State University, Kent, Ohio, 44242

The purpose of this study was to determine if decomposing terrestrial leaves and aquatic macrophytes are sources of trihalomethane (THM) precursors in drinking water reservoirs. THM's are a group of halogenated hydrocarbons formed during the chlorination of waters by the reaction of chlorine with naturally-occurring organic compounds. THM's are of concern because they have been shown to be carcinogenic and mutagenic.

Results from laboratory and field studies indicate that decomposing leaves and macrophytes are potential sources of precursors in reservoirs receiving a large portion of organic material from terrestrial and littoral vegetation. The rate and yield of THM precursor production is dependent on particle size and microbial activity. Autumnal peaks in THM precursor concentrations in water samples correspond to autumn leaf fall and aquatic macrophyte senescence. The findings suggest that watershed, lake, and reservoir management of these precursor sources may reduce precursor concentrations in drinking water supplies.

4:15 REGIONAL PATTERNS IN THE TROPHIC STATE OF OHIO RESERVOIRS by Donald G. Fulmer, Department of Biological Sciences, Kent State University,

Kent, OH 44242.

Watersheds are the primary source of nutrients which are critical in determining reservoir productivity and algal biomass. The hypothesis evaluated was that reservoirs with similar watershed characteristics should have similar trophic states (nutrient concentrations and algal biomass). A map of Ecoregions of the Conterminous United States (Omernick, 1987) was used to delineate regional watershed

patterns of soil type, land use, land form, and vegetation. A survey of 21 reservoirs in 4 of the 5 Ohio ecoregions was conducted during the spring and summer of 1989. These 4 ecoregions contain approximately 95% of Ohio's reservoirs. Total phosphorus and chlorophyll a concentrations were determined at multiple sites along each reservoir's longitudinal axis, and in major embayments. Similar data from Ohio lake surveys in the 1970s were evaluated. Total phosphorus and chlorophyll a concentrations could be grouped into 3 distinct regions, closely corresponding to the pattern predicted by the ecoregion map. Concentrations were highest in the northwest corner, lowest in the mountainous southeast region, and at intermediate levels in between. The results have important implications. Some reservoirs have higher concentrations than expected from ecoregion characteristics, suggesting that these water bodies have a high potential for restoration.

4:30 IN SITU SEDIMENT TOXICITY EVALUATIONS USING PIMEPHALES PROMELAS LARVAE, DAPHNIA MAGNA AND CERIODAPHNIA DUBIA. Skalski, C., G. Sasson-Brickson, and G.A. Burton, Jr. Biological Sciences Department, Wright State University, Dayton, OH 45435.

Ecological assessments of contaminated stream sites are enhanced by field testing. In situ exposures (2-7 days) of fathead minnows and cladocerans were conducted in streams impacted by nonpoint and point source pollution. Sediments contained high concentrations of metals and polynuclear aromatic hydrocarbons. Fish and benthic macroinvertebrate community indices were depressed. In situ sediment toxicity was frequently less than laboratory exposures and in situ reference survival rates were acceptable. In situ interstitial water exposures with Daphnia magna also revealed survival rates significantly different from laboratory exposures. In situ sediment exposures proved to be useful and sensitive indicators of both degraded and nondegraded stream conditions.

4:45 CHANGES IN THE ABUNDANCE AND DISTRIBUTION OF OLIGOCHAETA IN THE CLEVELAND HARBOR AREA FROM 1978 TO 1989
Lloyd S. Ross and Kenneth A. Krieger, Water Quality Laboratory, Heidelberg College.

Oligochaete density and individual species distributions within the Cleveland Harbor area of Lake Erie were compared between 1978 and 1989. Ponar grab samples, from six harbor stations and six open water stations were sieved through a 595 µm mesh screen. Oligochaetes were first subsampled, then enumerated and identified to species.

The harbor showed a 4.1% decline in oligochaetes from an average of 25,995/m² in 1978 to an average of 24,935/m² in 1989. The oligochaetes in the open water increased 200% from an average of 1,837/m² to an average of 3,674/m². The 28 species found in 1989 included all of the 15 species found in 1978. The oligochaete contribution to the overall macroinvertebrate density decreased. The trophic condition index (0.00 to 2.00) using oligochaetes indicated a slight improvement in the harbor (from 1.99 to 1.92) and a greater improvement in the open water (from 1.82 to 1.44) in the period from 1978 to 1989.

SECTION R. Ecology

Poster Session at 10:00 a.m.

Saturday, April 28, 1990

Lobby Physical Education Bldg.

Board I
@ 10:00 a.m. GENETIC STRUCTURE OF A HABITAT-SPECIALIST FISH, COTTUS BAIRDI BAIRDI. Christopher Mitchell, E. Raymond Heithaus, and Lawrence Blumer. Biology Department, Kenyon College, Gambier, Ohio 43022.

We examined the genetic structure of Mottled Sculpin (Cottus bairdi bairdi) populations within and between streams. We wished to test the hypothesis that a river is a barrier to dispersal for C. bairdi, which is a habitat specialist for riffles in cool, headwater streams. We sampled (N= 270 fish) different riffles within Big Run Creek (BRC), Knox Co., Ohio, four other tributaries to the Kokosing River, and the headwaters of the Kokosing River. Thirteen loci in nine enzyme systems were assayed using starch gel electrophoresis. Fish from different riffles within BRC showed genetic differentiation at four of the nine variable loci. Sculpins from different streams differed significantly at three of the same loci (PGM, PGD, and GDI), plus a fourth locus. Genetic differentia-

tion was stronger between riffles within BRC ($G_{ST} = .18$) than between streams ($G_{ST} = .10$). We found no evidence for isolation by distance (Nei's D decreased with distance between sites).

SECTION S. Library & Information Sciences

Only Morning at 9:00 a.m.

Friday, April 27, 1990

Rooms 315-316 Univ. Library

Ms. Norma Pearson, Presiding

9:00 BACK TO THE FUTURE: A REVIEW OF LIBRARY FORECASTS & TRENDS, TEN YEARS AFTER.
Cary M. Klein. Carlson Library, University of Toledo, Toledo OH 43606

Ten years ago, forecasters predicted radical changes for libraries as a result of technological innovations. Some of these changes have come into fruition, while others have barely moved off the drawing board. Just as bankers have read about the coming "cashless economy" for decades, we are still waiting for the "library without walls" that librarians have been reading about for decades.

Technologies and library innovations which were "on the leading edge" 10 years ago are looked at, including: micrographics, electronic publishing, satellite transmissions, and online bibliographic networks. Many other technical innovations are common in libraries today, which were not envisioned 10 years ago, yet they have impacted operations at many libraries. Innovations which have lived up to expectations will be discussed, along with those that have missed the mark. Similarities between the library and banking communities are explored, in terms of the rates of adopting new technologies into our institutions, and the reasons why innovations take so long to have a visible impact on society.

9:30 IMPROVING SERIALS CONTROL: FROM A MANUAL TO AN AUTOMATED SYSTEM. Karen J. Aufderberge. Carlson Library, University of Toledo, Toledo, OH 43606.

Beginning in July 1988, the University of Toledo Library implemented the INNOVACQ computer system for serials control. As in other libraries, the computer has modernized the technical services operation by replacing paper files, eliminating labor-intensive tasks, and increasing the speed of serials check-in. Automatic invoice processing, Boolean searching, computerized serials check-in, and automatic claiming are INNOVACQ functions which provide improved serials control. Bibliographic, order, and check-in information for each title is brought together in a single database. Although the computer records are more complex, and thus require more training and documentation for both staff and patrons, the procedures for ordering and check-in are much more efficient than in a manual system. This presentation focuses on the implementation of INNOVACQ at the University of Toledo Library, and on the computer capabilities which particularly facilitate serials control.

9:45 SPECS AND STANDARDS - BASELINES FOR TECHNOLOGIES
Robert J. Rittenhouse
Physical Sciences and Engineering Bibliographer
Science and Technology Library ASC104H
The University of Akron 44325-3907

In the consideration of boundary and indicator literatures for technologies, specifications and standards need to receive far more attention. End users often tend to use very narrow ranges of specification literature such as only one to a few relevant standards for specific design or problem areas. Major academic, public, and special libraries should consider providing a greater variety of specification and standard indexes, online database services, and specification collections to strengthen accessibility of their clientele to these technology baselines. Designers and researchers should be aware of major publishers such as ANSI, IEEE, Naval Publications and Forms Center, NBS, ASTM, NFPA, SAE, also foreign standards, and less well-known sources such as Hydronics Institute, American Association of State Highway and Transportation Officials, Air-Conditioning and Refrigeration Institute, Tire and Rim Association, Inc., and International Organization for Standardization. Some criteria for the types of indexes and specifications holdings for libraries are stated in this paper.

10:15

DUPLICATES AND THEIR RETENTION IN THE LIBRARY COLLECTION. Dale Ebersole, Jr. Carlson Library, University of Toledo, Toledo, Ohio 43606.

In all library collections there exists a small number of titles that are heavily used. Some examples are reserve collections that provide supplementary materials for large classes, alternative textbooks for required courses with large numbers of students, critical and/or standard editions of popular titles and authors are needed, and reference works in great demand. Automated circulation systems that collect use data allow librarians to monitor duplicates. To effectively maintain the duplicate segment the librarian needs to know the institution's past acquisition pattern. The role of requests, transfers from reserve collections, overlapping of approval plans, and the decision to add duplicate volumes based on subject or use parameters all need to be evaluated. A volume's use pattern, subject, type, author and age all contribute to the decision to retain a duplicate.

10:30

PRELIMINARY OBSERVATIONS OF TRADITIONAL AND NONTRADITIONAL STUDENTS' LIBRARY SKILLS AT KENT STATE UNIVERSITY. Rajinder Garcha, Carlson Library, University of Toledo, Toledo, OH 43606.

A study was undertaken to compare library skills and attitudes of traditional and nontraditional students entering Kent State University during the Spring Semester of 1989. It was discovered that nontraditional students present a challenge to library instruction due to a lack of familiarity with and commitment to the academic routine and a lack of library experience overall. Freshmen students were administered a questionnaire prior to receiving any formal library instruction. Chi-square tests were used to test significant differences between the two groups regarding the variables of library skills and library attitudes. Because of the sample size, the study was limited. However, some observations were made that merit further study and may have implications for library instruction programs which will be designed to address the growing population of nontraditional college students in the 1990s.

CODES OF ETHICS AND IDEOLOGIES FOR INFORMATION PROFESSIONALS: DO THEY CONTRIBUTE TO "INFORMATION MALPRACTICE"? Dr. Thomas J. Froehlich, School of Library Science, Kent State University, Kent, Ohio 44242-0001.

11:00

The American Society for Information Science has developed a code of ethics for information professionals after the manner of the Code of Ethics of the American Library Association. The value and role of codes and the relation of the ASIS and ALA codes will be discussed. Furthermore, it is further argued that there is an implicit ideology at work within the so-called information society and ASIS's endorsement of such a society and its concern for information technologies and their institutionalization. Features of this ideology are discussed in terms of their ethical implications. Finally, drawing on this discussion, issues of global concern for information scientists will be raised: whether information scientists will contribute to such phenomena as the widening gap between the information rich and information poor; diminishing public and free access to information; and the devaluation of historical information, despite codes of ethics and proclamations to the contrary.

**SECTION S. Library & Information Sciences
Only Afternoon & Business Meeting
at 1:30 p.m. Friday, April 27, 1990
Rooms 315-316 Univ. Library
Ms. Norma Pearson, Presiding**

2:00 p.m.

10th. Anniversary of Section S: A Retrospective View

Ron Watterson

Medical College of Ohio at Toledo

2:30

CONTROLLING THE MASS OF PAPER DOCUMENTS AND PRESERVING OUR CULTURAL RECORD THROUGH MICRO-TECHNOLOGY. G. Robert McLean, University of Toledo Libraries, Toledo, Ohio, 43606.

There are never enough file cabinets to store records in a business or library. The technology of putting documents on microfilm for preservation and convenient retrieval is here today, much different than what was experienced 20 or 30 years ago. Computer technology has also made its way into the microprocessing units of microfilm cameras, readers and other equipment, and film itself with the use of Computer Output Microfilm (COM). Storing volumes of periodicals on library shelves in original format takes up enormous space in linear feet. On microfilm, a few cabinets will do, which also permits security from theft, mutilation of pages, allows long-term storage, complete collections, acquisition of out of print material, and to get copies of unique collections from other libraries. If people are getting pushed out of their offices from the paper avalanche, the microformat is the answer. It is legal and admissible in court, and original size paper copies can be made instantly. Zoom lenses on some printers can even make the original document print oversize for the visually impaired. The microformat has changed the way information is managed and stored in a similar yet different method as a computer. Record management and retention will depend on the requirements of the user.

3:00

LOCALLY MOUNTED DATABASES IN ACADEMIC LIBRARIES. Margaret Guss, University Library and Learning Resources, The University of Akron, Akron OH 44304

3:30

THE PAST AND THE FUTURE IMPACT OF NEW TECHNOLOGY ON THE ROLE OF SCIENCE LIBRARIANS
Marian Winner, Head Science Librarian, Brill Science Library, Miami University, Oxford, OH 45056

Ten years ago when Section 5: Library and Information Science of the Ohio Academy of Science was born, we were just beginning to search online databases using such archaic equipment as the "Silent 700". Today we can quickly access any database doing complex searching with sophisticated microcomputers. Faculty and researchers are so impressed with this new technology that they are doing their own searches. What will be our role in the future? Will it disappear or will we form a new partnership with our sophisticated users. We must accept this challenge and prepare for change. This discussion will stimulate each participant to prepare for a most interesting future.

**SECTION S. Library & Information Sciences
9:00 a.m., Saturday, April 28, 1990
Lobby of Physical Education Building
Medline on CD-ROM Demonstration and
Hands-on Experience**
