Abstracts of Technical Sections

NOTE: Abstracts of posters follow abstracts of podium presentations by section.
Saturday, April 29, 1989

SECTION A. Zoology in A225
First Morning 9:00 a.m.
Saturday, April 29, 1989
Paul C. Stromberg, Presiding

9:00 A GYNANDROMORPH OF THE FAIRY SHRIMP BRANCHINECTA LINDAHLI WITH OTHER ANOMALIES FOUND IN THE ANOSTRACAN CRUSTACEA. Ralph W. Dexter, Dept. of Biological Sciences, Kent State University, Kent, Ohio 44242.

In collecting fairy shrimps (Crustacea: Anostraca) from temporary pools and ponds in Ohio, Illinois, Colorado, and New Mexico since 1936, anomalous specimens have been found on rare occasions. Also, anostracans sent by other collectors have been examined for abnormalities. Since my report of 1953, the following additional records have come to hand. A second record of a gynandromorph of Branchinecta lindahli is reported from Death Valley National Monument in California. It was a functional female which developed male claspers. A male specimen of Eubranchipus vernalis collected in Ohio had a malformed second antenna (clasping organ) on the left side. Red-eyed specimens of E. vernalis were collected in Ohio, and of Branchinecta campestris in Nebraska. While female anostracans are usually more numerous than males, populations of E. vernalis and E. bundyi in northeastern Ohio and of E. serratus in east central Illinois have been found on occasion with reversed sex ratio.

9:15 SPRING ECOLOGY OF CLADOCERA IN DIKED LAKE ERIE WETLANDS
Terry Z. Riley and Theodore A. Bookhout
Ohio Cooperative Fish and Wildlife Research Unit, 1735 Neil Avenue, Columbus, OH 43210

The objective of this study was to determine cladoceran response to early spring water-level manipulation in nodding smartweed (Polygonum lapathifolium) wetlands. Experimental smartweed wetlands were partially drained in early April 1986, 1987, and 1988, to a depth of approximately 30 cm. Control smartweed wetland water levels were not lowered, but water levels in experimental and control wetlands fluctuated with evaporation and precipitation. Samples were collected weekly from initiation of drawdown through mid-June or earlier if all surface water was gone. Samples were collected in the water column, on the surfaces of smartweed leaves and in the benthos. Cladoceran abundance was negatively correlated with water depth ($P<0.05$), and was significantly higher by early May in experimental wetlands than in control wetlands. A rapid decline in cladoceran abundance in experimental and control wetlands occurred in mid- to late-May. Early spring water-level reduction improves conditions necessary for rapid increases in cladoceran abundances.

9:30 TEMPERATURE AND HUMIDITY REACTIONS OF PORCELLIO SCABER LATREILLE, 1804 (CRUSTACEA: ISOPODA: ONISCOIDEA).
Roger L. Lane, Kent State University, Ashtabula Campus, Ashtabula, OH 44004

Specimens of Porcellio scaber Latreille, 1804 were presented a choice of 10% and 60% humidity conditions. The choice chambers were maintained at one of four temperatures (20° C, 15° C, 10° C, or 5° C) and under either light or dark conditions. At all temperatures, in the light and in darkness, the more humid environment was preferred. However, at 15° C and in the light, when compared to the other temperature situations in the light, a significantly fewer number chose the higher humidity. At 20° C only was there a significant difference in the number of animals choosing the higher humidity in light vs. dark, with light being preferred. Under dark conditions, a significantly greater number chose the higher humidity at 10° C and 5° C. Although more animals chose higher humidity at 10° C and 5° C in the dark, as opposed to in the light at these temperatures, it was not a statistically significant difference. These choices or preferences represent advantageous reactions in terms of foraging and protection.

9:45 ADAPTIVE RADIATION IN SNAIL-KILLING FLIES OF THE GENUS TETANOCERA (DIPTERA: SCIOMYZIDAE).
B. A. Foote, Department of Biological Sciences Kent State University, Kent, OH 44242.

The genus Tetanocera contains 30 Nearctic species whose larvae attack a variety of gastropod prey. The range of feeding habits in this one genus nearly equals the spectrum of feeding behavior reported for the entire family Sciomyzidae. Nearly half of the species are predators of aquatic pulmonate snails, 3 species attack aquatic snails stranded by dropping water levels, 4 species prey on wetland snails belonging to the family Succineidae, 1 species attacks woodland snails, and 3 species prey on slugs. The primitive feeding habit, based on out-group comparisons, is that of attacking aquatic snails at the water surface, whereas the remaining feeding habits represent specialized radiations. Shifts into more terrestrial habitats has resulted in greater host specificty, more parasitoid feeding habits, and reduction in number of prey killed by individual larvae. Modifications of larval morphology have accompanied the radiations into more specialized trophic niches.

10:00 ALTERATION OF SEX CHARACTERISTICS IN PARASITIZED MIDGES. J.H. Hubschman and M.A. Stack, Department of Biological Sciences, Wright State University, Dayton, Ohio 45435

The term "intersex" has been applied to adult midges whose secondary sex characteristics have been altered as a result of infestation by mermithid nematodes. We have studied the relationship of Limnomermis bathybia (Nematoda: Mermithidae) to Chironomus decorus (Diptera: Chironomidae) in Western Lake Erie. We examined approximately 21,000 adult midges of which about 8000 were parasitized. Female midges that contain Limnomermis bathybia exhibit 1) a fused ninth sternite; 2) a loss of the genital opening; and 3) a loss of spermathecae. Parasitized male midges exhibit 1) a modification of the normally elongate abdominal segments to a shortened, squared shape; 2) a loss of long plumose antennae by short non-plumose antennae; 3) widening of the wings characteristic of females and; 4) formation of paired bristle pads on the eighth sternite characteristic of female midges. We found no instance of parasitized female midges exhibiting male characteristics.

10:15 PATHOGENESIS AND RESISTANCE TO PSOROPTES OVIS (ACARI: PSOROPTIDAE) ON HEREFORD CATTLE. Paul C. Stromberg and Frank S. Guillot, Department of Veterinary Pathobiology, The Ohio State University, Columbus, Ohio and USDA Knipling-Bushland Livestock Insects Laboratory, Kerrville, Texas.

Psoroptes ovis is a non-burrowing mite that causes dermatitis and reduced performance in feedlot steers. Naive cattle develop a progressive exudative dermatitis with a thick scab which may cover 100% of the body surface. Cattle develop acquired resistance which is expressed as less extensive dermatitis and lower population densities of mites. Female mites lay approximately half the number of eggs on resistant cattle as on susceptible cattle. Infested cattle develop a moderate anemia and marked neutropenia which may result in secondary opportunistic bacterial infection and death. Bone marrow of infested cattle is hyperproliferative and the scab over the skin lesions contains numerous neutrophils indicating the neutropenia is caused by excessive efflux into the scab. Clinical disease is induced by microulceration of the epidermis by actively feeding mites and is unrelated to microorganisms in the serum-rich scab. Neutrophil efflux occurs through these ulcers. The abundance of degranulating mast cells associated with the dermatitis implicates immediate hypersensitivity as the underlying pathogenic mechanism. Death of mites following treatment results in rapid healing of skin, resolution of neutropenia, anemia and other clinical abnormalities.

SECTION A. Zoology in A227
Second Morning 9:00 a.m.
Saturday, April 29, 1989
Ted Cavender, Presiding

9:00 BRAIN ACETYLCHOLINESTERASE INHIBITION BY MALATHION IN BLUEGILL SUNFISH LEPOMIS MACROCHIRUS Chelliah R. Richmonds and Hiran M. Dutta, Department of Biological Sciences, Kent State University, Kent, Ohio 44242

Effect of a short term exposure of bluegills to different concentrations of malathion was studied in this investigation. Acetylcholinesterase activity was estimated according to the method of Ellman et al., (1961). Bluegills were exposed to 0.002, 0.004, 0.008, 0.016, 0.032 and 0.048 ppm malathion for a period of 24 hours. When compared with control animals, the mean per cent acetylcholinesterase activity after exposure for these different exposure concentrations was found to be 98.76, 91.65, 78.90, 36.36, 24.45 and 14.69 respectively. Bluegills showed hyperactivity at a concentration of 0.008 ppm. At higher concentrations the fish became sluggish and when the duration of exposure was extended beyond 24 hours, about 50% of them died between 72 and 96 hours at a concentration of 0.048 ppm. The reduction in the level of acetylcholinesterase activity is one of the major causes of death.

9:15 ARCHAEOLOGICAL SITES: A WINDOW TO THE PAST FOR THE LAKE ERIE BASIN FISH FAUNA. Ted M. Cavender, Museum of Zoology, The Ohio State University, Columbus, Ohio 43210.

Archaeological excavations in northern Ohio have recovered fish remains from midden and garbage pit sites (AD 750-1650) that should provide considerable information on the original composition and abundance of the Lake Erie basin fish fauna. Amerinds utilized for food a majority of the larger fish species found in the moving water habitats of the Maumee, Portage, Sandusky and Huron Rivers and also in the Lake Erie near shore and onshore (wetland) habitats. In work completed thus far, the following fish species have been identified: lake sturgeon, longnose gar, bowfin, mooneye, cisco, northern pike, muskellunge, silver chub, golden shiner, quillback, longnose sucker, white sucker, hogsucker, spotted sucker, silver redhorse, river redhorse, black redhorse, golden redhorse, shorthead redhorse, greater redhorse, black bullhead, yellow bullhead, brown bullhead, channel catfish, stonecat, white bass, rock bass, pumpkinseed, bluegill, smallmouth bass, largemouth bass, yellow perch, sauger ?, walleye, and freshwater drum.

Absent from excavation sites are the gizzard shad, buffalo fishes (Ictiobus sp.) and the paddlefish. This negative evidence tends to support the idea that these species were exceedingly rare in Lake Erie or introduced there in historical times. The lack of black and white crappie (Pomoxis) is more difficult to explain. River redhorse from Indian Island suggest this species was found in Lake Erie.

9:30 PHYLETIC ANALYSIS OF AMERICAN CYPRINID SCALES MILES M. COBURN and Ted M. Cavender, John Carroll U., University Hts. OH 44118 and Ohio State U., Museum of Zoology, Columbus OH 43210.

When scales are used as a source of characters for phylogenetic analysis a large number of taxa can be examined and compared in a relatively short time. A photographic survey of scales from 250+ species of American cyprinids and 100+ species of Palaearctic cyprinids and cyprinoid outgroups suggest American cyprinids are monophyletic. Shared derived states are: a basal focus; sinuous posterior radii; enlarged and irregular apical ridges; no basal or lateral radii; scales thinly ossified typically with perifocal resorption of bone; circular ridges deposited in a distinctive pattern characteristic of most taxa. Phyletic lineages include two major clades within Notropis, a Columbia basin group of Richardsonius, Oregonichthys, Mylocheilus, and Clinostomus as sister to Notropis; a chub clade in part composed of Semotilus, Couesius, Campostoma, Nocomis, and Exoglossum; a Phoxinus lineage; a western clade consisting of a basal grouping of coastal taxa centered in California, and a more derived group extending from the Great Basin to central Mexico including Relictus, Eremichthys, Rhinichthys, Moapa, the plagopterins, and Algansea, whose scales have basal and lateral radii, and circuli that are convex to the focus at the boundary of the lateral and apical fields. Notemigonus has character states placing it unambiguously with Eurasian leuciscines.

9:45 REGENERATION OF THE ANDROGENIC GLAND AND CONTROL OF MALE REPRODUCTIVE FORM IN THE CRAYFISH ORCONECTES IMMUNIS.
Irene L. Katzan and Thomas C. Jegla
Dept. of Biology, Kenyon College, Gambier, OH 43022

The androgenic gland controls the primary and secondary sex characteristics of male crayfish. Seasonal changes in the morphology of the androgenic gland have been correlated with reproductive form. The gland is large and healthy with little connective tissue in animals recently molted to Form I and it is small and degenerate in individuals recently molted to Form II. If androgenic glands are involved in maleness and crayfish survive for more than one year, which has been shown in this study, then androgenic glands must regenerate. This hypothesis was tested by removing one gland from 86 crayfish which had recently molted to Form II and after every 10 days taking out the remaining gland from 6 animals. The glands were sectioned and embedded in paraffin to prepare them for microscopic observation. Preliminary analysis suggests that the glands do indeed regenerate. To assess the extent of androgenic control over molting form, molting was induced in 23 crayfish by destalking them after both of their glands had been removed to see into what form they would molt. One-third of the androgenic-glandless crayfish destalked while still in Form II molted to Form I. All crayfish with their androgenic glands removed that underwent a natural summer molt molted to Form I.

10:00 DISTRIBUTION OF THE CRAYFISH GENUS ORCONECTES (DECAPODA:CAMBARIDAE) IN WEST VIRGINIA. G. Whitney Stocker, 13773 Bodle Rd., NE, Newark, Ohio, 43055 and Raymond F. Jezerinac, Department of Zoology, The Ohio State University at Newark, Newark, Ohio 43055.

During the summer of 1988, a survey of the crayfishes of West Virginia was undertaken. One hundred sixty nine of the collections made contained crayfishes of the genus Orconectes. Specimens were also examined from the Crayfish Museum of The Ohio State University at Newark and Marshall University, Huntington, West Virginia. Orconectes obscurus was captured from the Ohio, Tygart Valley, Cheat, Potomac, Greenbrier, Williams, and New River basins. Orconectes sanbornii was captured from Ohio River tributaries south of Fishing Creek, lower Guyandot, Kanawha, New, Greenbrier, Elk, Coal, and Little Kanawha River basins. Orconectes sp. was captured from the Big Sandy, upper Guyandot, upper Coal, Elk, Greenbrier, East, Bluestone, New, and James River basins. Orconectes limosus was found at one site in the Potomac River basin in Berkeley County. Orconectes virilis was captured from the Potomac, Greenbrier, New, and Kanawha River basins. Orconectes rusticus was found in the Kanawha River and Fourpole Creek basins in Caball and Kanawha Counties. The latter two species probably have been introduced.

10:15 DISTRIBUTION OF THE STREAM CRAYFISHES OF THE GENUS CAMBARUS (DECAPODA:CAMBARIDAE) IN WEST VIRGINIA. Raymond F. Jezerinac, Department of Zoology, The Ohio State University at Newark, Newark, Ohio 43055 and G. Whitney Stocker, 13773 Bodle Rd., NE, Newark, Ohio, 43055

During the summer of 1988, a survey of the crayfishes of West Virginia was undertaken. Specimens were also examined from the Crayfish Museum of The Ohio State University at Newark and Marshall University, Huntington, West Virginia. Cambarus (C.) bartonii bartonii was only captured from the Potomac River drainage. Cambarus (C.) b. carinirostris was found in the Monongahela, upper Kanawha, upper Little Kanawha, and Ohio River tributaries north of, and including, Fish Creek. Cambarus (C.) b. cavatus occurred in streams of the Ohio River basin south of Fish Creek. Cambarus (P.) robustus has a distribution similar to C. (C.) b. cavatus. Cambarus (C.) sciotensis occurred in the Big Sandy, Guyandot, and upper New River drainages. Cambarus (H.) longulus, a new state record, occupied the James River drainage in Monroe County. Cambarus (H.) chasmodactylus was found in the Greenbrier River and headwaters of the Elk River. The latter locality is a new drainage record for the species. Cambarus (P.) nerterius, a species associated with cave streams, was captured in the only cave investigated in Greenbrier County. Cambarus (P.) veteranus, previousy reported from the Guyandot River drainage, was not found.

10:30 DISTRIBUTION OF THE PRIMARY BURROWING CRAYFISHES OF THE GENERA FALLICAMBARUS AND CAMBARUS (DECAPODA: CAMBARIDAE) IN WEST VIRGINIA. Raymond F. Jezerinac, Department of Zoology, The Ohio State University at Newark, Newark, Ohio 43055 and G. Whitney Stocker, 13773 Bodle Rd., NE, Newark, Ohio, 43055

During the summer of 1988, a survey of the crayfishes of West Virginia was undertaken. Specimens were also examined from the Crayfish Museum of The Ohio State University at Newark and Marshall University, Huntington, West Virginia. Fallicambarus (C.) fodiens was found at a total of two sites along the Ohio River floodplain in Mason and Cabell counties. Cambarus (L.) diogenes was captured at 33 sites on the Appalachan Plateau. Cambarus (J.) monongalensis occurred at 43 sites. These sites were north of the Elk

River on the Appalachian Plateau and at high elevations in the Appalachian Mountains. Cambarus (J.) dubius, captured at 73 sites, occupied the Appalachian Plateau and the valley floors in the Appalachian Mountains.

SECTION A. Zoology in A231
Only Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Ted Cavender, Presiding

2:00 COYOTE/DOG DAMAGE TO OHIO LIVESTOCK.

Linda S. Fechtel and Bonnie L. Lamvermeyer
Department of Biology, Denison University, Granville, Ohio 43023.

The purpose of this study was to evaluate predation on Ohio livestock by coyotes during the initial two year Ohio Department of Agriculture indemnity payments program. Initial data was obtained from coyote indemnity claim reports filed in 1987-89. Two different mail surveys provided additional information. The first questionnaire was sent to 123 livestock owners who had claims paid by the Ohio Department of Agriculture. The second questionnaire was sent to all 88 county dog wardens. Statewide claims paid amounted to over $40,000. Sheep were the most frequently killed livestock (65% of those reported)followed by poultry (31%) and calves (4%). Controls most often used were shooting, trapping, playing radios in barns, and using enclosures. Forty-six percent of the producers said that coyote predation has been a problem for 1-3 years. According to the majority of the dog wardens, the coyote predation problem began within the past three and a half years. Dog damage (payable from dog license monies) amounted to over $71,000 in 1985, over $57,000 in 1986, and over $87,000 in 1987.

2:15 THE STATUS AND DISTRIBUION OF THE HELLBENDER, CRYPTOBRANCHUS ALLEGANIENSIS, IN OHIO

Pfingsten, Ralph A.
347 Pineview Cir., Berea, OH 44017

From September, 1985 to November, 1988, The Ohio Division of Wildlife funded this study to determine the status and distribution of the hellbender, Cryptobranchus alleganiensis in Ohio. Almost all streams with a watershed over 100 square miles in the Ohio River drainage were checked. Over 27,000 miles were travelled and over 2000 hours were spent the field. Animals were captured by turning large rock slabs in riffle areas less than 2 feet deep. Each animal was measured and tagged with a Floy T-tag. 112 animals were tagged over the three year period. Animals were found in 4 totally new watersheds and from 3 streams where unconfirmed reports existed. Four previously known populations were confirmed as still viable and 7 new populations were found in streams already known to harbour hellbenders. Several of these findings were the result of the unique opportunity provided by the drought of 1988. A mark-recapture study was initiated to estimate population density. However, there were too few recaptures to make an estimate. A state record size animal (male, TL=63cm) was found as well as the first known complete nest. No larva were found. With the exception of Scioto-Brush Creek, no animals were found west of the Scioto River or in the Ohio River. Less than 200 animals are recorded in the history of the state. Endangered status is recommended.

2:45 SPRING FEEDING ECOLOGY OF TEAL ON THE LAKE ERIE MARSHES

Deidre M. DeRoia and Theodore A. Bookhout, Ohio Cooperative Fish and Wildlife Research Unit, 1735 Neil Avenue, Columbus, Ohio 43210

Duck production on the Lake Erie marshes has been greatly reduced by loss of wetlands through drainage. Knowledge of the nutritional and environmental needs of waterfowl might lead to better habitat management practices for breeding waterfowl. Feeding ecology of blue-winged teal (Anas discors, BWT) and green-winged teal (A. crecca, GWT) was studied on Lake Erie marshes during April and May, 1987-88. Diets were determined by examination of esophageal contents. Spring diets of both species (n = 39 BWT, 15 GWT) were dominated by invertebrates. BWT consumed predominantly chironomid larvae (89.1% by volume), physid snails (3.6%) and corixids (1.4%). GWT selected chironomid larvae (98.8%), cladocerans (0.4%) and isopods (0.4%). BWT preferred deeper water (x = 21 cm) than did GWT (x = 12 cm). BWT teal feeding sites were dominated by Japanese millet (Echinochloa frumentacea) and cattail (Typha spp.); GWT fed in cattail and bulrush (Scirpus spp.) Preliminary analysis indicates chironomids might be less abundant in the water column than in teal diets.

3:00 STRUCTURAL VARIATIONS IN THE DISTRESS CALL OF THE NORTHERN CARDINAL (Cardinalis cardinalis)

Vince N. LaPolla, James L. Ingold,& David R. Osborne Department of Zoology, Miami University, Oxford, Ohio 45056

Variations in the Northern cardinal (Cardinalis cardinalis) distress call were measured using sonagraphic analysis. Six call parameters were analysed by sex, age, and season. A direct relationship between the number of harmonics per call and frequency range was found for all calls. Female calls had higher base and peak frequencies and a wider frequency range than male calls. Immature calls were found to utilize more harmonics, faster call rates, and narrower frequency ranges; only immature malesand not females used lower peak frequencies. Spring (adult male) calls were structurally different from fall (adult and immature male) calls in 67% of the parameters. Due to significant differences between male and female calls, males show greater altruism during brooding, while females show greater altruism year round. Distress calls appear to be fundementally innate, while structural variability is learned.

3:15 BIOLOGY AND IMMATURE STAGES OF LEIOMYZA LAEVIGATA (DIPTERA: ASTEIIDAE), A CONSUMER OF MUSHROOMS

Britt Bunyard and B. A. Foote
Dept. of Biological Sciences, Kent State University
Kent, Ohio 44240

Information is presented on the life cycle and larval feeding habits of Leiomyza laevigata Meigen, a Holarctic species of the dipteran family Asteiidae. Adults were reared from Lepiota rachodes (Vitt.) Quél. [Agaricaceae], a common fleshy fungi. This is the first description of the larval stages of any of the approximately 100 species of Asteiidae worldwide.

3:30 LIFE HISTORY AND TAXONOMY OF SHORE FLIES OF THE GENERA NOSTIMA, PHILYGRIA, AND LEMNAPHILA FOUND IN OHIO (DIPTERA: EPHYDRIDAE).

James F. Edmiston, OFM, Department of Biological Sciences, Kent State University, Kent, OH 44240

Minute shore flies of the genera Nostima, Philygria, and Lemnaphila found in Ohio represent part of a comprehensive revision of the Tribe Philygriini (Diptera: Ephydridae). Philygria debilis (Loew), Nostima picta (Fallen), and Nostima approximata (Sturtevant and Wheeler) feed upon blue-green algae; Lemnaphila scotlandae (Cresson) mine duckweed (Lemna). Morphological, behavioral, and life history characteristics of these genera were compared. Phylogenetic and taxonomic analysis indicates the close relationship between Nostima and Philygria. Lemnaphila is more closely related to the genus Hydrellia.

4:00 EFFECTS OF FORSKOLIN AND 1,9-DIDEOXYFORSKOLIN ON INSECT ECDYSONE 20-MONOOXYGENASE ACTIVITY.

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

Previous studies have demonstrated that forskolin, a plant terpenoid and activator of adenylate cyclase, can affect ecdysteroid biosynthesis in insects. Accordingly, it was of interest to examine the effects of forskolin and its inactive derivative 1,9-dideoxyforskolin on insect ecdysone 20-monooxygenase (e-20-m) systems, the cytochrome P-450 dependent steroid hydroxylases which convert ecdysone to the more active molting hormone 20-hydroxyecdysone. Homogenate fractions of wandering stage larvae of Drosophila melanogaster or fat body or midgut from last instar larvae of Manduca sexta were incubated with radiolabelled ecdysone and increasing concentrations (0.0001 to 1 mM) of forskolin or 1,9-dideoxyforskolin and the e-20-m activity quantified by radioassay. Both terpenoids were found to elicit dose-dependent inhibition of e-20-m activity in all the insect preparations (I_{50}'s = 0.1 to 0.01 mM). It would appear, therefore, that the forskolin inhibition of ecdysteroid synthesis may be independent of cyclic AMP mediation and more a property of the shared stereochemistry of the forskolin and 1,9-dideoxyforskolin nucleus. Supported by NIH (AI 20604), OBOR (Ohio), FRC (BGSU) and Sigma Xi Grants.

4:15 THE OHIO SURVEY OF LEPIDOPTERA. Eric H. Metzler, Ohio Department of Natural Resources, Fountain Square, Columbus, Ohio 43229.

The Ohio Lepidopterists initiated the Ohio Survey of Lepidoptera in 1984. In 1985, The Ohio Department of Natural Resources Division of Wildlife contracted with The Ohio Lepidopterists to compile data on all Lepidoptera species in Ohio. Nearly 3,000 species of Lepidoptera are expected from Ohio. The multi-year project includes gathering all specimen records from collections, making collecting trips for additional data, starting a reference collection of Ohio Lepidoptera, and publishing survey information. The survey is completing its third year of the grant. Over 50,000 Ohio specimen records are included in the database. The butterflies are nearly done; statewide coverage is excellent. Nine species of butterflies are recorded from every county. Three superfamilies of moths (Bombycoidea, Sphingoidea and Noctuoidea) are nearly complete. The rest of the moth groups remain to be done. Complete label data are recorded. Locations are recorded to the nearest 1/2 mile where possible. The data permit excellent biogeographic analysis of Ohio; preliminary investigation shows congruence with geologic and phytogeographic regions. The data can be used in the analysis of important issues: The status of species as endangered or threatened can be substantiated. Habitats deserving protection can be identified. Threats can be identified. Conservation tactics can be proposed. Land management needs are highlighted.

SECTION A. Zoology
Poster Session in Theater Lobby
Saturday, April 29, 1989

Board A @ 9:00 a.m. YIELD REDUCTION IN GRAPE PHYLLOXERA, DAKTULOSPHAIRA VITIFOLIAE (FITCH) INFESTED SEYVAL GRAPES. Murdick J. McLeod and Roger N. Williams, Dept. of Entomology, Ohio Agricultural Research and Development Center, Ohio State University, Wooster, OH 44691, U.S.A.

Occurrence of the foliar form of the grape phylloxera, Daktulosphaira vitifoliae (Fitch) has increased with the widespread planting of French hybrid cultivars of grapes in Ohio, but the economic impact of foliar phylloxera has not been well studied. Experiments were initiated in 1988 to define its impact on selected yield parameters of a three-year old Seyval vineyard. Individual shoots on the grape vine were artificially infested with phylloxera infested leaves from greenhouse colonies. Treatments consisted of shoots infested at five different growth stages and an untreated check arranged in a randomized complete block with 20 replications per treatment. Each shoot was cluster-thinned prior to bloom to one cluster per shoot. Grapes were harvested 14 September 1988 and measurements were taken on cluster weight, number of berries per cluster, mean berry weight, and % Brix. Those shoots infested 7 and 14 days after bloom had significantly lower cluster weight than the untreated check.

Board B @ 9:00 a.m. ILLUSTRATIONS AND DESCRIPTIONS FOR IDENTIFICATION OF LARVAE OF STELIDOTA (COLEOPTERA: NITIDULIDAE) FOUND IN NORTH AMERICA, NORTH OF MEXICO Roger N. Williams, Chengwang Peng, Dan S. Fickle, and Jimmy R. Galford, Department of Entomology, Ohio State University, Ohio Agricultural Research and Development Center, Wooster, OH 44691, U.S.A.

The genus Stelidota Erichson (Coleoptera: Nitidulidae) is comprised of ca. 50 species worldwide, of which only three species are present North of Mexico; Stelidota geminata (Say), S. ferruginea Reitter, and S. octomaculata (Say). So far, very little effort has been made to identify the larvae of this genus. S. geminata is the only member of the genus whose larval stage has been studied. In this paper, mature larvae of the three species are illustrated and described. The following character differences were found between the three species and may be used to identify them: pronotum color, characters of the mandible, and setae on the mesothoracic and third abdominal segment. A key to mature larvae of the three species of Stelidota is given.

Board C @ 9:00 a.m. OCCURRENCE AND CONTROL OF VITACEA POLISTIFORMIS (HARRIS) (LEPIDOPTERA: SESIIDAE) IN OHIO VINEYARDS. Roger N. Willians and Jozef L. W. Keularts. Department of Entomology, Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, Ohio 44691.

The grape root borer, Vitacea polistiformis, is a grape pest of increasing importance in Ohio. Pheromone trapping of male moths in several counties resulted in catches primarily in the southern part of the State. Despite catches in nearby counties in Michigan, no males were caught in traps in Northwestern Ohio. During the 1988 season fewer moths were caught than in the previous two seasons. The first peak occurrence was about two weeks earlier in 1986 and 1987 than in the 1988 season.
As part of a cooperative project an attempt was made to evaluate the use of a synthetic pheromone in hindering males from finding females. In two small vineyards large numbers of rope tie pheromone dispensers were placed. Pheromone traps placed in these and in two control vineyards were checked regularly for caught male moths. No males were trapped in the treated vineyards while numerous moths were caught in the untreated ones. Because the grape root borer has a two year life cycle it is too early to know how effective this method of control would be.

Board D @ 9:00 a.m. A SURVEY OF DIGESTIVE DISACCHARIDASES IN THE POLYCHEATE, *NEREIS VIRENS*. Natalie Schoch King, Zoology Department, Miami University, Oxford, Ohio 45056

A survey of the digestive tract of *N. virens* for the presence of the disaccharidases--trehalase, maltase, sucrase, lactase, and cellobiase--was performed. The highest activities for all enzymes were found in intestinal tissue homogenates. The activities in esophageal homogenates were low; cavital activities were minimal. Centrifugation of fresh or frozen intestinal homogenates at 105,000 x g for 1 hour resulted in 80-95 % of the activities remaining in the supernatant indicating that these enzymes are part of a soluble fraction of intestinal tissue. The effect of pH on activities of these enzymes was also determined. Optima for all disaccharidases were near pH 6. Maltase had an additional peak near pH 4. It seems likely that the acid optimum of maltase is due to a lysosomal acid hydrolase; the enzymes with optima near pH 6 are probably not lysosomal. These digestive disaccharidases are possibly associated with the glycocalyx of intestinal cells. Because these enzymes are soluble after simple homogenization, they are ideal enzymes for further characterization and purification.

SECTION B. Plant Sciences in A231
First Morning 9:00 a.m.
Saturday, April 29, 1989
Hugo Valdebenito, Presiding

9:00 CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATERS IN WESTERN OHIO FENS. Barbara K. Andreas and Gary R. Bryan. Div. Natural Areas and Health Careers, Cuyahoga Community College, Cleveland, Ohio 44122.

Seven chemical and physical characteristics were examined in water samples taken between May - October, 1986, from five western Ohio peatlands. These are Ankeney Fen, Greene Co.; Liberty Fen, Champaign Co.; Silver Lake Fen, Miami Co.; and Springfield Fen and Prairie Road Fen, Clark Co. Selection of these peatlands was based on their floristic composition and these areas have been referred to as "prairie" fens. pH ranged from 7.45 (Ankeney Fen) to 7.79 (Springfield Fen); conductivity, from 629 μmhos/cm (Ankeney Fen) to 735 μmhos/cm (Liberty Fen); calcium ions, from 52.9 mg/L (Springfield Fen) to 64.0 mg/L (Liberty Fen); and magnesium, from 32.4 mg/L (Prairie Road Fen) to 34.2 mg/L (Ankeney Fen). When comparing these results to characteristics examined in 1985 for eastern Ohio peatlands, only Jackson Fen, Stark County, had values similar to those of the western Ohio peatlands. Based on water chemistry characteristics, Ohio peatlands examined to date fall into three categories: strongly minerotrophic, weakly minerotrophic and semi-ombrotrophic. Based on vascular plants, floristic similarity was determined for each pair of western Ohio peatlands. These values ranged from 0.80 (Liberty Fen to Springfield Fen) to 0.90 (Springfield Fen to Prairie Road Fen).

9:15 DISTURBANCE PATTERN AND OAK REGENERATION IN TWO HARDWOOD FORESTS IN OHIO. Do-Soon Cho and Ralph E.J. Boerner, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Many reports say that oaks are decreasing and that sugar maple and beech are increasing in abundance in Midwestern forests. We hypothesized that this vegetational change was caused by the change in the disturbance regime after the European settlement to a current dominance of small scale disturbances in this region. To verify this, we examined the disturbance pattern and the oak regeneration in gaps and under closed canopies in Goll Woods State Nature Preserve, north-western Ohio, and Sears-Carmean Woods State Nature Preserves, north-central Ohio. Canopy gap area and extended gap area in Goll Woods was 2.8% and 9.1%, respectively, and those in Sears-Carmean Woods was 2.9% and 11.6%, respectively. Oaks were abundant in canopy and seedling size classes, but were almost absent in large sapling size class (2.5 - 10 cm dbh). However, there was no significant difference in the oak regeneration between gap and non-gap areas. Basswood was the most frequent gap maker in Goll Woods. In contrast, sugar maple, beech and oaks were the most frequent gap makers in Sears-Carmean Woods.

9:30 CONTROLS ON RESPONSES OF FOREST PLANTS TO MYCORRHIZAL INFECTION. I. VARIATIONS IN P UPTAKE EFFICIENCY AMONG LOCAL MYCORRHIZAL STRAINS. Ralph E.J. Boerner, Department of Botany, The Ohio State University, Columbus, OH 43210.

To assess the level of variation in relative P uptake efficiency of vesicular-arbuscular mycorrhizal (VAM) strains from different forest sites, we cultured inoculum from roots and rhizosphere soil of herbs from four Ohio forest types whose soils varied from <4.0 to >5.6 in A horizon pH and >3 fold in extractable P. Geranium robertianum plants were then inoculated with one of these strains, grown in sand culture for eight weeks in a greenhouse and fed with either low P or high P nutrient solutions. Plants given inocula from the lower fertility sites consistently outgrew plants given inocula from higher fertility sites and plants given non-VAM inoculum, regardless of P level. Residual available P levels remaining in the soil after the plants were harvested were significantly lower in soils from VAM plants than non-VAM plants at both P levels, and significantly lower in soils from VAM plants given inocula from the lower fertility sites than plants given inocula from higher fertility sites at low P levels. We also present data on absolute P and N uptake and relative uptake efficiency.

9:45 CONTROLS ON RESPONSES OF FOREST PLANTS TO MYCORRHIZAL INFECTION. II. EFFECTS OF BELOWGROUND GRAZING BY COLLEMBOLA ON GROWTH AND P UPTAKE. Kathleen K. Harris and Ralph E.J. Boerner, Department of Botany, The Ohio State University, Columbus, OH 43210.

Because many taxa of soil micro- and mesofauna graze on plant roots, fungal hyphae, and soil organic matter particles, we hypothesized that increasing the density of a generalist grazing collembolan (Folsioma candida) would affect plant growth either by direct root loss or indirectly through the loss of external VAM hyphae responsible for P uptake, and that this effect would vary inversely with soil organic matter. We grew Geranium robertianum plants in either sand/perlite or organic-rich greenhouse soil mix for eight weeks and with initial collembolan densities ranging from 0 to 25 collembola per 10 cm pot. Total plant growth and shoot mass were significantly lower in pots which had 15 or 25 collembola than in pots with no collembola, but 5 collembola per pot did not significantly affect growth. Plants grown in the presence of collembola at any density had higher root:shoot ratio than control plants. Overall, plants grown in sand were larger, had a higher root:shoot ratio, and had an average of 30% higher tissue P concentration than plants in soil mix. Collembolan density did not affect P concentrations; therefore, within a soil type, P uptake paralleled total plant mass.

10:00 EFFECTS OF OZONE OR SULFUR DIOXIDE ON PITCH PINE SEEDLINGS. Amy J. Scherzer, Dept. of Botany, The Ohio State University, Columbus, OH 43210

Pitch pine (Pinus rigida Mill.) seedlings were fumigated with O_3 or SO_2 to determine their effects on growth and symptom expression. Seedlings fumigated twice with 0.20 ppm O_3 for 4 hr at age 14 wk had significantly greater shoot mass than those fumigated with 0.30 ppm; 0, 0.08, 0.10 and 0.15 ppm were intermediate and not significantly different. Root starch content decreased with increasing O_3 with controls having significantly more starch than the 0.15, 0.20, and 0.30 ppm O_3 treatments. Root starch in seedlings treated with 0.20, 0.50, 0.60, 0.70, and 0.90 ppm SO_2 was significantly lower than in the controls. Seedlings from 6 genetic families fumigated for 5 wk starting at age 6 wk differed in direction and degree of growth response when exposed to 0.08 or 0.30 ppm O_3. Significant differences existed among families in needle, shoot, and total mass, but no differences were found among O_3 treatments within a family. Visible injury consisted of light chlorotic mottle on oldest needles, and differences among families were apparent following treatments with 0.40 ppm O_3. Discriminant function analysis indicated that growth responses were indistinguishable among families receiving no O_3; however, treated seedlings could be classified based on various height and/or shoot measurements. I conclude that some pitch pine families are more sensitive to O_3 than others.

10:15 THE DIATOM FLORA OF SUBAERIAL HABITATS IN NORTHERN ARIZONA. John Vaccariello and Jeffrey R. Johansen. Department of Biology, John Carroll University, University Heights, OH 44118.

Diatoms of drip walls and waterfalls in the Navajo sandstone canyonlands of northern Arizona were identified and quantified. The subaerial diatom floras in this study were compared to published wet wall floras from northern Arizona, Utah, and Hawaii. We found that there were a few diatom species indicative of wet wall conditions that occurred in almost all of the sites. Amount of moisture was a more critical factor in species distribution than substrate.

10:30 ALLELOPATHIC EFFECTS OF ARRHENATHERUM ELATIUS SUBSP. BULBOSUS (POACEAE) ON THE VEGETATION OF THE PARQUE BOTANICO HUALPEN, CONCEPCION, CHILE. Jorge E. Arriagada, Department of Botany, The Ohio State University, 1735 Neil Ave., Columbus, Ohio 43210.

Arrhenatherum elatius, an introduced forage species in Southern Chile, has become an undesirable weed and has expanded mainly where rape, wheat and oats are cultivated. Such a situation has occurred on the prairie of Parque Hualpen, where A. elatius currently covers about 70% of the surface. This research was designed to test the hypothesis that the rapid expansion exhibited by A. elatius is due mainly to production of chemical inhibitors and that the resulting vegetational pattern is primarily due to allelopathy. The two main objectives were to test the inhibitory effect on the associated species using standard bioassays and to identify and quantify the allelopathic compounds. The extracts of A. elatius are significantly inhibitory. The analyses of the extracts indicate high concentrations of ferulic, chlorogenic, p-coumaric and p-hydroxybenzoic acids.

10:45 POLLINATION DYNAMICS OF BUMBLEBEES (BOMBUS) AND PLANTS IN A SUBALPINE MEADOW COMMUNITY. Lazarus Walter Macior, Department of Biology, The Univ. of Akron, Akron, OH 44325.

Data collected over a 15-year period in Berkeley Park, Mt. Rainier, indicate a high degree of functional integration of Erythronium, Dodecatheon, Castilleja, Pedicularis, and Mimulus floral mechanisms with bumblebees, their prime pollinators. Anthesis corresponds to the emergence of specific pollinator castes. Erythronium and Dodecatheon are queen-pollinated, while Pedicularis and Mimulus are primarily worker-pollinated. Corolla reflectance coincides with the visual spectrum of pollinators. All flowers attractive to bumblebees include a strong blue reflectance visible to the insects. Depth of nectariferous corolla tubes is correlated with tongue length of nectar-foraging pollinator species. The long-tongued B. flavifrons is virtually the exclusive nectar-foraging pollinator of the deep-tubed Castilleja flower. In general, the abundance of Bombus species on plant species corresponds to the abundance of pollinator species in the area. B. flavifrons, B. melanopygus, and B. occidentalis are common, while B. bifarius, B. mixtus, and B. rufocinctus are uncommon. Analysis of corbicular pollen loads from foragers indicates a higher degree of fidelity (60%) in the queen caste than in workers (25%). The high degree of reproductive coordination between plants and their pollinators in the stressful but stable subalpine environment may result from intense natural selection.

SECTION B. Plant Sciences in A225 First Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
John J. Furlow, Presiding

2:00 MACROPHYTE SURVEY OF NORTHERN OHIO. James K. Bissell and Robert J. Bartolotta, The Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, OH 44106

Twenty-seven deep water habitats in northern Ohio were surveyed in 1988 for submersed and floating macrophytes to establish base line data on species diversity and abundance at each site. Voucher specimens were collected from each site. In most cases, selection of the sites was based upon the existence of historical or recent records of rare native Ohio macrophytes. The survey documented recent loss or decline of many of these species. Congress Lake in Stark and Portage Counties, Chippewa Lake in Medina County, and several natural, glacial lakes in Portage and Summit Counties were found to have low diversities of species when compared to historical data. Mud Lake in Williams County, Punderson Lake in Geauga County, Springfield Lake in Summit County, and Dollar, East and West Twin, and Stewart Lakes in Portage County had very high diversities of macrophytes. Noteworthy finds include Wolffia brasiliense from Ashtabula and Geauga Counties, a large population of Myriophyllum exalbescens from Summit County, rediscovery of a population of Potamogeton robbinsii at Stewart Lake in Portage County, and location of two presumed extirpated species in Portage County, Potamogeton friesii and Najas gracillima. This survey was funded in part by a Natural Areas and Preserves Tax Check-off Grant.

2:15 PODOSTEMUM CERATOPHYLLUM MICHX., A PLANT NEW TO OHIO. Beverly Danielson, Department of Botany, The Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, OH 44106.

Podostemum ceratophyllum was collected in the Grand River in Ashtabula Co. in August, 1986. No other records exist for the Great Lakes Drainage Basin. This discovery adds a new family, as well as a new genus, to the Ohio flora. Podostemum ceratophyllum is a temperate zone representative of the primarily tropical family Podostemaceae. Its range includes scattered sites in Central America and the West Indies, but it is concentrated along the Appalachian Mountains, with a northernmost site in New Brunswick and a disjunct population in the Ozarks. The nearest population to the Grand River site is 50 miles away in Mercer Co., Pennsylvania on the Shenango River (Ohio River drainage system). A most curious plant, Podostemum ceratophyllum grows submerged in rapidly moving water, adhering by pods to rock surfaces. It is probably overlooked because of its resemblance to the algae of the same habitat. Although abundant where it occurs, it is currently viewed as in jeopardy throughout the northeastern United States, where entire populations have disappeared with human disturbance to waterflow. The Grand River site was revisited in 1988, and Podostemum ceratophyllum was found to be extant. Several searches elsewhere in the Grand River have failed to produce additional sites.

2:30 TRIFOLIUM STOLONIFERUM (FABACEAE) REDISCOVERED IN OHIO. Allison W. Cusick, Division of Natural Areas & Preserves, ODNR, Fountain Sq., Columbus, OH 43224.

Trifolium stoloniferum Muhl. ex A. Eaton (running buffalo clover) is listed as a Federally Endangered species by the U.S. Fish & Wildlife Service. This clover formerly grew in eight states from West Virginia to Kansas. As of the spring of 1988, this species was confirmed extant at only five sites in Indiana, Kentucky and West Virginia. Trifolium stoloniferum was known historically from nine counties of southern Ohio, the last collection being in 1907 in Belmont County. The writer directed a team of seasonal botanists in an intensive search for running buffalo clover in southwest Ohio in 1988. A total of 250-270 plants were discovered at eight sites in Clermont, Hamilton and Warren counties. Population sizes range from 1 to ca 100 individuals. Trifolium stoloniferum seems limited to mesic sites in semishade where there is a pattern of longterm, moderate disturbance, such as mowing, trampling or grazing. The Division and landowners are working together to insure the continued survival of this rare species in Ohio.

2:45 THE OHIO DISTRIBUTION OF MAGNOLIA MACROPHYLLA MICHX. AND MAGNOLIA TRIPETALA L. James F. Burns, ODNR Division of Natural Areas & Preserves, Fountain Sq., Columbus, OH 43224

Magnolia macrophylla (Bigleaf Magnolia) and M. tripetala (Umbrella Magnolia) are small trees of the southeastern US. They often occur together as understory trees in mixed mesophytic forests of the southern portion of the Cumberland and Allegheny Plateaus. M. macrophylla occurs on mesic slopes of three deep valleys of Liberty Twp., Jackson County, Ohio. It is disjunct here by more than 100 miles from the nearest station in east-central Kentucky. It is listed as Endangered in Ohio. M. tripetala occurs in a few scattered stations in mesic valley bottoms and lower slopes in Hocking, Scioto and Vinton counties, but can be locally abundant in Liberty Twp., Jackson County. Southern Ohio is the extreme northwest edge of its total range. It is listed as Threatened in Ohio. These magnolias are classic examples of plants that migrated north into Ohio along the ancient Teays River corridor. Populations were then isolated to upland refugia by the formation of glacial Lake Tight. Relict populations remain isolated today. It is speculated that this is due mainly to soils and seed dispersal, but in local areas could be due to land use and cutting histories.

3:00 BOTANICAL CONTRIBUTIONS OF MRS. WILLIAM A. KELLERMAN

Ronald L. Stuckey, Department of Botany, The Ohio State University, Columbus, OH 43210

Stella Victoria (Dennis) Kellerman (1855-1936) was an active but relatively unknown botanist with many talents. As the wife of William Ashbrook Kellerman (1850-1908), first chairman of botany at The Ohio State University, she assisted him in many phases of his career. She prepared nearly 300 line drawings of plants for his grammar school textbook, Elements of Botany (1883), and meticulously copied the manuscript for the printer. Her own interest in botany involved the local floras of Kansas and Ohio, the morphological variations and evolution of leaves and flowers, and the culture of garden plants. Her interpretation of the morphology of the corn tassel has important implications for present-day thinking on the origin of this grass. She was particularly interested in leaf-variation of the tulip tree. She published 80 known papers in the professional scientific journals during the late 1880s and throughout the 1890s. These journals included Science, publications of the state scientific academies of Kansas and Ohio, and the popular horticultural magazines Meehan's Monthly and Vick's Illustrated Monthly Magazine. As a charter member of the Ohio Academy of Science, Mrs. Kellerman presented seven papers from 1892 to 1899. She served as vice-president of the Academy in 1894 and 1901.

3:15 EVOLUTION OF FLORAL MORPHOLOGY IN THE ENDEMIC HAWAIIAN GENUS CLERMONTIA (CAMPANULACEAE: LOBELIOIDEAE). Thomas G. Lammers, Department of Botany, Miami University, Oxford, OH 45056.

Clermontia Gaudich. is a genus of trees and shrubs endemic to the Hawaiian Islands. The classification of the genus was recently revised on the basis of floral morphology. Structural differences of the perianth, resulting from variation in the curvature of the tube, the posture and position of the lobes, and the relative lengths of tube and lobes, were used to divide the genus into six series. Species within a series are distinguished largely by differences in size, pigmentation, and presentation of the flowers. The observed differences in floral morphology may be the result of partitioning of pollinator resources. Clermontia species are pollinated by nectarivorous passerine birds. Typically, each series of Clermontia is represented in a given area by just one species. Thus, sympatric congeners differ significantly in floral morphology. The pronounced territoriality and short-term constancy of the birds could have promoted reproductive isolation of Clermontia populations via external mechanisms. As such, these birds have played a major role in their evolution.

3:30 SYSTEMATICS OF DESMANTHODIUM (COMPOSITAE, HELIANTHEAE). Tod F. Stuessy and J. Arriagada, Department of Botany, The Ohio State University, 1735 Neil Avenue, Columbus, Ohio 43210.

Desmanthodium is a genus of eight species distributed in Mexico and Central America. It is closely related to Clibadium of Central and Andean South America and Ichthyothere of Brazil. Species of all three genera have small flowering heads aggregated tightly into larger clusters. Desmanthodium differs in having each ray achene enclosed by a membranous saccate bract. Present studies reveal a new species from Chiapas, Mexico, that is sufficiently different to be regarded as a new subgenus with morphological tendencies toward Clibadium. The remaining seven species sort well into three sections: (1) D. lanceolatum, D. ovatum; (2) D. perfoliatum, D. tomentosum; and (3) D. fruticosum, D. guatemalense, D. hondurense. Within the latter section, D. fruticosum represents a separate series apart from the other two closely related taxa. Uniform chromosome numbers of n= 18 for three species in two sections sugget that change in chromosome number has not accompanied speciation within the genus.

3:45 EVOLUTION OF ERIGERON (COMPOSITAE) IN THE JUAN FERNANDEZ ISLANDS, CHILE. Hugo A. Valdebenito, Tod F. Stuessy, and Daniel J. Crawford. The Ohio State University, Columbus, OH 43210.

Four species of Erigeron are endemic to the Juan Fernandez Islands, Chile. Three are restricted to the younger island, Masafuera: E. luteoviridis, E. ingae, and E. rupicola. The fourth, E. fernandezianus, is found on Masafuera and on the older island, Masatierra. Phenetic, cladistic and flavonoid chemical analyses were used to determine the patterns of evolution among the endemic taxa. To understand relationships of the four endemic species of the genus to continental relatives, phenetic analyses were done with the island taxa and 19 species of section Erigeron of mainland South America. The results suggest that the island taxa form a monophyletic group resulting from a single introduction to the archipelago, with the closest phenetic relation to E. leptorhizon from. Cladistic and flavonoid studies help give evolutionary directionality to the group of four taxa and reveal that the four species apparently evolved on Masafuera with E. fernandezianus dispersing to Masafuera in more recent (perhaps historical) time. This is the only example, so far known, of a group of taxa evolving on the younger and more distant island on the archipelago rather than first developing on the older island.

4:00 FLAVONOID DIVERGENCE OF ARALIA CHINENSIS AND A. SPINOSA (ARALIACEAE), AN EASTERN ASIAN AND NORTH AMERICAN DISJUNCT SPECIES PAIR. Jun Wen and Daniel J. Crawford, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Floristic comparative studies on the disjunct distribution between eastern Asia and North America have been conducted by many workers. Few in-depth studies appear to have compared related species displaying this well-known disjunction. Aralia chinensis and A. spinosa (Araliaceae) are morphologically very similar and they constitute an eastern Asian and North American species pair. The flavonoid divergence of this species pair is analyzed in this study. Nine flavonoid compounds were detected in these two species and all are flavonols (kaempferol and quercetin). A. chinensis from eastern Asia displays a much more complex flavonoid pattern than the North American A. spinosa. The former has seven compounds, including both kaempferol and quercetin, while the latter only has one or two compounds with quercetin only. In terms of the formation of the disjunct pattern in Aralia, the flavonoid data prefer the long distance dispersal hypothesis to the vicariance hypothesis.

4:15 FLAVONOID SURVEY OF FOUR SPECIES WITHIN THE TRIBE MULINEAE (HYDROCOTYLOIDEAE, APIACEAE). James C. Zech. The Ohio State University, Botany Dept., 1735 Neil Ave., Columbus, Ohio 43210-1293.

As part of the revision of the genus Mulinum, the flavonoid profiles of Mulinum spinosum (Cav.)Pers., M. leptacanthum Phil., Azorella compacta Phil., and Gymnophyton flexuosum Clos., all members of the tribe Mulineae and subfamily Hydrocotyloideae, were examined. Because taxa of Mulinum are intraspecifically variable and appear to be unstable in regards to their morphology and environmental influences, it is proposed that flavonoid data may be useful in determining taxonomic boundries as well as providing additional data for generic delimination. Standard methodology for flavonoid extraction and identification were followed according to Mabry, et al. (1970). Results provide the potential of flavonoid data for the delimination of species within Mulinum, genera within the Mulineae, and the possible reevaluation of generic placement within subtribes of the Mulineae. In addition, the resulting data weakens several generalizations made by Harborne (1967, 1971, & 1975) as to the flavonoid composition within the Mulineae and Hydrocotyloideae, and point towards a more homogenous flavonoid composition within the Apiaceae.

4:30 ALLOZYME VARIATION IN COREOPSIS LATIFOLIA (ASTERACEAE). Daniel J. Crawford, Richard Whitkus and Barbara J. Post. Department of Botany, The Ohio State University, Columbus, Ohio 43210 and 4104 Princeton Boulevard, South Euclid, Ohio 44121.

Enzyme electrophoresis was employed to measure allozymic variation in five populations of the rare diploid species Coreopsis latifolia which appears to represent a relict taxon endemic to a small area of the southeastern United States. Genetic identity and gene diversity statistics were employed to analyze allelic frequency data. Genetic identities among the five populations ranged from 0.955 to 0.998, which is similar to the values often reported for conspecific plant populations. Total gene diversity within C. latifolia is low compared to other species with similar life history traits. Larger populations contain significantly more variation than do smaller ones. Populations of C. latifolia are deficient in heterozygotes compared to expected equilibrium values.

SECTION B. Plant Sciences in A227
Second Afternoon 1:30 p.m.
Saturday, April 29, 1989
Barbara Andreas, Presiding

2:00 CUTICLE ULTRASTRUCTURE AND MICROMORPHOLOGY FROM SUN AND SHADE LEAVES OF QUERCUS VELUTINA LAM. (BLACK OAK). Jeffrey M. Osborn and Thomas N. Taylor. Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Environmental differences in leaf anatomy and morphology are well known, including those induced by development under varying light regimes. Variation in cuticle ultrastructure and micromorphology are evaluated in sun and shade leaves of *Quercus velutina* Lam. using TEM and SEM. Both leaf types possess an adaxial cuticularized epidermis (cuticular membrane) differentiated into four regions; cell wall proper, inner loosely reticulate layer, outer densely reticulate layer, and an amorphous layer of cutin. The adaxial cuticular membrane of sun leaves averages 5 μm in diameter compared with a cuticular membrane of shade leaves which is 3 μm in thickness. Difference in thickness is primarily attributed to an increase of over two fold in the inner loosely reticulate region of sun leaves. The epidermis of the abaxial surface is thinner than that of the adaxial surface. Abaxial cuticular membranes are also thicker in sun leaves, lack an outer amorphous layer, and are completely reticulate, especially in association with stomata. Systematic and ecological interpretations of cuticle fine structure and surface morphology are considered for both extant and extinct systems.

2:15 A FOSSIL FUNGUS POSSESSING CLAMP CONNECTIONS FROM THE TRIASSIC OF ANTARCTICA. Jeffrey M. Osborn, Thomas N. Taylor, and James F. White, Jr. Department of Botany, The Ohio State University, Columbus, Ohio 43210 and Department of Biology, Auburn University at Montgomery, Montgomery, Alabama 36193.

Fungal remains of early-middle Triassic age have been discovered within fossil plant tissues collected in silicified peat from Antarctica. This Triassic fungus represents the third unequivocal clamp-bearing fungus described from the fossil record. Specimens consist of a branched, septate mycelium composed of hyphae ranging in diameter from 6.2-7.5 μm. Thick-walled spores were produced in chains and are interpreted as dikaryotic, resting chlamydospores. Affinities with several present-day fungi are considered. The Triassic fungus is most comparable to modern basidiomycetes, however, without documented basidia, precise taxonomic assignment remains equivocal and it is therefore suggested to be a 'conidial basidiomycete'. Ecologically, this clamped fungus most likely represents an example of a generalized saprophyte.

2:30 FATES OF CH AND CL FLOWERS IN THREE SPECIES OF VIOLA. Finley Bryan and Jackie Adams. Department of Botany, Ohio University, Athens,OH 45701.

Most species of Viola have chasmogamy/cleistogamy (CH/CL) systems such that during the growing season, production of open (CH) flowers is followed by production of closed (CL) flowers. One explanation of the evolution and persistence of CH/CL systems is that CH flowers suffer high levels of floral predation, and CL flowers are necessary to ensure adequate seed production. To date, there have been no quantitative data showing fates of individual CH and CL flowers. These data would give insight into selective pressures which could explain the presence of CL flowers. We tested this hypothesis by following the fates of CH and CL flowers for three species of Viola: V. soraria, V. canadensis, and V. pennsylvanica. Viola soraria is a stemless blue violet which was studied in a meadow. V. canadensis and Viola pennsylvanica are, respectively, white- and yellow flowered, leafy-stemmed, woodland violets. V. canadensis reportedly lacks CL flowers. We will present data on the probability of setting seed for both types of flowers in the three species, as well as the effects of predation, parasitism, and drought on their success.

2:45 PHYSIOLOGICAL CHARACTERIZATION OF SIX LIPID-PRODUCING DIATOMS FROM THE SOUTHEASTERN UNITED STATES. Mahasin G. Tadros and Jeffrey R. Johansen. Biology Dept., Alabama A&M University, Normal, AL 35762 and Dept. Biology, John Carroll University, University Heights, OH 44118.

Amphiprora hyalina, Cyclotella cryptica, Navicula acceptata (2 strains), Navicula saprophila, and Nitzschia dissipata were isolated from intertidal waters in Mississippi, Alabama, and Florida. The strains were remarkably tolerant to both temperature and salinity, with most having temperature optima of 30-35°C and salinity tolerances of 10-60 mS/cm. Growth rates for all strains were high, with rates in doublings/day being: A. hyalina, 2.0; C. cryptica 3.0; all Navicula strains, 3.8; and N. dissipata, 2.6. All six strains had lipid contents in excess of 37% ash-free dry weight (AFDW) under nutrient limited conditions, with N. saprophila having the highest lipid content at 48% AFDW. This work was done as part of an effort to develop a liquid fuels-from-microalgae technology currently under the direction of the Aquatic Species Program at the Solar Energy Research Institute. Our results and those of our coworkers support the conclusion that this project is technologically feasible.

3:00 EFFECT OF HIGH TEMPERATURE STRESS (HTS) AND SODIUM BISULFITE ON ELECTROLYTE LEAKAGE FROM MAIZE LEAVES IN RELATION TO SPORULATION OF BIPOLARIS MAYDIS RACE T. M. Akhtar, M. O. Garraway and E. C. W. Wokoma*, Dept. of Pl. Path., OARDC and The Ohio State University, Columbus, OH 43210. *Faculty of Biological Sciences, Univ. of Port Harcourt, Rivers State, Nigeria

Detached leaves of two isolines of the maize (Zea mays L.) inbred W64A which differ in their degree of susceptibility to the fungal pathogen Bipolaris maydis race T (BMT) were exposed to HTS i.e., 6h in the dark at 42C or to sodium bisulfite (500 µg/ml), a reducing agent, for 24h in the dark at 28C. Such leaves were inoculated with BMT then incubated for 48h in the dark at 28C. Control leaves were similarly inoculated and incubated but not exposed to HTS or bisulfite. Exposure to HTS or bisulfite prior to inoculation significantly increased electrolyte leakage as well as sporulation on both isolines compared with their respective controls. Leachates were recovered from leaves of both isolines which were exposed either to HTS or bisulfite, then incorporated into water-agar media. Sporulation on media amended with the above leachates was significantly higher than their respective controls. Thus, electrolyte leakage in part may play a mediating role in increased sporulation of BMT on maize leaves in response to HTS or bisulfite.

3:15 COMPARISON OF POLYPHENOLOXIDASE (PPO) FROM BIPOLARIS MAYDIS INCUBATED WITH AND WITHOUT XYLOSE. R. C. Evans and M. O. Garraway. Biology Dept., Rutgers Univ., Camden, NJ 08102 and Dept. of Plant Path., OARDC, The Ohio State University, Columbus, OH 43210.

When B. maydis race T was incubated on a basal glucose-asparagine-mineral salts agar medium supplemented with xylose (GX medium), PPO activity in the mycelia decreased compared to mycelia incubated on a similar medium lacking xylose (G medium). A protocol was developed for the partial purification of PPO using (1) ethanol-chloroform and (2) $(NH_4)_2SO_4$ precipitation methods. A comparison of the $(NH_4)_2SO_4$ fractions from G- and GX-grown mycelia indicated that the two sources of PPO were similar in pH and buffer concentration optima, substrate specificity and response to inhibitors. Lineweaver-Burke plots indicated that the PPO from all fractions of GX mycelia was non-competitively inhibited with respect to PPO from all fractions of G mycelia. The addition of precipitate from step (1) to aliquots of either the crude or ethanol-chloroform fractions resulted in decreased PPO activity. These results suggest that the difference in PPO activity between G- and GX-grown mycelia might be partially explained by a xylose-mediated inactivation rather than by differences in the amounts of enzyme present.

3:30 ASSAY OF GLUTATHIONE REDUCTASE IN CRUDE TISSUE HOMOGENATES USING DTNB (5,5'-DITHIOBIS(2-NITRO BENZOIC ACID)). Thomas L. Vierheller, Ivan K. Smith, Department of Botany, Ohio University, Athens, Ohio 45701-2979 and Carol A. Thorne, Department of Chemistry, Parkersburg Community College, Parkersburg, West Virginia.

A method for assaying glutathione reductase (EC 1.6.4.2) in unpurified plant extracts is described. The method is based on the increase in absorbance at 412 nm when DTNB is reduced by GSH. The effects of the following parameters on the assay were tested: various buffers, pH, buffer concentration, compounds commonly present in enzyme preparations, thiols, and the presence of another NADPH-dependent enzyme. The assay is more sensitive and less subject to interference than the widely used assay where NADPH oxidation is monitored. In particular, the specificity of DTNB allows assay of glutathione reductase in the presence of other NADPH-dependent enzymes and common protein extract contaminants. This DTNB assay is being used to test for changes in glutathione reductase activity of Glycine max during cold temperature stress. The Km of glutathione reductase and various environmental effects on the Km have also been determined using the DTNB assay.

SECTION B. Plant Sciences Poster Session in Theater Lobby Saturday, April 29, 1989

Board E @ 9:00 a.m. RELATIONSHIP BETWEEN DURATION OF EXPOSURE TO SELECTED GROWTH HORMONES AND RATE OF SHOOT FORMATION IN TOMATO LEAF DISKS. B. Ruff, T. Jensen and R. Noble. Department of Biological Sciences Bowling Green State University, Bowling Green, OH 43403

Leaf disks of Lycopersicon esculentum were differentially exposed to Murashige and Skoog (MS) medium containing IAA and kinetin, which initiates callus formation, and MS medium containing zeatin, which initiates shoot formation. Medium containing IAA and kinetin is also referred to as Evans medium. Leaf disks that were 9 mm in diameter were excised along the midrib and placed on Evans medium for 5, 7, or 9 days. Disks were then transferred to zeatin medium for 3, 5, 7, 10 or 14 days. After each exposure sequence, disks were transferred to basal medium. Total shoot formation was recorded. Quantitatively and qualitatively the best results were obtained from tissue exposed to Evans medium for 5 days and zeatin medium for 10 days. Tissue exposed to Evans medium for more than 7 days showed a decrease in shoot production. This method of regeneration seems appropriate for rapid shoot formation.

Board F @ 9:00 a.m. TOLERANCE TO LOW PHOSPHORUS LEVELS IN AN ANTHOCYANINLESS TOMATO VARIETY (LYCOPERSICON ESCULENTUM). R. Noble[1], D. Emmaty[2], D.H. Lee[1], and T. Jensen[1]. [1]Department of Biological Sciences, Bowling Green State Univ., Bowling Green, OH 43403; [2]Heinz U.S.A. Agricultural Research, 13737 Middleton Pike, Bowling Green, OH 43402.

Varieties of tomato (Lycopersicon esculentum) were grown hydroponically to test for tolerance to low phosphorus levels. Heinz variety 883 and an anthocyaninless mutant

(957) were grown from seedlings at different phosphorus concentrations (2mM to 0.03mM). The fresh weights were measured weekly. At the end of five weeks photosynthetic weights, dry weights and mineral contents of the plants were measured. Variety 957, at each time interval, showed a greater increase in fresh weight and similar increases in dry weight except at the lowest phosphorus concentration (0.03mM). The anthocyaninless mutant showed a lower concentration of phosphorus in its tissues than variety 883. While showing a greater increase in weight, variety 957 showed a lower net photosynthetic rate on upper leaves.

Board G @ 9:00 a.m. FUNGICIDE DEPOSITION QUANTIFIED BY COMPUTER-CONTROLLED ELECTRON BEAM ANALYSIS

C.R. Krause, C.C. Powell and J.M. Ichida. Nursery Crops Research Laboratory, USDA-ARS, 359 Main Rd. Delaware, OH 43015 and Department of Plant Pathology, The Ohio State University, 2021 Coffey Rd.,Columbus, OH 43210

Investigations were conducted to identify, characterize and quantify fungicide smoke particles on various surfaces using computer-controlled electron beam analysis (CCEBA) and to determine the rate of fungicide particle deposition. Inert specimen stubs and Rhododendron leaf surfaces were sampled at various times and locations following treatment with vinclozolin applied as a self-dispersing smoke within a greenhouse. Scanning electron microscopy, energy dispersive X-ray analysis with a digital scan generator and an automated image analysis program called Particle Recognition and Characterization were combined to perform CCEBA on the samples. Vinclozolin particles were located, sized and characterized over a 50 μm^2 raster area. Deposition of fungicide particles was completed by the 6th hour following ignition with uniform deposition at varying distances from the ignition point. CCEBA is a valuable tool for complete assessments of the deposition, behavior and efficacy of fungicides on plants and other environmental surfaces in the treatment area. Such data is important for crop safety, environmental hazard and fungicide impact studies.

SECTION C. Geology in B206
First Morning 9:00 a.m.
Saturday, April 29, 1989
Robert J. Malcuit, Presiding

9:00 AGE AND ORIGIN OF THE SKINNERS RUN PYRITE BED, CUYAHOGA COUNTY, OHIO. Glenn Zagger and Philip Banks, Dept. Geological Sciences, Case Western Reserve University, Cleveland, Ohio 44106

The Skinners Run Pyrite Bed is an informal unit that occurs at the boundary between the Chagrin and Cleveland Shales of Cuyahoga County. It is a thin (1-10 cm thick) sheet deposit composed of exhumed and reworked pyritized burrows and pelletal materials, with scattered bone and plant fragments and shark teeth. Pyritization occurred under anaerobic conditions during a period of minimal clastic input to the basin. Subsequent resumption of activity by bottom currents scoured the pyritized materials and redistributed them to form the present deposit. Conodonts extracted from the Pyrite Bed consist mainly of robust species and platform elements capable of surviving the reworking. They exhibit a CAI index of 1, indicating that burial temperatures never exceeded about 60 degrees. The species present are consistent with the Middle expansa Zone of the late Famennian (A. Harris, pers. comm.), thus placing narrow limits on the time of deposition of the uppermost Chagrin Shale - lowermost Cleveland Shale in this region.

9:15 EXCAVATION OF AN ISOTELUS SHALE LAYER AT CAESAR CREEK STATE PARK. SHRAKE, Douglas L. and SCHUMACHER, Gregory A., Ohio Department of Natural Resources, Division of Geological Survey, Fountain Square, Building B, Columbus, Ohio 43224.

Abundant, well-preserved Isotelus specimens have long been collected from the upper 20 feet of the Upper Ordovician Waynesville Formation in Warren, Clinton, and Greene Counties, Ohio. Modern investigations addressing the stratigraphy, sedimentology, taphonomy, paleontology, and paleoecology of this unique stratigraphic interval have not been undertaken. These subjects were incorporated into a study designed to call attention to this interval and provide preliminary observations on which future studies can be based.

The excavation site was on the Caesar Creek State Park emergency spillway. A square meter of an Isotelus-bearing shale layer, within the upper Waynesville Formation, was quarried to a depth of 13 centimeters, a centimeter at a time. Maps were generated showing the position and taphonomic information of each faunal element present on the surface of each layer excavated. Samples were collected for macrofaunal analysis, textural analysis, and thin sectioning in order to address the depositional and taphonomic history of the layer. Tentative results indicate that two fossil-rich horizons are present in the excavated shale layer. In both horizons, the trilobite sclerites indicate little, if any, effects from post-mortem transport.

9:30 LIMESTONE NODULES FROM THE OREGONIA AND ELK CREEK BEDS, CINCINNATIAN SERIES, SOUTHWESTERN OHIO. Boardman, M.R., Bergstrand, P.M., Colby, N.D., Hodnett, M.L., Lasemi, Z., and Slone, G.B., Geology Department, Miami University, Oxford, Ohio, 45056

Megascopic and microscopic examination of the nodular limestones from the Oregonia and Elk Creek beds of southwestern Ohio suggest that the carbonate nodules are remnants of a flourishing carbonate-producing environment. Nodules in the Oregonia bed are predominantly coarse microspar wackestones with coarse, angular fragments of a typical Cincinnatian fauna of brachiopods, bryozoans, crinoids, trilobites, molluscs and articulated ostracods. Uncompacted burrows and encrusting bryozoans suggest that the lime sediment was cemented prior to compaction of the unit. Insoluble residue includes clay minerals, pyrite and phosphatized allochems. The nodules are ovoid in shape (7 by 4 cm) and are separated from each other by several centimeters. Nodules in the Elk Creek bed are lithologically similar to those of the Oregonia bed, but are larger (12 by 5 cm) and coalesced to form wavy, discontinuous lenses approximately 5 cm thick. Occasionally shale laminae are entombed in the perifery of some nodules and suggest that shale deposition, carbonate sedimentation and cementation were closely associated in time and space. The lithologic characteristics of the nodules suggest that the limestone results from deposition of a typical Ordovician sediment which was at least partially cemented near the sediment-water interface. The nodules are not formed by concretionary growth, but by partial to complete break-up of layers of cemented lime sediment. Deposition of shale was not synchronous with carbonate, but was temporally and spatially closely associated. Compaction of the unit (50%) occurred after nodule lithification.

9:45 EARLY CEMENTATION ORIGIN OF NODULAR LIMESTONES, ELK CREEK AND OREGONIA BEDS (CINCINNATIAN SERIES), SOUTHWESTERN OHIO. Lasemi, Z. and Boardman, M. R., Dept. of Geology, Miami University, Oxford, OH. 45056

Field observation and scanning electron microscopy (SEM) reveal evidence for an early cementation origin of limestone nodules in the Elk Creek and Oregonia beds (Upper Ordovician) in southwestern Ohio. In outcrops, nodules are generally characterized by draped shale laminae suggesting differential compaction of the surrounding argillaceous sediment, and that the nodules must have been hard at the time of their origin. Early lithification of nodules is also supported by the presence of abundant unflattened burrows within nodules, and by SEM examination which shows the presence of abundant cement-filled microfenestrae. Microfenestrae are small voids (mostly 2-15 μm) and are common in uncompacted modern lime muds. Laboratory experiments show that 10-15% compaction can totally obliterate microfenestrae. Comparison of the thickness of the draped laminae around and outside the nodules suggests 50% compaction of the surrounding shale. Without early cementation, this compaction would have obliterated all former microfenestrae in these nodules. Early cementation and, thus, the formation of the nodules probably occurred in submarine environments. Evidence for a submarine origin include the presence of borings, encrusting bryozoans, and the absence of evidence suggesting early subaerial diagenesis. This is supported by the results of SEM examination which reveal the common presence of bladed, zoned calcite cements similar to Mg-calcite cements in marine cemented, Bahamian crusts and nodules.

10:00 THE GEOHYDROLOGY OF MARS Jeffrey K. Risner
85 Rolling Hills Drive
Athens, Ohio 45701

The recent advances in space science have now made it possible to construct models of the existence, volume and hydrologic cycle of the water of the planet Mars.

Outgassing models of water vapor indicate that the surface of Mars should be covered with water to a depth of 10 to 100 meters. Geomorphic evidence suggests a depth of at least 500 meters, yet no surface water, other then glacial ice at the poles, exists today. Martian gravity would keep water from escaping the planet. A survey of surface and atmospheric water volumes indicate that the majority of water is probably hidden as ground water.

The construction of a hydrologic cycle model indicates that Mars has a active but near static hydrologic cycle, dominated by water discharge in desert lowlands and water recharge ate the ice covered poles. Ground water flow plays a major role in this system

10:15 COMPUTER SIMULATION OF INTACT PLANETOID CAPTURE FOR PLANETS VENUS AND EARTH: OVERVIEW OF DYNAMIC PROCESSES. R. J. Malcuit, D. M. Mehringer, and R. R. Winters, Denison Univ., Granville, OH 43023

A three-body numerical integration code with an energy-dissipation subroutine has been devised to study the effects of close gravitational interactions between Earth-like and Venus-like planets and lunar-like (lunar mass and density) planetoids in co-planar, heliocentric orbits to assess the possibility of intact gravitational capture of lunar-like planetoids by planets Venus and Earth by radial tidal energy dissipation. The results can be placed into five categories: (1) close, non-capture encounters in which the planetoid is deflected into a near parabolic course by the planet and then continues on a heliocentric orbit; (2) non-capture scenarios in which the planetoid goes into planetocentric orbit for a few orbits and then returns to a heliocentric orbit; (3) stable gravitational capture scenarios in which the planetoid enters into planetocentric orbit because of radial tidal energy storage and subsequent dissipation within the two interacting bodies; (4) grazing collision scenarios in which the closest approach distance is greater than the sum of the planet-planetoid radii but less than the grazing limit when equilibrium tidal bulges are considered, and (5) collision scenarios in which the distance of closest approach is less than the sum of the planetary radii. In general, prograde capture orbits are stable for Earth-like planets and retrograde capture orbits are stable for Venus-like planets.

SECTION C. Geology in B208
Second Morning 9:00 a.m.
Saturday, April 29, 1989
Ann G. Harris, Presiding

9:00 MINE SUBSIDENCE IN THE STEUBENVILLE, OHIO AREA Ann G. Harris, Department of Geology, Youngstown State University, Youngstown, OH 44555

Country Club Hills is a development in Steubenville, Ohio. This particular site was originally commercially deep mined for coal from 1932-1966. Several small family mines were dug earlier. The remaining Pittsburgh seam was stripped mined from 1955-1962. When the old workings were encountered, they were sealed off by pushing spoil into the opening. Augering was also attempted but was quickly abandoned. The area was reclaimed, in the 1960's. Site preparation from 1969-1971 included blasting as deep as 40' to accommodate the sewer lines. Some of which occurred over the abandoned deep mines which were 25'-60' deep. Original reclamation left the site, with high relief, therefore, the entire site was graded by removing material from the hilltops and compacting it in the depressions. Construction of homes with standard foundtions commenced in 1971, after drilling the homesites over the commercial mines. In 1985 six homes on Fairway Drive were damaged when a section of the buried highwall collapsed over the intercepted old workings, which in turn caused some of the strip mine fill to shift. Since that event, other homes have been damaged. Damage to homes appears to be spreading gradually throughout the entire development. Test drilling has revealed large voids in the strip mine fill as well as in the abandoned deep mines. Damage to the homes is expected to continue in the ensuing years.

9:15 THE NEGATIVE ENVIRONMENTAL IMPACT OF IN-STREAM MINING IN LICKING COUNTY, OHIO. James E. Bradley. Department of Geology and Mineralogy, The Ohio State University at Newark, University Drive, Newark, Ohio 43055.

Most of the sand and gravel extracted in Licking County, Ohio, comes from in-stream or near-stream mining. This mining includes both large and small scale operations, some of which have been in operation for many years. In some cases, the effect of these operations on the streams and adjacent areas have been profound. Some of the more important negative environmental results are: changes in aquatic habitats; stream widening; stream course changes; increased downstream sedimentation; loss of many acres of very productive farm land; damage to residential properties (or cost to some landowners to protect their property); and one of the newer small operations has increased the chance of flood and bridge damage. Consequences of these mining operations have led to litigation in the courts of Licking County. The results of these court cases have not stopped in-stream mining. Because of these problems, legislation has been proposed in the Ohio House of Representatives that would stop or greatly control in-stream and near-stream mining in Ohio.

9:30 ROLE OF SLUMPED MATERIAL IN PROTECTING THE BASE OF THE BLUFF FROM WAVE EROSION ALONG A SECTION OF LAKE ERIE SHORELINE. Shahalam M. Amin, Kent State University, Kent, Ohio 44242.

A considerable portion of the shoreline along Lake Erie is formed in relatively weak Quaternary sediments and suffers from severe bluff erosion caused by toe undercutting by wave action. It is generally assumed that slumped material from various mass movements provide significant protection to the base of the bluff from further wave erosion. However, little is known on the effectiveness and the processes involved in this kind of natural protection.

The study was done on a 1.5 mile long Lake Erie shoreline near the Ohio-Pennsylvania border. A number of slumps, mostly block falls caused by toe erosion were monitored weekly for the ice-free months in 1986. The volume of material contributed by each slump and their effectiveness in providing protection to the base of the bluff was evaluated on a temporal as well as spatial scale. It was found that slumped material on a cohesive shoreline do not provide an effective blanket against wave erosion on the toe of the bluf as anticipated.

9:45 MUNICIPAL WASTEWATER TREATMENT WITH ZEOLITES AND CLAYS AS COAGULANTS. Howard H. Lo and Michael T. Groh, Department of Geological Sciences, and Yung-Tse Hung, Department of Civil Engineering, Cleveland State University, Cleveland, Ohio 44115.

In this laboratory study, the effect of types and dosages of zeolites and clays on the treatment of municipal wastewater using coagulation process was investigated. Wastewaters were collected from Central Wastewater Treatment Plant, Solon, Ohio, and Painesville Wastewater Treatment Plant, Painesville, Ohio. Zeolites used included mordenite, faujasite, silicalite, and synthetic zeolite-A. Clays used included kaolinite, montmorillonite, halloysite, and bentonite. The turbidity of the wastewater in general increased with dosage for all coagulants. However, clays showed a gradual decrease in turbidity at higher dosages. Bentonite, halloysite, and faujasite were able to reduce Na content in the wastewater with 12 to 21% reduction at a dosage of 400 mg/l. Most zeolites appeared to be quite effective in removing Ca and Mg from the wastewater with removal efficiency up to 99% at a dosage of 2 g/l. Results of TOC (total organic carbon) measurement showed that bentonite, kaolinite, halloysite, silicalite, and mordenite as coagulant were effective in removing organic pollutants from the wastewater. The TOC removal efficiency ranged from 10% to 37% at a dosage of 1 g/l with bentonite and silicalite having the highest removal efficiency.

10:00 THE IMPORTANCE OF GROUNDWATER ADVECTION ON SEDIMENT-WATER CHEMICAL EXCHANGE AT OLD WOMAN CREEK FRESHWATER ESTUARY, Joseph P. Eaker, Dr. Gerald Matisoff, Department of Geological Sciences, Case Western Reserve University, Cleveland, Ohio 44106

Old Woman Creek Estuary (O.W.C.E.) is a shallow freshwater wetlands which drains into Lake Erie. The water and chemical budget of O.W.C.E. are controlled by riverflow and groundwater seepage into the estuary and outflow by seepage through a barrier sandbar or as direct overland flow when the sandbar is breached. The purpose of this study was to determine the flux of solutes across the sediment-water interface and determine which mechanism is the dominant force in this exchange. During the summer drought of 1988 diffusion of solutes from the sediment to the overlying water dominated this flux. As the drought ended, groundwater advection began dominating this flux. At the mouth of the estuary, this transport is dominated by seepage from the estuary to Lake Erie through the barrier sandbar. As the summer drought ended, the volume of this seepage increased significantly.

10:15 GROUNDWATER HYDROLOGY OF CHIPPEWA CREEK VALLEY, WAYNE AND MEDINA COUNTIES, OHIO. Mohammad Z. Iqbal, Dept. of Geology, University of Akron, Akron, OH 44325

A groundwater resource evaluation of Chippewa Creek Valley in Wayne and Medina Counties, Ohio, shows continued availability of groundwater for agricultural and domestic uses. Geologic cross sections constructed from about 100 well logs illustrate that major a drift aquifer composed of sand and gravel ranges between 100 and 150 feet in thickness. The aquifer potential becomes limited upward because of an overlying aquitard of till ranging from 30 to 40 feet in

thickness. There is a general thickening of the till layer from northeast to southwest. The outwash aquifer is relatively "clean" and devoid of any clay lenses within the study area.

Hydraulic properties of the aquifer were derived from data available from water well logs. Average transmissivity values of the aquifer exceed 30,000 gpd/ft near the central part of the study area near Seville. The hydraulic conductivity of the aquifer has a mean value of 300 gpd/ft^2. The mean specific capacity of the aquifer is 4.81 gpm/ft. Groundwater of the aquifer is the calcium-magnesium-bicarbonate type. Analyses of major constituents show that the water quality is suitable to be used for drinking and agricultural purposes.

10:30 GRAVITY ANALYSIS OF THE JEROME FORK BURIED VALLEY, ASHLAND COUNTY, OHIO
PFOUTS, Douglas, & NOEL, James, Geology Dept., Ashland College, Ashland, Ohio

The Jerome Fork flows southeastward through Ashland County. Near the southeastern border of Mohican township it intersects and becomes the Lake Fork, which turns to the southwest and becomes the Mohican River in Holmes County. The area is underlain by glacial drift and alluvial deposits. Bed rock consists of the sandstone and shales of the Cuyahoga formation.

Gravity readings were taken along the trend of Jerome Fork from just north of Jeromesville to the north of Bailey Lakes. The stations were located at bench marks or at other survey points.

Profiles and bouguer maps clearly show a negative anomaly and that it is the result of fluvial sediments deposited in a bed rock valley.

The gravity interpretation is further indicated by a depth to bed rock map constructed from data obtained from the well records at the Ohio State Division of Water. This map shows similar shape and trend as the gravity map.

SECTION C. Geology in B208
Only Afternoon & Business Meeting
1:30 p.m.
Symposium on Ohio Stratigraphy
at 2:00 p.m.
Saturday, April 29, 1989
John P. Sabo, Presiding

1:45 A NEW STRATIGRAPHIC UNIT IN THE DEEP TEST CORE NEAR LYTLE, OHIO. SHRAKE, Douglas L., ODNR, Division of Geological Survey, Fountain Square, Building B, Columbus, Ohio 43224.

The ODNR, Division of Geological Survey test well in Wayne Township, Warren County, Ohio, is significant because it is the deepest (4,620 feet) continuously cored hole in Ohio and penetrates a unit previously undocumented in Ohio. The original goal of the test well was to obtain a continuous core and corresponding geophysical-log suite from the surface into the crystalline Precambrian basement complex beneath southwestern Ohio. The discovery of a new stratigraphic unit has modified this goal. The new unit occurs beneath an uncomfortable contact with the Cambrian-age Mount Simon Sandstone approximately 3,450 feet below the surface. Presently, 1,170 feet of this unit has been cored, increasing the know sedimentary sequence in this portion of Ohio by approximately 25 percent.

The new pre-Mount Simon sedimentary unit has been tentatively named the Middle Run sandstone after a stream located near the well site. Preliminary petrologic analysis indicates that the Middle Run sandstone is a lithic arenite. Physically the Middle Run sandstone is a fine to medium-grained, pink to dark-red sandstone with abundant biotite and lithic grains and very low porosity. Sedimentary features present in the Middle Run sandstone include abundant red shale streaks, clasts, and conglomeratic layers, angular bedding contacts, grain overgrowths, and bands of calcareous cement.

2:00 A NEW LITHOSTRATIGRAPHIC UNIT IN SOUTHWESTERN OHIO: THE STRAIGHT CREEK MEMBER OF THE GRANT LAKE LIMESTONE. SCHUMACHER, Gregory A., SWINFORD, E. Mac, and SHRAKE, Douglas L., Ohio Department of Natural Resources, Division of Geological Survey, Fountain Square, Bldg. B, Columbus, Ohio 43224.

The Straight Creek member of the Grant Lake Limestone is a new Upper Ordovician map unit established to describe the lateral equivalent of the Mount Auburn member of the Grant Lake Limestone. This unit has been mapped along a narrow, southeast-trending outcrop belt originating in eastern Clermont, County, Ohio, and extending into northeastern Kentucky. A composite type section is designated from exposures along the West Fork of Straight Creek in central Brown County, Ohio. The unit is characterized by interbedded, thin, discontinuous, wavy to irregularly bedded, fossiliferous, limestone and shale. Limestone constitutes an average of 74 percent of the unit. The thickness of the unit ranges from 18 to 27 feet, and both contacts are gradational. This member is differentiated from the Mount Auburn by the reduced amount of shale and the limestone bedding style. Shale averages 26 percent of the Straight Creek, versus 64 percent for the Mount Auburn. Limestone beds are in the Straight Creek are primarily wavy to irregularly bedded versus mainly nodular bedded in the Mount Auburn. The Straight Creek-Mount Auburn facies relationship is interpreted as a change from a shoaling, open-marine environment (Straight Creek) to a shallow, semi-protected environment (Mount Auburn).

2:15 HISTORICAL DEVELOPMENT AND ASSOCIATED PROBLEMS WITHIN THE PENNSYLVANIAN STRATIGRAPHY IN OHIO. Glenn E. Larsen, ODNR, Division of Geological Survey, Fountain Sq., Bldg. B, Columbus, Ohio 43224.

This study is an analysis of the historical development of Ohio's Pennsylvanian stratigraphic classification. Studies of this kind help define and clarify the problems inherent in the stratigraphic nomenclature. Resolution of such problems facilitates further development of a useful stratigraphy and philosophy for mapping.

Detailed investigations of Pennsylvanian-age rocks in Ohio began in the late 1820's. From 1858 to 1893, investigations by Newberry, Andrews, White, and Orton, established the stratigraphic framework upon which the present-day nomenclature is based. During the 1950's the cyclothem concept was used to classify and correlate Pennsylvanian lithologic units into formations. This led to a proliferation of stratigraphic terms, as almost every stratum of shale, sandstone, coal, etc. was named and designated as a member. By the early 1960's, cyclothems were considered invalid as a lithologic classification. Currently, Pennsylvanian nomenclature of Ohio consists of four groups containing 123 named beds, with no formal formations or members.

The Ohio Division of Geological Survey considers all nomenclature below group rank as informal until the problems of formation and member designations are resolved. One of the goals of the current mapping program is to resolve some of these problems.

2:30 THE LOWER MERCER LIMESTONE IN MAHONING AND COLUMBIANA COUNTIES. Rea, Ronald G., ODNR, Division of Geological Survey, Fountain Square, Building B, Columbus, Ohio 43224.

In Mahoning County the Lower Mercer limestone is exposed only in the more deeply incised stream valleys due to a veneer of glacial sediment. An extensive core drilling program being conducted by the Division of Geological Survey has shown this unit to persist in the subsurface throughout the county as well as in Columbiana County. Though originally called a limestone, this unit generally consists of both a limestone and a shale facies.

The limestone is dark gray to very dark gray, dense, hard, and fossiliferous with a very fine crystalline matrix. It maintains a relatively constant thickness of 2½ to 3 feet. Where exposed the limestone has a bedding plane 5 to 7 inches above the base; however, throughout the rest of the unit horizontal stratification is indistinct or lacking. The shale facies is dark gray to black, calcareous, fossiliferous, and generally grades upward into a silty shale. It lies above, below, or in lieu of the limestone and ranges in thickness from 4 inches to 5 feet.

Stratigraphically the Lower Mercer limestone occurs 130 to 150 feet below the Lower Kittanning coal and 130 to 160 feet above the base of the Pennsylvanian System. This unit has demonstrated excellent lateral persistence and is the unit most often recognized in Lower Pennsylvanian strata of northeastern Ohio.

2:45 ROCK CAMP MARINE ZONE-A NEW INFORMAL UNIT IN THE CONEMAUGH GROUP (PENNSYLVANIAN) OF NE OHIO. Slucher, E. R., ODNR, Division of Geological Survey, Fountain Square, Bldg. B, Columbus, OH 43224.

The Rock Camp marine zone is a newly recognized Pennsylvanian unit in the lower Conemaugh Group of Ohio. Recognition of this unit is an outgrowth of the statewide mapping program currently being conducted by the Division. Thus far, this unit has been recognized in over 80 square miles of south-central and southeastern Columbiana County.

The Rock Camp marine zone is mainly an upward-coarsening sequence of shale, siltstone, and sandstone that ranges from 0 to more than 100 feet in thickness. The lower portion, in areas of maximum thickness, is gray black, very fossiliferous, and may contain concretions of dark-gray aphanic limestone. Fossils become sparse to absent upward as the unit coarsens, and grades from gray to greenish gray in color. The unit's base is commonly sandy to silty and the basal contact can be sharp or gradational. Laterally, the unit rises stratigraphically and thins from 65 feet to 0 over a distance of 2 miles. Associated with this thinning is a facies change from shale with brackish- to restricted-marine fauna to nonmarine flint clay and mudstone. Stratigraphically, the base of the unit can range from approximately 20 feet above the Upper Freeport coal bed to over 40 feet above the Mahoning coal bed. Recognition of this unit will aid in the stratigraphic interpretation of lower Conemaugh rocks in northeastern Ohio.

3:00 CONEMAUGH MARINE ZONES IN THE VICINITY OF STEUBENVILLE, OHIO. CAUDILL, Michael R., ODNR, Division of Geological Survey, Fountain Square, Bulding B, Columbus, Ohio 43224.

Four Conemaugh Group marine zones, Ames, Portersville, Cambridge, and Brush Creek, exposed in new road cuts along WV Route 2 east of Steubenville greatly facilitate bedrock mapping in Jefferson County, Ohio, by the Division of Geological Survey. Variations within these zones suggest structural influence on local Conemaugh sedimentation.

Each zone displays significant lateral variations. The Ames, a 3-6-cm-thick fossiliferous shale, thickens southward and becomes a 30-40-cm-thick marine limestone. The Portersville, a thick coarsening-upward sequence of dark shale, contains thin beds of iron-rich packstone, which coalesce southward to form a basal, 1-1.3-m-thick, cross-bedded, pelloidal packstone. The Cambridge consists of two marine sequences. The upper sequence is dominated by 7-15-m-wide lenses of marine limestone. A laterally truncated nodular marine limestone marks the lower sequence. The Brush Creek is a coarsening-upward sequence of dark fossil-rich shale, which locally has been eroded by incursions from distributary channels.

Pronounced lateral variations in the Ames and Portersville marine zones correspond to thickening trends in the underlying Lower Freeport coal. Previous workers have suggested these trends are related to syndepositional movement along a NW-striking fault. Similar movement may have affected the deposition of Conemaugh strata.

3:15 GLACIAL GEOLOGY OF WESTERN OHIO 1947 - 1977, Richard P. Goldthwait, P.O. Box 656, Anna Maria, FL, 34216

For these 30 years my students, and those of Perry Stewart, Jane Forsyth, and Dick Durrell studied and produced theses on 32 counties scattered over western Ohio. Some were published by Ohio Water Division, Geological Survey and in field guides. Great strides were made due to 1. the coming of ^{14}C dates, 2. the turn to key stratigraphic sections, 3. correlation of units by granulometry, lithology, and fabric and, 4. soils reports supplied a critical help. Each of two main ice lobes deposited 6 to 7 discontinuous offlapping till sheets last identified as following:

Till member (or feature)	Terminal mor. (or position)	Date range (^{14}C avg.BP)	Soil catena (Composition)	Other features
Rainsboro T	(Plateau Scarp)	125-150 T	Cincinnati	loess 3'+
	(Ohio R.)*	(>125,000)	(clay-loam)	leach 7'
Gahanna T	(buried mid-OH)	55-65 T	patchy	stone ct.
(Wolf Crk)*		(>60,000)	(clay-loam)	
Boston T	outer Cuba M	21-23 T	deep Russell	loess 2'
Whitewater*	buried*	(21,000)	(silty-cl-loam)	stone ct.
Caesar T	Cuba-Xenia M	18-20 T	Miami-Russell	loess 1'
(Shelbyville)*	Hartwell M*	(18,100)	(stony-cl-loam)	leach 3'
Darby T	Reesville M	17-18 T	Miami-Crosby	B.belts
(Arcanum)*	Farmersville*	(17,300)	(loam)	2'lchd. pavem'ts
Olentangy T	Powell M	14-15 T	Morley-Blount	leach 1'
	Union City*	(14,800)	(clay-loam)	graded N
Tymochtee T	Wabash M	12-13 T	St. Clair	boulders

*Miami sublobe only

3:45 TERTIARY AND QUATERNARY STRATIGRAPHY OF SW OHIO Brockman, C. Scott, ODNR, Division of Geological Survey, Columbus, OH 43224, and Lowell, Thomas V., Department of Geology, University of Cincinnati, Cincinnati, OH 45221.

A critical review of SW Ohio's post-Paleozoic stratigraphic studies has been attempted in light of lithostratigraphic conventions and modern dating techniques.

Wisconsinan stratigraphy of the Miami lobe is based on a few exemplary sections. Key considerations in its development and extension include lithologic character, relative position and development of paleosols, and radiocarbon age estimates. Refinements require determination of regional lithologic variation, interpretation of depositional environment, and improvements in age estimation.

Correlations between the two Illinoian-age lobes of the area have not been attempted; however, lithologic studies may identify differences among Illinoian tills. Recent amino acid studies on fossils have better identified subsurface units formerly considered Wisconsinan.

Pre-Illinoian units of the area include at least two tills and associated glaciogenic sediments. Clastic sediments, lacking intercalated tills, fill subsurface Deep-Stage-age valleys. Distinctive alluvial sediments within high-level Teays-age valleys may be related to Tertiary units identified in Kentucky and Indiana. Magnetostratigraphic methods have had limited use in the area.

4:00 THE THREE TILLS OF LOGAN COUNTY, OHIO Jane L. Forsyth, Geology Department, Bowling Green State University, Bowling Green, Ohio 43403

Three Woodfordian (Late Wisconsin) tills were identified in Logan County by Forsyth in a dissertation (1956) and a quadrangle report (1967), tills named (youngest first) Marysville, Bellefontaine, and Pickrelltown, and distinguished on the basis of their texture (Marysville is clay-rich, the others loamy), associated soil (Marysville - Morley, the others - Miamian, the old Miami 6A and Miami 60), and regional occurrence from north to south, plus association with specific tree species in mature woodlots. Only local names were assigned at that early time. Now that other till names are in the literature, correlation of these tills with others in western Ohio is possible, generally agreeing with the laterauthors: correlation of the Marysville with Goldthwait and Rosegreen's (1969) Hiram and Gooding's (1973) Union City, et al.; the Bellefontaine with Goldthwait and Rosegreen's Darby and Gooding's and Stewart's (Goldthwait and Stewart 1981) Knightstown; and the Pickrelltown with Gooding's and Stewart's Crawfordsville/Shelbyville tills. Eastern equivalents of these tills also exist, but correlation is complicated as lime content lowers markedly in this direction and associated soils change to Alexandria, two depths of which (Centerburg (younger) and Mount Liberty - Forsyth, 1966 - Licking Co. - and 1961 - Knox Co.) I correlate with the two older Logan Co. tills (no true clayey Hiram-type till was recognized in these counties).

4:15 TILL STRATIGRAPHY IN UNION COUNTY. Michael P. Angle, ODNR, Division of Geological Survey, Fountain Square, Bldg. B, Columbus, OH 43224.

Initial, SSC-related field work in Union County employed the stratigraphic scheme successfully used by the Survey in north-central Ohio. Descriptions and laboratory analyses of tills collected from outcrops and cores demonstrated that this scheme worked remarkably well. Tills, from youngest to oldest, were the clayey Hiram and Hayesville Tills and the compact and stony Millbrook Till which consists of a silty "upper", a clayey "middle", and a sandy "lower" unit. The noncompact, sandy Navarre Till, intermediate between the Hayesville and Millbrook, was absent or represented by a thin, platy zone.

Southwards from the Powell Moraine the Hiram and Hayesville Tills thin and eventually disappear. Underlying them is a till closely resembling the Navarre which is the surficial till south of the moraine. Underlying the Navarre is a compact, sandy till which resembles the "Lower" Millbrook. West of Marysville, the entire local till sequence becomes appreciably more silty and clayey. The Hiram and Hayesville Tills are underlain by a compact clayey till resembling the "middle" Millbrook.

This variation in till stratigraphy may reflect an actual change of till sheets, a major facies change, or both. Numerous stratigraphic schemes have been previously employed in the Scioto Lobe. Criteria, relevance, and utility of these schemes will be reviewed, correlations suggested, and recommendations made.

4:30 **LITHOFACIES AND MINERALOGY OF THE LATE WISCONSINAN NAVARRE TILL IN STARK AND WAYNE COUNTIES, OHIO**

STORCK, Richard J. and SZABO, John P., Department of Geology, The University of Akron, Akron, Ohio 44325

The Navarre Till in Stark and Wayne Counties is the oldest till of late Wisconsinan age in the Killbuck Lobe of Northeastern Ohio. The type section of the Navarre Till is located near the distal margin of ice advance in Stark County. Interpretations of the diamict at the type locality include a meltout till overlying a lodgement till with clasts from underlying shale. Other sections in the study area consist of meltout or flow tills which occur as stratified or massive diamicts interbedded with silts, sands, and/or gravels; lodgement tills are rare.

The Navarre Till is platy, oxidized, and leached with yellowish brown color and variable matrix texture of less than 20% clay and up to 50% sand. Oxidized, unleached samples contain little calcite and up to 3% dolomite. Unoxidized samples contain up to 7% carbonate. Quartz-feldspar ratios vary greatly and average of about 10. These high ratios may result from Pennsylvanian sandstones which form local topographic highs.

Aside from consistency and oxidized color, Navarre Till closely resembles Illinoian (?) Millbrook Till (type locality in Wayne County) in lithofacies, carbonate mineralogy, matrix texture, and quartz-feldspar ratios in this two county region near the glacial boundary.

4:45 A FRAMEWORK FOR FUTURE OHIO PLEISTOCENE STRATIGRAPHY. Richard R. Pavey, Ohio Department of Natural Resources, Division of Geological Survey, Fountain Square, Building B, Columbus, Ohio 43224.

Societal uses of the solid earth demand predictable definitions of material characteristics and geometry of individual geologic units. To satisfy this demand, the Ohio Division of Geological Survey, as a public agency, must employ a lithostratigraphic approach to glacial deposits.

Ohio researchers have applied a variety of methods to Pleistocene differentiation. Some lithostratigraphic definitions exist, but require varying degrees of modification to meet modern criteria and needs. Other classifications, although not lithostratigraphic, provide recognizable spatial boundaries that could correspond to separable lithologies. As glacial mapping and research at the Survey and elsewhere continues, lithostratigraphic definitions will evolve that build upon the existing body of research and nomenclature.

Compilation of an updatable catalog of stratigraphic names, histories, categories, and criteria can provide a forum for future communication and cooperation. This catalog is intended to foster stratigraphic evolution within a common framework for all interested Pleistocene workers.

SECTION D. Medical Sciences in G-1A
First Morning 9:00 a.m.
Saturday, April 29, 1989
Lee A. Meserve, Presiding

9:00 BLOOD PRESSURE, AND ACTIVITY OF THE SODIUM PUMP IN THE BORDERLINE HYPERTENSIVE RAT (BHR) FED HIGH DIETARY SODIUM. Bin Jiang and Daniel Ely, Dept. of Biol., Univ. of Akron, Akron, OH 44325.

The BHR is a good model for human borderline hypertension with a blood pressure intermediate between genetically normotensive and hypertensive rats. BHR males were bred from male spontaneously hypertensive rats and female Wistar Kyoto rats that were about 6 months old. The BHRs were randomly grouped (N=6≅10) and fed a high Na^+ (3.15%) diet or a normal diet (Na^+0.3%) diet for 7 weeks. Blood pressure (Bp) was recorded weekly by the tail cuff technique. Activity of the Na-pump of ghost cells was measured by inorganic phosphorus liberated from ATP. The ghost was prepared from the fresh blood by hyposmosis hemolysis. Body weight and plasma [Na^+] were also measured.

The result of this study showed a significant 32% elevation of systolic Bp in BHR with high dietary Na^+ as compared to controls ($p<.01$). Dietary Na^+ did not effect the plasma Na level. This study revealed a significant negative correlation ($r=-0.83$, $p<0.001$) between Bp and activity of the Na-pump. Possibly the lower activity of the Na-pump resulted in increased vascular tone. Also activity of the Na-pump decreased during the 7 weeks. The research suggests that the BHR has a genetic component of hypertension and the activity of the Na-pump is involved in the mechanism of hypertension (supported by Amer. Heart Assoc., Akron Affil.).

9:15 SALT AND STRESS INDUCED HYPERTENSION IN THE SPONTANEOUSLY HYPERTENSIVE RAT (SHR) REQUIRES NOREPINEPHRINE (NE). H.R. Bhagat, Gail Dunphy, Jean Weigand and Daniel Ely. Dept. of Biology, Univ. of Akron, Akron, Ohio 44325.

A high sodium diet and social stress accelerates hypertension in the SHR, however, the mechanism is not known. The objective was to prevent vasoconstriction in resistance vessels in order to test the hypothesis that salt-stress induced hypertension was due to NE increased vascular resistance not fluid expansion. The following groups of male SHRs (6 wks of age) were studied for 10 wks with drugs administered in the drinking water (n=5-14 rats/group: control Na diet (0.3% Na, CNa); high Na diet (3% Na, HNa); high Na^+ reserpine (HNa-R,1.7ug/cc) and high Na^+ + hydralazine (HNa-H,.08mg/cc). Similar groups were also placed in a territorial stress situation to compare blood-pressure (BP) during "normal conditions" versus "socially stressful conditions". BP was measured weekly by the tail cuff method and plasma NE by HPLC, and blood chemistries by Technicon ("SMAC"). CNa showed a 10% rise in BP and 91% rise in NE during stress; HNa also showed a 9% rise in BP and 116% rise in NE during stress; HNa-R did not change BP or plasma NE during stress; and HNa-H showed a 6% decrease in BP and 116% NE stress increase. A significant correlation between BP and NE in the first 3 groups was found ($r=0.84$;$p<.001$). There were no significant group differences in fluid volume indicators. In conclusion, the data suggests that NE is necessary for increased resistance and the salt-stress induced BP rise.

9:30 EVIDENCE SUPPORTING THE ROLE OF A TESTES DERIVED FACTOR IN THE DEVELOPMENT OF HYPERTENSION Cathleen Jenkins and Daniel Ely. Dept. of Biol., Univ. of Akron, Akron, OH 44325.

It is well established that blood pressure in age matched mammals is higher in males compared to females. Blood pressures (BP) were taken via tail sphygmomanometry on gonadally intact and castrated male Wistar-Kyoto (WKY), crossbreed (CB), and spontaneously hypertensive (SH) rats, as well as genetically testicular feminized (Tfm) and normal intact male sibling rats (N1) from the King-Holtzman strain. All animals (n=4-10/group) were placed on high sodium (3%) diets to accelerate the development of hypertension three weeks prior to initial BP and for the duration of the experiment (8-16 wks). BP and body weights were taken weekly for eight weeks. Control groups (WKY, CB, SHR) showed consistently (weekly) higher peak systolic blood pressures (SBP) compared to their castrated counterparts. WKY controls (178±8) vs. castrates (154±5, $p<.05$), CB controls (184±5) vs. castrates (155±13, $p<.05$), and SHR controls (197±9) vs. castrates (171±6, $p<.07$). Tfm rats exhibited higher BP (138±6) compared to N1 (106±5, $p<.01$). There were no significant differencesin body weights between control and castrate groups. Blood samples were taken retro-orbitally and plasma catecholamine levels (HPLC) showed that BP elevation cannot be explained by differences in plasma norepinephrine. In conclusion, the testes or a testes-derived factor, possibly testosterone, has a role in raising BP during the period of rapid growth and development in these strains of rats.

9:45 BIOCHEMICAL MARKERS OF TISSUE DAMAGE DURING 1 HOUR OF PERFUSED VS. NONPERFUSED RAT HEARTS. Gail Dunphy, Masoud Azodi, Helmar Dollwet, and Daniel Ely, Dept. of Biology, Univ. of Akron, Akron, OH 44325.

The maintenance of optimal cardiac conditions during periods of ischemia and heart transplant preservation are critical factors influencing recovery. Calcium influx, edema, and free radical generation contribute to cellular damage. In order to detect cellular damage during ischemia two biochemical indices were tested: creatinine phosphokinase (CK) and malone dialdehyde (MD) indicating lipid peroxidation due to free radical damage. Male rat hearts (n=20) were isolated using the Langendorff procedure and perfused at 80 mmHg afterload, 37° C with Krebs-Henseleit perfusate bubbled with 95% O_2/5% CO_2. Pressure-volume curves were obtained at time zero and after either 60 minutes perfusion or after global ischemia: 10, 30 and 60 minutes. CK levels showed a significant positive correlation with time of ischemia, $r=0.895$, $p<.01$, however, MD did not. The rat heart is functionally capable of 60 minutes of no-flow ischemia with about 85% recovery of function. However, if ischemia does not occur and the heart is continuously perfused for 1 hr. at constant pressure and temperature more lipid peroxidation (189% increase) and tissue damage occurs (72% recovery). In conclusion, 1) CK level is a more sensitive indicator of heart damage than malone dialdehyde after 1 hr. of ischemia; and 2) non-perfusion for 1 hr. permits 13% better heart function recovery than continuous perfusion (Supported by Ohio Board Regents-Research Challenge Grant).

10:00 LIPID PEROXIDATION INJURY AND PREVENTION DURING HEART PRESERVATION. Daniel Ely, Helmar Dollwet, Masoud Azodi, and Gail Dunphy, Dept. of Biology, University of Akron, Akron, OH 44325.

During coronary bypass and heart transplant periods of ischemia occur exacerbating existing tissue damage and membrane necrosis which may be due to oxygen-derived free radicals. The objective of the following experiments was to determine the effectiveness of several compounds on reducing free radical injury during 1 hour of continuous perfusion in the isolated Langendorff rat heart (Wistar Kyoto males, n=6-8 rats/experiment, 250-325 g) at a constant: temperature = 37° C; pressure-80mmHg; Krebs-Henseleit perfusate with experimental additives (free radical scavengers). Pressure-volume curves were obtained at time zero and after 60 minutes at 5 balloon volumes. The best scav-

engers: in reducing lipid peroxidation were: 0.25 uM $CuCl_2$ >catalase (150,000 units/L) > 0.125uM copper aspirinate; in maintaining coronary flow: catalase>.5uM aspirin > copper aspirinate; in maintaining peak systolic pressure: aspirin> copper aspirinate > catalase; and in maintaining diastolic pressure: $CuCl_2$ > catalase> aspirin. Superoxide dismutase (25,000 units/L) and 1mM mannitol were not as effective in maintaining cardiac function after 1 hour. In conclusion, the overall maintainance of cardiac function was best provided by: catalase> aspirin=$CuCl_2$ > copper aspirinate > superoxide dismutase>mannitol. (Supported by Ohio Board Regents, Research Challenge Grant).

SECTION D. Medical Sciences in G-1B Second Morning 9:00 a.m. Saturday, April 29, 1989 C. J. Neal, Jr., Presiding

9:00 SLIPPED FEMORAL CAPITAL EPIPHYSES: INCIDENCE, RACIAL DIFFERENCES, AND ASSOCIATION WITH SCHEUERMANN'S KYPHOSIS. B. Latimer and R. Mensforth, Laboratory of Physical Anthropology, Cleveland Museum of Natural History, Cleveland, Ohio 44106.

The femora of 2,965 Hamann-Todd Collection Black and White men and women ranging in age from 18 to 90+ years were examined for the presence/absence of slipped femoral capital epiphyses (SFCE). The low frequency of bilateral involvement (14%), marked preference for involvement of the left hip (83%), and early onset of degenerative joint disease are findings concordant with patterns reported in the current orthopedic literature. In contrast, the overall incidence of SFCE was significantly greater (290/100,000) compared to figures reported in clinical studies (2/100,000), the incidence of SFCE in Blacks (722/100,000) was 11.5 times greater compared to Whites (63/100,000), and no relationship between adult stature and SFCE was observed in either group. Furthermore, a strong relationship between SFCE and Scheuermann's kyphosis was observed. The latter defect is characterized by a low frequency overall (Blacks, 4%; Whites, 12%). However, 71% of individuals with SFCE displayed the spinal abnormality, an association that is highly statistically significant (x^2=36.6; p<.001). Additional findings that pertain to the etiology and epidemiology of SFCE are discussed.

9:15 EFFECTS OF HEPARIN UPON ATHEROGENESIS IN THE WATANABE HERITABLE HYPERLIPIDEMIC (WHHL) RABBIT
J. Workman, S. Schmidt, D. Donovan and R. Clarke
Akron City Hospital, Akron, OH, 44304

Heparin is routinely added to vascular cell cultures to inhibit smooth muscle cell replication. The in vivo effects of heparin upon atherogenesis have remained controversial, however. In this experiment 14 four month old WHHL rabbits were randomly assigned to three treatment groups: 1500 U heparin, 500 U heparin or saline. An injection protocol was followed for nine months. The rabbits were bled monthly from their marginal ear veins and the sera were analyzed for cholesterol and triglyceride contents. At sacrifice each rabbit's aorta was sampled at 10 specific locations from the arch to the iliac bifurcation. The reduction in the area of the aorta by atherosclerotic plaque at each site was calculated using a video imaging system. Heparin injections significantly reduced circulating cholesterol levels; no differences were measured in triglyceride levels. In rabbits injected with 1500U of heparin the ratios of plaque areas to aortic lumens were reduced at the levels of the aortic arch and in the abdominal aorta but did not differ statistically from the other treatment groups. Plaques from heparin treated animals contained more fatty deposits and foam cells compared to plaques from saline treated rabbits which were more fibromuscular in organization. We conclude that heparin modulates the occurrence and composition of atherosclerotic plaques in this animal model of naturally occurring atherogenesis.

9:30 DEVELOPMENT OF AN INDIRECT DYE-BINDING METHOD FOR ISOLATION OF Z-PROTEIN FROM LIVERS OF MALE RATS. Dietmar V. Trulzsch*, Sanford S. Singer+ and Ellena N. Weston*. from the Chemistry Department of the U. of Dayton+ and the Gastroenterology Department of the Dayton VA Medical Center*, Dayton, OH 45469.

Rat liver Z-protein is believed to be important to the hepatocyte in a number of ways. These include binding of fatty acids, heme, bile acids and prostaglandins. The usual method for Z-protein preparation begins by mixing cytosol with the blue dye, bromosulfophthalein, and separating the dye-Z-protein complex from other liver proteins by gel filtration chromatography, followed by ion exchange. This yields a purified Z-protein preparation defined by its 15 kDa molecular weight. We have found the procedure to be less than optimum for preparation of Z-protein samples directed toward study of interaction with enzymes that metabolize bile acids. Therefore, the method described here was developed to do away with the direct dye binding step. The new procedure includes sequential ion exchange and gel filtration chromatography of uncombined Z-protein. Its identification at each stage is done via indirect assay with Rose Bengal and does not compromise the integrity of the Z-protein to be used for study of biochemical interactions. We believe that the new Z-protein preparation is superior for use in study of bile acid metabolism and binding.

9:45 PURPURIN AND METALLOPURPURIN DERIVATIVES: PHOTOSENSITIZERS FOR TUMOR THERAPY. R.L. Liebes, C.M. Foss, S.H. Selman, A.R. Morgan & M. Kreimer-Birnbaum. St. Vincent Medical Center, Toledo, OH 43608, Medical College of Ohio, and Univ. of Toledo.

Photodynamic therapy of tumors is an evolving modality of cancer treatment which depends upon the retention by the tumors of systemically administered photosensitizers. Tumor destruction occurs after the photosensitizers are activated by light. Purpurins and metallopurpurins are a group of synthetic second generation photosensitizers. They absorb light above 650 nm, a region of the visible spectrum with good tissue penetration properties. A method for blood extraction of purpurins was designed, combining solvent extraction of the drugs by an ethyl acetate:acetic acid mixture, followed by HPLC on Partisil 5 C8 Reverse Phase columns run with a combination of solvent systems. Neither hemin nor endogenous porphyrins interfere with the purpurin chromatographic profiles. An external standard isohematoporphyrin dimethyl ester was clearly resolved from the purpurin derivatives. Additional studies were done on drug stability in various systems. Freshly prepared solutions of NT2 in tetrahydrofuran show purpurin concentrations of over 95%. After 24 to 72 hrs in solution, the main component had decreased to about 91%, and decomposition products were detected. These observations are important for the design of stable drug delivery systems and for pharmacokinetic studies. [Grant support: NIH CA-43006, F. M. Douglass Foundation, and F.O.Eagles (Maumee).]

10:00 MODULATION OF CELL SURFACE ANTIGENS OF RAT ESOPHAGEAL CARCINOMA BY MONOCLONAL ANTIBODIES. X. Wan, R.J. Jamasbi, and G.D. Stoner. Bowling Green State University, Bowling Green, OH 43403 and Medical College of Ohio, Toledo, OH 43699.

Attempts were made to determine if modification of the antigenic structure of the cell membrane by an antibody, (documented for the TL antigen), would translate to other tumors as well. Monoclonal antibodies (MoAbs) were prepared from the spleen cells of BALB/c mice immunized with a rat esophageal carcinoma (B_2T). The MoAbs were investigated by ELISA and FA techniques and two antibodies designated, MoAb 10-5 G (IgM), and MoAb 10-5A (IgG_1), were selected. The MoAb 10-5G reacted specifically with B_2T cells, whereas the MoAb 10-5A reacted with a number of transformed rat esophageal lines. Neither MoAb reacted with normal rat epithelial cells. Indirect FA was applied to the living cells to test for antigenic modulation. At 0 time, whole cell immunofluorescence was observed. However, when the stained cells were kept at 37C distinct antigenic aggregation, on the cell surface membrane occurred rapidly. Antigenic capping, internalization and shedding were clearly demonstrable after several hours of incubation. The degree of antigenic modulation by MoAb 10-5A was much higher for B_2T cells than for other transformed cell lines. Whether similar modulation phenomena occurs in vivo or whether antigen-denuded cells are produced is not clear. Supported by NCI-grant CA28950 and Ohio Board of Regent Research Challenge Grant.

SECTION D. Medical Sciences in B209 First Afternoon & Business Meeting 1:30 p.m. Saturday, April 29, 1989 Martha Kreimer-Birnbaum, Presiding

2:00 THE EFFECT OF ALCAP SURFACE AREA ON THE SUSTAINED DELIVERY OF STEROIDS BY ALCAP CERAMIC IMPLANTABLE DEVICES. J. Wiley, H. A. Benghuzzi & P. K. Bajpai. Department of Biology, University of Dayton, Dayton, Ohio 45469

Aluminum-calcium-phosphorous oxides (ALCAP) ceramics are nontoxic and readily accepted by the host. The purpose of this study was to investigate the effect of surface area (SA) of ALCAP ceramic devices on the delivery rate of diethyl stilbestrol, deoxycorticosterone acetate, estrone, corticosterone, testosterone acetate, testosterone propionate, estradiol, and dehydroandrosterone acetate by ALCAP ceramics. ALCAP capsules were fabricated by compressing calcined powders and sintering the capsules at 1400 ^{0}C for 36 h. The final inner SA ceramics were 2.01 $\pm$ 0.02 cm^2 and 3.10 + 0.01 cm^2 and the outer SA were 4.03 $\pm$ 0.02 cm^2 and 6.22 $\pm$ 0.11 cm^2. The amount of steroid released were determined spectrophotometrically. Results of this investigation showed that : (I) higher surface area ceramics released larger amounts of steroids, (II) molecular structure and weights of steroids play an important role in the release of steroids from the ceramics. Thus, surface area of the ceramic, and molecular structure and weight of the steroid should be taken into account when designing a sustained release ceramic device for delivering steroids.

2:15 THE EFFECT OF TEMPERATURE OF INCUBATION ON THE SUSTAINED DELIVERY OF STEROIDS AND PROTEINS FROM ALCAP CERAMIC CAPSULES. RM. Barbaro, H. A. Benghuzzi & P. K. Bajpai. Department of Biology, University of Dayton, Dayton, Ohio 45469.

In vitro studies are sometimes conducted at ambient temperatures. It is likely that variations in temperature can result in false interpretation of the collected data. Thus, this study was to investigate the effect of temperature of incubation (25 ^{0}C, 37 ^{0}C and 50 ^{0}C) on the delivery of a protein (bovine serum albumin) and a steroid (testosterone), by means of polylactic acid (PLA)-imgregnated and nonimpregnated ALCAP ceramics. ALCAP capsules were fabricated by calcining mixtures of aluminum, calcium, and phosphorous oxide powders and sintering the compressed cylinders. Each bovine serum albumin (BSA) or testosterone (TE)-containing experimental capsule was suspended in serum bottle containing 100 ml of phosphate buffered saline (pH 7.4) or 50% wt/vol aqueous ethanol, respectively. The amount of BSA and TE released from each capsule was measured by colorimetrically and spectrophotometrically, respectively. Impregnation of the ceramics with PLA resulted in a decreased rate of release of proteins and steroids from the ceramic. However, the ceramics, like any other system, released higher amounts of steroids and proteins at higher incubation temperatures.

2:30 EFFECTS OF MATERNAL INGESTION OF PBB ON THYROID STATUS AND ADRENAL AXIS RESPONSE IN 15 DAY OLD RAT PUPS. James A. Landis and Lee A. Meserve. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403-0212.

Polybrominated biphenyl (PBB) is a commercial fire retardant that was used for many years in the manufacture of thermally resistant plastics. PBB has become a relatively widespread pollutant mainly through the carelessness of industry. Once in the environment PBB is known to be highly persistent and resistant to biotransformation. Organismal studies have demonstrated that PBB can compromise the function of the thyroid gland in the adult animal. The present study tested the effect of maternal dietary PBB on thyroid status and adrenal response to stimulation in 15 day old rat pups. Test dams were fed a diet containing 0.05% (w/w) PBB (Firemaster BP-6) from the first day of pregnancy until termination of the experiment. Each litter of pups provided unstimulated controls, ether stressed, CRF injected, and ACTH injected animals. PBB depressed body weight by one-fifth at 15 days. Circulating thyroxine levels were slightly depressed, while T_3 levels were unchanged. Preliminary data indicate a depression of resting corticosterone levels, and a subnormal response to all stimuli in test animals. These results are similar to those previously reported in young rats fed polychlorinated biphenyl (PCB).

2:45 SUCROSE CONSUMPTION IN NORMAL AND VASOPRESSIN-DEFICIENT RATS UNDER STRESS AND NONSTRESSFUL CONDITIONS. Stephen R. Archacki, Cyrilla H. Wideman, and Helen M. Murphy, John Carroll University, Cleveland, Ohio 44118.

The Brattleboro rat is a mutant form of the Long-Evans strain and lacks the gene necessary for the synthesis of vasopressin. The purpose of this experiment was to determine if Long-Evans and Brattleboro rats have different taste and hunger preferences when offered both 8% sucrose and tap water drinking solutions under the conditions of: 1) ad-lib access to food and 2) 23 hours of food deprivation stress. The drinking solutions were placed in separate bottles which were rotated at random daily. The rats had ad-lib access to food during a seven day habituation period which was followed by a nine day experimental period in which the rats had one hour of access to food. The Long-Evans rats showed a preference for 8% sucrose during both the habituation and experimental periods. The Brattleboro rats, however, did not show a preference for the sucrose until the introduction of the experimental period when they consumed significantly more sucrose than water. Both strains displayed dramatically different patterns of sucrose consumption. It is hypothesized that the development of a carbohydrate preference of 8% sucrose relative to tap water is related to central and peripheral levels of the neurotransmitter serotonin. This effect may be modulated by vasopressin.

3:00 MODULATION OF ACETYLCHOLINE STIMULATED PHOSPHOINOSITIDE METABOLISM IN HIPPOCAMPAL SLICES BY SOMATOSTATIN. Lillian M. Shaffer and Linda A. Dokas. Medical College of Ohio, C.S. 10008 Toledo, OH 43699.

In the brain, Acetylcholine (Ach) stimulates phosphoinositide metabolism and specifically, the breakdown of phosphatidylinositol 4,5, bisphosphate (PIP_2) to diacylglycerol (DAG) and inositol triphosphate (IP_3). In the presence of lithium, subsequent breakdown of IP_3 is blocked at the conversion of inositol phospate (IP) to inositol and phosphate so that the accumulation of IP serves as a measure of PIP_2 breakdown. Somatostatin may modulated cholinergic actions on this system. Previous studies revealed that carbachol (a cholinergic agonist) elecits a consistently high level of IP accumulation. In the present studies, 10^{-5}M[D-Trp^{8}]-somatostatin was added to hippocampal slices incubated with [^{3}H]-inositol, lithium and protease inhibitors. The peptide caused an increase in IP labeling, although less than that seen with carbachol. To determine whether the peptide effect is direct, or due to modulation of a cholinergic system, incubations will be done in the presence of carbachol and somatostatin. Interactions of carbachol and somatostatin on PI metabolism will be correlated with reported effects on protein phosphorylation.

3:15 **CHRONIC STRESS SUBSENSITIZES ALPHA$_2$ ADRENERGIC AND NICOTINIC MECHANISMS WHICH REGULATE TEMPERATURE. Richard S. Jaeckle, M.D. and Steven C. Dilsaver, M.D. The Ohio State University; Department of Psychiatry; 473 W. 12th Avenue; Columbus, Ohio; 43210.**

Chronic inescapable stress produces alterations in brain noradrenergic and cholinergic systems. We studied the effects of chronic swim stress on alpha$_2$ adrenergic and nicotinic mechanisms potentially located in the hypothalamus which regulate core body temperature. Male rats (N=12/group) were given twice daily swim stress (8 minutes/session at 12°) for 14 days. We challenged the animals with clonidine (0.1 mg/kg i.p.) or nicotine (1.0 mg/kg i.p.) at baseline, after 7 and 14 days of stress, and weekly thereafter for 5 weeks following cessation of stress. The mean hypothermic response to clonidine was subsensitized after 7 and 14 days of stress and returned to baseline within 7 days of terminating stress. The mean hypothermic response to nicotine was subsensitized after 7 and 14 days of stress. The nicotine response continued to become even more subsensitized for 2 weeks after stress was discontinued and returned to baseline over the following 3 weeks. Our results suggest that chronic uncontrollable stressors may activate hypothalamic noradrenergic and cholinergic systems, possibly resulting in subsensitization of alpha$_2$ adrenergic and nicotinic cholinergic receptor-mediated mechanisms. These alterations develop at different rats during chronic stress and recover at different rates after the stressor is discontinued.

3:45 NEUROBIOLOGIC EFFECTS OF BRIGHT LIGHT. Steven C. Dilsaver, M.D., Department of Psychiatry, The Ohio State University, 473 West 12th Avenue, Columbus, Ohio 43210-1228.

Bright artificial light is a treatment for winter depression. The author reports that the effects of this treatment are similar to those properties of other somatic treatments for depression (such as lithium, tricyclics, and electroconvulsive therapy). All of these treatments produce subsensitivity to clonidine. Further, every antidepressant studied alters the sensitivity of rats to the thermic effects of nicotine. Bright artificial light also exhibits this effect. Unlike other treatments, bright artificial light produces subsensitivity to the muscarinic receptor agonist, oxotremorine. This renders it unique. Thus, laboratory data are consistent with the

clinical finding that bright artificial light exerts antidepressant effects. Additional physiological, biochemical, and receptor binding studies, designed to further elucidate similarities and differences between the neurobiologic effects of bright artificial light and those of other antidepressant treatments, are highlighted.

4:45 NEURONAL MIGRATION ANOMALIES
Alison S. Smith, M.D., Susan I. Blaser, M.D.
Cleveland Metropolitan General Hospital, Department of Radiology;3395 Scranton Road, Cleveland, Ohio 44109

Insults to the fetal brain between two and six months of gestational age may result in abnormalities of cell migration characterized by abnormal gyration. A prospective study of 23 patients with abnormalities of neuronal migration were collected. Eighteen studies had CT correlation. Five cases were histologically proven. Magnetic resonance (MR) and computed tomography (CT) images, as well as examples of pathologic specimens were presented to illustrate stages of the embryologic process. Failure of the germinal matrix to proliferate or to form is one theory implicated in schizencephaly. In agyria, an abnormal first layer of cortical neurons prevents penetration of subsequent waves of neuroblasts. A similar, but less aberrant process results in pachygyri with broad gyri, and a few sulci. Isolated heterotopic gray matter may occur without cortical abnormality and is associated with adult and adolescent onset seizures. Polymicrogyria can result from abnormal migration, abnormal inductive influences of a persistent superficial granular layer, or a destructive mechanism. MR was found to be superior to CT in the demonstration of these abnormalities on the basis of superior detail of cortical architecture as well as multiplanar imaging capabilities. The anomalies studies morphologically fit into the currently accepted scheme of the embryology of neuronal migration.

SECTION D. Medical Sciences in B210
Second Afternoon 1:30 p.m.
Saturday, April 29, 1989
Jere Boyer, Presiding

2:00 USE OF THE GELTEACH SYSTEM TO DESIGN A CLINICAL DIAGNOSTIC MICROORGANISM IDENTIFCATION PROCEDURE. Gregory S. Bambeck and Sandra Kerr. Kent State University, Stark County Branch, 6000 Frank Road, N.W., Canton, Ohio 44720.

The specific identification of microorganisms presently consists of a lengthy series of deductive experiments, the totality of which consume some 1200 pages of Bergey's Manual of Determinative Microbiology. Since each species and variety of organism expresses its genes in its own unique pattern, the use of a replicable very high resolution gel electrophoresis system should theoretically reduce the entirety of Bergey's manual and its plethora of procedures down to a single test. The Gelteach System is a highly replicable, quick, inexpensive prepackaged system which separates the genetically expressed polypeptides of microorganisms and sorts them by size in neat columns with a degree of resolution far greater than most gels presently published in the leading scientific journals. The resultant patterns are remarkably similar to the well known consumer product bar code. State of the art computing densitometers can scan these genetic expression "bar codes," place them in memory and perform cross sample comparison and identification. A single test global microorganism identification appears not only to be possible, but may be inevitable.

2:15 AIRBORNE FUNGAL SPORE COUNTS RELATED TO RISK FOR FUNGUS ALLERGY SUFFERERS. Francis Nussbaum, Kent State University Tuscarawas Campus, New Philadelphia, OH 44663.

To evaluate fungal spore populations, air samples from various locations on the Tuscarawas Campus were collected during June 1988. Quantitative counts were obtained from Petri plates exposed to the atmosphere for 3 minutes and subsequently incubated for 5 days. An unshaded lawn of mixed grasses and weedy plants was the major consistent contributor to the campus airborne fungal spore population. The mean morning spore count on the lawn for June was 2,590 per 110.8 cm^2 per hour. Using this as the standard index of 1.00 (100 %), relative spore counts at other sites during the morning were: parking lot 0.10, hayfield 1.02, stream bank 0.13, soybean field 0.35. Midday relative counts were: lawn 0.22, parking lot 0.07, hayfield 0.26, stream bank 0.13, soybean field 0.39. Afternoon counts were: lawn 0.15, parking lot 0.21, hayfield 0.28. stream bank 0.08, soybean field 0.11. Evening counts were: lawn 0.51 parking lot 0.08, hayfield 0.39, stream bank 0.15, soybean 0.17. The variation in spore counts among the various microenvironments and their diurnal fluctuations suggest improved ways to evaluate risk to persons sensitized to fungus allergies. Single samples from "average sites" at "average times" are not reliable.

2:30 A SURVEY OF POSTDOCTURAL IMPLANT EDUCATION AT U.S. DENTAL SCHOOLS. Deborah A. Mendel, DDS, Ohio State Univ. College of Dentistry, 305 W. 12th Ave., Columbus, Ohio 43210

The demand for dental implant education is increasing. This project was designed to assess how implantology is included into the curriculum for postdoctural students in graduate oral surgery (OS), periodontics(PER), prosthodontics(PROS), and general practice(GP) training programs. A survey was mailed to the directors of the above graduate programs at all U.S. dental schools. 55% of the programs responding stated that their curriculum contained a formal course on dental implants. 73% have interdepartmental seminars in whole or in part on dental implants. Residents receive surgical implant placement experience in 14% of PROS, 43% of PER, 85% of OS, and 8% of GP programs.Clinical restorations on dental implants are completed by residents in 79% of PROS, 0% of PER, 0% of OS, and 30% of GP programs. The implant systems most often utilized were Branemark (65%), IMZ (37%), Core-Vent(33%), Integral(26%), and Staple Bone Plate (15%). Only 17% of the programs responding stated that their students received no dental implant education. The results of this survey indicate that implantology is becoming an integral part of postdoctural education at U.S. dental schools and that the "team approach" is the primary method of care.

2:45 CHILDREN'S ATTITUDE TOWARDS HEALTH AND ILLNESS. PROCTOR, Monica, FRANCO, Kathleen, CAMPBELL, Nancy. Medical College of Ohio, P.O. Box 10008, Toledo, Ohio 43699.

Health value is generally assumed to be universally high, even in children. Much research has therefore, been devoted to studying children's knowledge of health and illness. Studies have typically assessed cognitive understandings of chronically ill children or hospitalized children. Little if any research, however, has explored the child's understanding of illness in relation to the personal experience of having a serious illness in a family member such as a parent. Since it is well known that chronic illnesses can have severe and long lasting effects on all family members, it seems plausible that conditions related to living with a chronically ill parent can effect a child's knowledge of health and illness. It is our hypothesis that children living in a household with a chronically ill parent may differ from control children, who did not have a chronically ill parent in their feelings about the stability of their parents, their own health, illness susceptibility, illness prevention, death and family structure. The presentation will explore current knowledge about children's attitudes towards illness.

3:00 HEALTH CARE CRISIS: PROFESSIONAL NURSING
Beryl G. Chickerella, MS, RN, CNAA
Doctors Hospital, 1087 Dennison Ave., Cols, OH 43201

Although there are 13,000 more nurses in Ohio than eight years ago, the shortage is increasing. Recent cyclical shortages reflected demand, longevity, technology, increased breadth of nursing opportunities, expectations for health care . The situation is now exacerbated by supply deficits (smaller age cohort, improved opportunities for women, lack of educational funding, perceived career limitations).
Previous nursing shortages have been addressed by increasing wages, which although necessary, are not sufficient to attract qualified people into the profession. The 1982 ANA study "Magnet Hospitals" identified features which attract and retain nurses to hospitals (quality of care, autonomy in nursing practice, colleageal relationships with physicians, career opportunities, educational support as well as wages). These features are still "magnets".
Remedies to the nursing shortage must be multi-focal.

1. Bright, able, caring people (both sexes-all ages) must be recruited into nursing. (federal and philanthropic support must be available.)
2. Colleges of nursing must work cooperatively with employers of nurses to insure graduates are prepared and utilized appropriately.
3. Creative approaches to extending the scope of the professional nurse must be generated.
4. Technological support for nurses is imperative. Until recently most technical advances require more intensive nursing care. Computerized bedside charting can reduce nursing time requirements by 10-12%.
5. The image of nursing must be improved. The positive aspects of the profession must be heralded by nurses themselves and by the public. All forms of media should depict nursing and nurses realistically - as a profession of serious, well prepared, compassionate individuals who are providing an invaluable service to mankind, and who are appropriately acknowledged.

4:00 LASER ANGIOSURGERY: INTRAVASCULAR MICRO-MACHINING OF ATHEROSCLEROSIS
John R. Kramer, Jr., M.D. and Michael S. Feld, Ph.D. Cleveland Clinic Foundation, Cleveland, Ohio 44195, and Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

Atherosclerosis, a vascular obstructive disease, is a major cause of morbidity and mortality in the United States today. Significant advances in technology over the last several decades have led to open heart surgery and percutaneous balloon angioplasty but the quest for less invasive and less costly techniques to treat the disease will continue into the 21st century.

One of the most exciting new approaches under investigation uses laser light to ablate atherosclerotic via fiberoptic catheters. Physicians and physicists are cooperating to produce a medical laser system that will allow the clearing of vascular obstructions without significant damage to supporting vascular structures. The laser angiosurgery system regulates dose by precisely defining and controlling fluence and directs aim by exploiting differences in laser induced autofluorescence of normal and abnormal vascular structures.

While such an approach remains highly experimental today, many investigators believe that rapid advances in fiberoptic and laser technologies will lead to the wide spread use of lasers in the cardiovascular system during the next century.

SECTION D. Medical Sciences
Poster Session in Theater Lobby
Saturday, April 29, 1989

Board A @ 10:00 a.m. IN VITRO ACTIVITY OF ITRACONAZOLE AGAINST SELECTED FILAMENTOUS FUNGI. J.M. Boyer, Aultman Hospital, 2600 Sixth Street, Canton, Ohio 44710

The in vitro activity of itraconazole (ITR), a triazole compound, was examined using a total of 25 selected filamentous fungi. Although the activity of ITR against most usual human fungal pathogens has been examined in detail, its activity against environmental, opportunistic fungi requires further investigation. Susceptibility testing was performed using a procedure previously described by the author. In brief, spore-suspensions or homogenized hyphae are placed on a non-nutrient support medium containing antibiotic. Nutrient discs are then placed on the plate. After appropriate incubation, plates are examined for growth. The lowest concentration plate with no growth is the MIC of the organism. It was found that all isolates tested, save one, had MIC's within the usual range of blood levels achieved by ITR. The mean MIC for six isolates of Aspergillus was 1.3 ± 0.6; one of Wangiella = 0.8; two of Pseudallescheria = 3.5 ± 1.5; three of Alternaria = 0.2 ± 0.1; one of Fusarium = 2.0; two of Fonsecaea = 0.9 ± 0; three of Mucor = 0.8 ± 0.4; three of Rhizopus = 1.4 ± 0.8; one of Drechslera = 3.0; two of Penicillium = 3.0 ± 0.5 with a third isolate of Penicillium resistant at 50 ug/ml. It is likely that ITR will have an impact on the treatment of immunocompromised patients such as those with cancer, who are infected with opportunistic filamentous fungi. (All numerical data for MIC's is reported in ug/ml).

Board B @ 10:00 a.m. UTILIZATION OF IMMUNOCYTOCHEMICAL TECHNIQUES TO EVALUATE ERYTHROCYTE MEMBRANES FOLLOWING THE TRANSFUSION OF INCOMPATIBLE BLOOD. T.K. Hathaway,* J. L. Adams,** and C. Heckman*** *Walter Reed Army Medical Center, Washington, DC 20307; **Dept of Medical Technology & Dept of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403

Immune clearance and destruction of red blood cells (RBC) following infusion of incompatible blood have generally been thought to involve opsonic proteins, i.e., immunoglobulins (IgG, IgM) and complement. Fibronectin (FN) participates in many significant biological and pathophysiological activities and has opsonic characteristics; plasma fibronectin (PFN) has been associated with acute hemolytic transfusion reactions (HTR). Immunocytochemical techniques were used to localize and identify opsonic proteins coating and contributing to lysis of RBC during an acute HTR. Three dogs were infused with heterologous RBC; plasma hemoglobin (Hb), PFN, IgG, IgM, and complement (C3) were measured to assess the HTR. RBC collected at timed intervals before and after the infusion were viewed by fluorescent and electron microscopy. Immediately after infusion of RBC, plasma Hb levels rose and PFN, IgG, IgM, and C3 levels declined. Using both immunocytochemical techniques, IgM, IgG, FN, and C3 were identified on surfaces of transfused RBC. Immunocytochemical techniques were successfully applied to evaluate RBC membranes following HTR.

Board C @ 10:00 a.m. ENHANCEMENT OF NATURAL KILLER ACTIVITY AND RESPONSIVENESS TO CONCANAVALIN A IN FISCHER RATS BY RESTRAINT STRESS. Sanjay Jain and J. Ross Stevenson, Dept. of Biological Sciences, Kent State University, Kent, OH 44242.

Stress usually has a depressing effect on immune function. However, we observed apparent immune enhancement following restraint stress. Fischer rats were restrained in snug-fitting wire mesh tubes for 14 hr/day during the light portion of a daily 14:10 hr light/dark cycle for 0, 11, 22, or 33 days. Animals were sacrificed immediately after the last restraint session, and trunk blood and spleens were collected. Blood neutrophil per cent was significantly higher after 11 or 22 days of restraint than in controls, as expected, and returned to baseline at 33 days. However, natural killer activity of spleen cells against YAC-1 targets, measured by an LDH-release assay, was higher than controls after all periods of restraint, especially after 11 days. Responses to Concanavalin A by spleen cells from restrained rats were also higher than controls. This apparent immune enhancement by stress occurred earlier (11 days) than the similar enhancement after 4 weeks of sound stress in mice reported by Monjan and Collector (Science, 196: 307. 1977). The difference in the nature of the stress may be responsible for this difference.

Board D @ 10:00 a.m. AGING OF THE HUMAN TACTILE SENSORY SYSTEM
Linda Petrosino and Donald Fucci
Department of Communication Disorders
Bowling Green State University, Bowling Green, OH 43403

A measure of sensory system acuity is that system's ability to temporally resolve stimuli. The ability to temporally resolve oral vibrotactile stimuli has been under investigation as a means to assess the sensory system that is involved in fine speech control. The purpose of this study is to determine the temporal resolution abilities of the aging tactile sensory system.

Thirty-eight subjects (12 yrs. - 80 yrs.) were employed in this study. Fusion thresholds were obtained from the tongue and the hand for each subject with a two pulse vibratory stimulus. The pulses were 1 msec. pulses with a second sequentially generated pulse having a variable time of onset from the first pulse. The stimulus was presented to the test structure starting at an interval time that allowed the subject to perceive the stimulus as two discrete events. This interval was decreased until a fusion point (stimulus was perceived as one) was reached. The stimulus interval was then increased until the subject "felt more than one". The mean in msec. of four of these reversal points were accepted as the fusion threshold. A linear regression was performed in which values for the tongue and hand were plotted across age. It was seen that tactile sensitivity does get poorer with increasing age.

Board E @ 10:00 a.m. CHARACTERIZATION OF THE PLASMA MEMBRANE ATPase OF RHODOTORULA glutinis
Taha A. Kumosani and Charles Griffin
Hughes Laboratories, Department of Chemistry, Miami Univ., Oxford, OH 45056

Abstract: Plasma membrane vesicles from the yeast Rhodotorula glutinis were purified from the crude homogenate by differential centrifugation and pH precipitation, and the plasma membrane bound ATPase was characterized. The enzyme was found to be highly specific for ATP, and to exhibit an absolute requirement for magnesium ions. The enzyme was not, however, stimulated by monovalent ions. Lineweaver-Burk plots of the ATPase activity were linear and a V_{max} of 0.714 umole of ATP hydrolyzed per min. and a K_m for MgATP of 1mM were calculated. Vanadate, Diethylstilbestrol, and N, N'-Dicyclohexylcarbodiimide were shown to inhibit the ATPase activity, while no inhibition was observed with Azide or Ouabain. The plasma membrane ATPase activity showed an optima at pH 6.5.

SECTION F. Geography in C233
Only Morning 9:00 a.m.
Saturday, April 29, 1989
Jeffrey J. Gordon, Presiding

9:00 COMPARISON OF REMOTELY SENSED AND SURFACE MEASURED SNOW WATER EQUIVALENT FOR THE MAUMEE RIVER BASIN, Thomas W. Schmidlin, Geography Department, Kent State University, Kent, Ohio 44242.

The National Weather Service (NWS) conducts airborne gamma radiation measurements of snow water equivalent (SWEQ) over 1400 flight lines in 26 states and in Canada when there is a local potential of flooding from snowmelt. The NWS also measures SWEQ daily at all their first-order stations located at airports. In the Maumee River basin of Ohio, Indiana, and Michigan, the airborne data routinely gave much higher values of SWEQ than the surface measurements at NWS offices. The difference is believed to be a result of differing land use over the areas measured by the two methods. The surface SWEQ measurement is a point measurement taken over sod on the airport grounds. The airborne SWEQ measurement is taken over a flight line 16 km long and 0.3 km wide with natural vegetation. The airborne SWEQ measurement likely best represents the true SWEQ of a region and these results indicate that caution should be exercised in the use of the 35 years of surface SWEQ measurements now available at NWS offices.

9:15 CLIMATE MODELING SIMULATIONS USING AN ENERGY BUDGET APPROACH, Fred J. Starheim and Thomas W. Schmidlin, Department of Geography, Kent State University, Kent, Ohio 44242

The greenhouse effect is a growing environmental issue gaining prominence in both research and political circles of late. The concern is that rising concentrations of carbon dioxide and other radiatively-active trace gases are causing increasing planetary temperatures which will effect changes in sea level and global climate patterns. This paper presents the results of analyses conducted with a recently published global energy budget climate model which has been modified by the authors to account for the time and space variations of insolation and albedo. This study and modified model are based on an article by R. W. Pease in the Annals of the AAG (77:450-461). Both models use a stipulated set of energy budget partitioning factors. Using a finite difference solution in lieu of the continuous mathematics of differential calculus, the models provide a relatively quick calculation procedure which enables them to be used on a microcomputer.

9:30 THE HEAT ISLAND OF AKRON-CANTON AIRPORT. Nirmala Kochar and Thomas W. Schmidlin, Department of Geography, Kent State University, Kent, OH 44242.

Air temperatures measured at airports may not represent the temperatures of surrounding rural areas because of extensive paved surfaces, buildings, lack of tall vegetation and flow of traffic. These factors may cause the presence of a heat island which is generally an urban phenomenon. So, the temperature of the airports may not represent that of the surrounding rural land. This was verified by studying the temperature and wind of the Akron-Canton Airport and eight nearby rural sites between December 1987 and October 1988. The results showed that an airport heat island did not exist under cloudy conditions or when the wind was not calm over 4 or more rural sites. However, the airport was a heat island for 75% of the calm and clear nights. Hence, the airport temperature is not representative of the surrounding rural land under clear, calm conditions and it would be appropriate to establish instruments at a truly rural site.

9:45 LABOR AVAILABILITY AND APPAREL INDUSTRIES IN KAOHSIUNG, TAIWAN: A STUDY OF CULTURAL INFLUENCE UPON INDUSTRIAL DECISIONS. Stephen S. Chang. Bowling Green State University, Bowling Green, OH 43403.

Taiwan increased its pace of industrialization during the 1960's with the establishment of three export processing zones. However, in the recent decade Taiwan faces an increasing labor shortage as a result of rapid economic development and a related decline in birth rate. This paper explores the issue of labor availability and the apparel industries in Kaohsiung, Taiwan. The same situation exists throughout Taiwan.

With the establishment in 1966 of the export processing zone in Kaohsiung where a number of apparel industries are located, different companies formulated plans to help recruit the best from a large pool of labor and maintain a low turnover rate. Towards the end of the 1970's, the labor supply began to tighten and the pressure of shortages continually increased till this present day. Companies have to implement new measures to competitively recruit and retain their needed workers who would not hesitate to change jobs frequently. The various strategies which evolved to respond to the changing conditions are discussed. They serve to illustrate the importance of cultural factors in influencing industrial decisions.

10:00 FROM ADMINISTRATION CENTERS TO SMALL TOWNS: URBAN DEVELOPMENT IN ABA, SOUTHWESTERN CHINA. Ge Lin, Geography Department, The University of Akron, Akron, Ohio, 44325-5005.

Current studies of small towns in China are mainly devoted to those of the developed eastern part of China. Many believe, apparently based on the experience of East China, that the developed area will show a higher speed of urbanization in comparison with the undeveloped area (western China). However, personal observations indicate that the converse is true. This paper provides an empirical study in the Aba area in Sichuan province, to show that political control over the region is the main reason for rapid development and evenly distributed small towns in the region.

The paper contains three sections. First, it briefly reviews the historical emergence of urban centers in this region and indicates that political control over the region was the determinant factor in urban emergence. Second, it points out that the post-communist revolution urbanization process is a repetition of the earlier historical pattern, but with more rapid speed. The last section evaluates the performance of small towns in the region through service, economic and social functions; and the conclusions are not encouraging.

10:15 MOST LUXURIOUS RAILROAD FREIGHT OF ANGLO-AMERICA, Mildred M. Walmsley, 19201 Van Aken Blvd.,#206, Shaker Heights, OH 44122

The increasing demand for silk cloth prompted a growing textile industry a century ago. Silk yarn by millions of tons reached four west coast seaports from the Orient. From five million tons in 1886-90 to nearly 80 million tons in 1926-30, was transported from ship in four to five freight cars by superior passenger locomotives to New York City. Speed records continued to be broken as the Silk Specials had the right-of-way over all passenger, mail, and refrigerated freight cars; stopping the maximum of five minutes to change locomotives-tenders and crew of widely-spaced distances. Trains were required to reach New York City in five days. Bales of silk were then transported by rail, later by truck, to silk mills in New Jersey and Pennsylvania.

10:30 GEOGRAPHIC PATTERNS OF TICKET-SPLITTING IN OHIO: A COMPARISON OF THE 1988 PRESIDENTIAL AND SENATE VOTES. Thomas Maraffa and David Stephens, Department of Geography, Youngstown State University, Youngstown, Ohio 44555

Ticket-splitting was a widely reported pattern of voting behavior in the 1988 general election. Perhaps nowhere was the contrast as sharp as in Ohio, where a conservative presidential candidate carried the state at the same time one of the senate's most liberal members was returned to office. In this paper we compare differences in the percentage of the vote for Bush for president to that for Voinovich for senator by county, to determine patterns of ticket-splitting in the state. Statistical and map analyses of voting patterns were performed. On the average Bush received 13% more of the vote than Voinovich. However, in 33 counties the difference in vote was greater than 15%. Ticket-splitting was particularly high in the rural and suburban counties of the southern parts of the state. Counties in the vicinity of Cleveland and those with high levels of unionization had lower rates of ticket-splitting.

10:45 WATER USE: A NEGLECTED COMPONENT OF LAND USE STUDIES. Thomas D. Anderson, Department of Geography, Bowling Green State University, Bowling Green, OH 43403

The inventory of land uses is an essential part of the planning process. But despite advances in the technology and methodology of land use study, few such reports give detailed attention to the uses of water bodies. This paper presents a rationale for water use as a specific objective for geographic inquiry, with a focus upon rivers. Rivers occupy surface space but differ significantly from land in that their qualities are not fixed. Their waters are subject to rapid changes in volume, area, velocity, chemical and sediment content, and although channeled they differ constantly at any given point. By federal law navigable river surfaces and their waters are not "owned" in the sense that land is and public access is assured. Simultaneous use of rivers for a variety of purposes is possible and common. Several accepted categories of land use are presented and contrasted with a tentative classification of water use, using examples from the lower Maumee River.

SECTION F. Geography in C233
Only Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Leonard Peaceful, Presiding

2:00 PRODUCTION AND IMPLICATIONS OF DASYMETRIC AND DOT MAPS IN A COMPUTER ENVIRONMENT by P.F.Fisher, Kent State University, Kent, Oh 44240.

Statistical information is usually collected by enumeration district, and then presented in the form of a choropleth map. The simplifying assumption implicit in this whole process is that the data are evenly distributed across the district. Two cartographic methods, dasymetric and dot maps, have been developed to accomodate this, and enable production of maps to a greater level of distributional detail. These mapping methods use knowledge of how the phenomena mapped is related to some other parameter to refine the distriubtion illustrated. This paper will document and illustrate the computer software requirements for dasymetric and dot map production. The approach has major implication for those concerned with error and uncertainty in geographic databases, and these will be discussed.

2:30 A COMPARISON OF SMALL TOWN AND SUBURBAN TRANSIT STATION IMPACT AREAS. Henry Moon, Department of Geography and Planning, The University of Toledo, Toledo, Ohio 43606.

Rapid transit stations have generated a considerable amount of land use change in both small towns and the more suburban areas that lie adjacent to metropolitan areas having transit systems. Any growth that follows station construction occurs in conjunction to or in conflict with existing development. Because small town stations open in already urbanized areas, the ensuing pattern of development is expected to be different from that occurring near suburban stations. However, several key land uses can be expected to be found near all stations. For example, one might expect to find feeder roads, parking lots, bus terminals, and "kiss and ride" stops near most if not all stations. This study utilizes a combination of air photo interpretation and field work to document the land use pattern currently found around San Francisco (BART) and Washington, D.C. (METRO) study station sites. Based on this investigation, the following conclusions are drawn:

1) a significant amount of fringe land has been and is being developed as a result of rapid transit systems,
2) two discernible patterns of land use occur, and
3) there are discrepancies and similarities between small town and suburban station land use patterns allowing the construction of two models of station area development.

2:45 WHERE HAVE ALL THE PORCHES GONE?

Jane L. Craig P.O.Box 106, Bath, Ohio 44210

The concept of the porch was brought to the United States as part of the cultural heritage of many nations. It was, for some period of time, an accepted feature on both rural and urban houses across the country. The advance of technology had an effect on lifestyles, as well as on the way houses were designed. People no longer were dependent on their immediate surroundings for social interaction. The porch migrated from the front of the house to the side; and ultimately to the back, where under California influence, it became a patio and finally a deck. After WW II, the expanding population created a need for inexpensive, quickly built housing. Porches were considered a frill and, along with basements and attics, were no longer built. Today there appears to be a resurgence in porch building.

3:00 Landscape Preservation: A Plea for the Inclusion of the Common and Utilitarian. Jeffrey J. Gordon, Department of Geography, Bowling Green State University, Bowling Green, OH 43403.

The last outhouse in use in Bowling Green, Ohio was sold at auction in 1988. The new owner will tear it down along with the house (without utilities), a shed, and a garage in 1989 to build a new house. Although reported in the local newspaper, no mention was made to try and save the outhouse, probably a ludicrous idea to most people. Preservation has become more accepted in recent decades as new laws protect qualifying sites. Although such legislation has already helped save innumerable landmarks, these efforts have usually been made on the magnificent, grandiose, imposing, and ambitious structures which include a wide array from banks, churches, and libraries to mausoleums and mansions. Examination reveals that the structures we consciously and consistently choose to preserve are not general examples from past landscapes but reflect the elite minority present then. Preserving only an unusual and atypical selection from the past results in a highly inaccurate and misleading legacy of earlier life. Efforts are needed to preserve more of the common landscape features which more realistically reflect the culture and life of the masses of people. Although less impressive, preserving these more typical structures will provide a less skewed, wider, and clearer understanding of our heritage.

3:15 HIGH TECH MICRO BUSINESS OF NORTHEASTERN OHIO

Richard W. Janson
Kent State University
The Janson Industries
1200 Garfield Ave. S.W.
Canton, OH 44706

Vera K. Pavlakovic
Division of Economic & Business Research
University of Arizona
Tucson, AZ 85721

Several conceptions of the relationship of high technology to small business are frequently assumed by development managers charged with policy formulation for economic growth. These include the following beliefs: 1. Most invention occurs in the small business sector; 2. Small business is responsible for the net growth in employment; 3. Innovation in large scale industry are highly dependent on implementation by the small businss sector.

The applicability of these statements to the high tech micro firms in the region of northeastern Ohio are assessed. The micro firms are also classified by industrial sector and by customer sector. Brief descriptive titles for the technologies are cross correlated with the micro firms. Inferences for the growth trajectory of northeastern Ohio are optimistic, because of development strategies already put in place by the Celeste Administration.

SECTION H. Science Education in G229B
First Morning 9:00 a.m.
Saturday, April 29, 1989
Rebecca Stricklin, Presiding

9:00 DO SOMETHING WILD: CONSTRUCT A BLUEBIRD NESTING BOX. Robert E. Rohrbaugh, Jackson Memorial Middle School, 7355 Mudbrook Street N.W., Massillon, OH 44646

One of our most beautiful songbirds, the Eastern Bluebird (Sialia sialis), is making a dramatic comeback in population, largely due to bird boxes put up by concerned people. Here's your chance to join in by constructing a bluebird box that you can take home with you.

Thanks to citizen contributions, through the "Do Something Wild!" checkoff option on the Ohio state income tax return form, all materials are provided free of charge.

You will also see the slide show "Where Have All The Bluebirds Gone?" produced by the North American Bluebird Society.

10:00 A NATURAL APPROACH TO SCIENCE: MUSEUM RESOURCES IN THE CLASSROOM. Ann Hoopfer. Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, Ohio 44106

The 1985-86 National Survey of Science and Mathematics Education found that while most teachers believed that laboratory classes were the most effective for teaching Science, most reported they do not have access to adequate laboratories, equipment, supplies, and other resources needed for teaching science. In addition, many elementary teachers may have insufficient science education to enable them to create an interesting approach to the subject for their students. To serve this need among classroom teachers, The Cleveland Museum of Natural History has created a Science Resource Center which is directed by a full-time coordinator to serve the teachers of the area. "Hands-on" resources such as taxidermied animals, specimen collections, replicas in kits, and "discovery trunks" are loaned to teachers. After-school Workshops offer teachers instruction in relevant areas of natural science, geology and astronomy. The development of the "loan units" and course offerings is directed by an advisory committee of area teachers. They pinpoint areas of expertise and describe curriculum resources which can be provided by the collections and staff of the museum. Funded by corporate grants separate from the museum's operating budget, this outreach program makes museum quality natural history resources available to the classroom while continuing to enhance the teaching of the natural sciences in teh Cleveland area schools.

SECTION H. Science Education in G229J
Second Morning 9:00 a.m.
Saturday, April 29, 1989
Toni L. Miller, Presiding

9:00 SCIENCE TECHNOLOGY FOR TODAY'S STUDENT. Thomas O. McCullough, Department of Mathematics and Applied Sciences, University of Cincinnati, Cincinnati, Ohio 45221 and Barbara J. Barker, Department of Chemistry, Xavier University, Cincinnati, Ohio 45207.

A program has recently been developed to train individuals for scientific technical positions in industry and government. These individuals have little or no background in science. Generally, they also have deficiencies in fundamental mathematical skills.

In the science technology program the skills of the students are developed gradually. Emphasis is placed upon fundamental laboratory practice. In response to the expanding biotechnical industry, course content is divided uniformly between chemistry and biology.

The first year of this two year program consists of general studies in chemistry and biology. An introduction to instrumental methods is provided. The second year of the program stresses applications of instrumental procedures. Upon completion of the program, graduates are successfully placed as technicians in industrial or governmental positions.

9:15 ADVANCED LEARNING FOSTERED BY OPTIONAL SCIENCE PROJECTS. Barbara J. Barker, Department of Chemistry, Xavier University, Cincinnati, Ohio 45207 and Thomas O. McCullough, Department of Mathematics and Applied Sciences, University of Cincinnati, Cincinnati, Ohio 45221.

Optional projects can be effective supplements to traditional classroom learning. They provide an opportunity for the student to be creative and innovative. They make a topic more meaningful and relevant.

The described projects were offered as an option in a college general chemistry course. This course was taken by students majoring in various fields. Students generally selected a project related to their major or extracurricular interests. These projects included posters, reports, models, or computer programs. Display of their projects in the department created enthusiasm among all students, even those not in the course. This heightened enthusiasm improved morale. It created an environment which supported and fostered learning. It made science more meaningful to the students in their daily lives.

9:30 CHICKENS IN THE CLASSROOM? PUTTING BIOS BACK IN BIOLOGY. William R. Bingle, David E. Lewis, and Kathleen J. King, Perry High School, 3737 Harsh Ave. S.W., Massillon, Ohio 44646

As traditional methods of dissection and "animals in a jar" Biology come under well deserved scrutiny and criticism, we have instituted the use of living specimens for growth and behavorial studies that fills a need which is evident in suburban students. Most students are lacking in even the most rudimentary skills in handling and caring for animals and are unaware of the importance of commercial animals in basic human nutrition. Using one day old chickens in the classroom allows the student to practice responsible handling and data gathering techniques. The lab exercise that we have developed addresses these issues.

Students observe behavior and growth. They collect, record, graph, and interpret data on these birds over a two week period. In addition, respect, proper care, and handling of the animals is demonstrated. The recognition and treatment of diseases common to chickens is an important part of lab preparation. Students have indicated that this lab activity has been a memorable part of their Biology experience.

9:45 ANIMAL USE AND CARE COMMITTEES AT THE PRE-COLLEGE LEVEL. Spencer E. Reames and Terry Keiser. Benjamin Logan H.S. Box 98, Zanesfield, Ohio 43360 and Dept. of Biological Sci., Ohio Northern University, Ada, Ohio 45810.

At the present time there is a great deal of discussion and concern about the use of animals at all levels of teaching and research. There has been much published in the popular press about the use of animals in research, yet few people understand the procedures that researchers must go through before the first animal is utilized in the laboratory. The implementation of animal care and use committees at the pre-college level could be used to teach about the "real" world situation and at the same time protect animals against inhumane use. This presentation will discuss the possible implementation of local animal care and use committees.

10:00 SCIENCE FAIR TEACHER/DIRECTOR Ruth Bombaugh, Langston School, 150 Pleasant Street, Oberlin, OH 44074

Ever feel overwhelmed by the skills your students need to be taught and the organizational details you need to accomplish in order to implement a successful science fair? Year-round organizational schedules for students and the teach-director can solve these problems.

SECTION H. Science Education in G229L
Third Morning 9:00 a.m.
Saturday, April 29, 1989
James Walker, Presiding

9:00 "INVENTURE: A PROJECT FOR TEACHING INVENTIVE AND CREATIVE SKILLS IN GRADES SEVEN THROUGH TWELVE"; VERSIC, Ronald J., Chairman, Youth Inventors Committee, Inventors Council of Dayton, 140 East Monument Avenue, Dayton, OH 45402

This paper describes the project developed by the Inventors Council of Dayton in conjunction with local educators in the Dayton, Ohio area. The project lasts for 45 days and makes use of a student guide, a teacher's manual and a two-hour video tape containing five programs. The project has been successfully used in schools in the Dayton, Ohio area and nationally. At the present time, the project is being expanded to the People's Republic of China at their request. This paper will describe the program, its acceptance and use in several school systems.

10:00 EARTH SYSTEMS EDUCATION: A NEW PERSPECTIVE ON PLANET EARTH AND THE SCIENCE CURRICULUM. Victor J. Mayer, Professor Science Education, Ohio State University; 249 Arps Hall; Columbus, OH 43210

The most recent NAEP indicates a continuing decline in knowledge of earth science concepts among high school students. Another study by Weiss indicates that offerings of high school earth science cources are also declining. At the same time, knowledge of Planet Earth processes and of the global changes being induced by technology have accumulated at an astonishing rate. The earth that students study in their textbooks does not represent that now known by scientists.

Mounting concern in both the earth science education community and among earth scientists resulted in a conference held in Washington, DC in April, 1988. The 39 educators and scientists participating reached consensus on four goals and 10 concepts that every citizen should understand about Planet Earth. These provide the basis for changing the science curriculum in the nation's schools through a new thrust that brings together interested educators in a cooperative endeavor being called "Earth Systems Education". Their goal is to infuse modern concepts regarding the earth system at all appropriate levels of the K-12 curriculum.

SECTION H. Science Education in B215 First Afternoon & Business Meeting 1:30 p.m. Saturday, April 29, 1989 William Bingle, Presiding

2:30 INFLUENCE OF SCIENCE DAY ON CAREER DEVELOPMENT: STUDIES OF 1949 OHIO SCIENCE DAY SUPERIOR RATED PROJE C TS.

Joyce Hostetler,* St. Wendelin School, Fostoria, OH, and Harold H. Lee , Ph.D., Master of Liberal Studies Program, The University of Toledo, Toledo, OH 43606-3390.

The object of this study was to ascertain the influence on the winners of the first State Science Day with respect to their subsequent education, careers, and relationship of their projects to their career development. The study also seeks from the winners advice on improving science education. Of the individuals who were located, 80% responded. Respondents are well educated , with 81% having B.S. and 31% having M.D. or Ph.D. degrees. Out of sixteen, fourteen are involved in science careers and seven of them are teaching at the university level. Half entered careers directly or indirectly related to their Science Day projects. Outstanding contributions include medical and biological research and developments in engineering. Advice given includes the value of a mentor, subject mastery necessary for success, and current topics of interest to students should be explored.

* Part of a thesis for a Master's Degree.

2:45 AN OVERVIEW OF A WORKSHOP ON SCIENTIFIC SOFTWARE AND COMPUTER INTERFACE TECHNOLOGY FOR TEACHERS K-12. DR. John L. Smith Mount Vernon Nazarene College 800 Martinsburg Rd. Mount Vernon, Ohio 43050

Over forty teachers (K-12) in Knox County participated in a three-day workshop on software and Interface Technology in the summer of 1987 at MVNC. The activities of this workshop will be discussed in detail in this session. In addition, data will be shared concerning the effects of the workshop on the participants' teaching methods the following year

3:00 SCIENCE AND TECHNOLOGY: THEIR USAGE AND IMPLICATIONS FOR THE CLASSROOM and INDUSTRY Stricklin, Rebecca-Oak Hills High School 3200 Ebenezer Road Cincinnati, OH 45248 Sarquis, Mickey - Miami University-Middletown and other panel members

Science and Technology have changed radically in the last few years in how they are being used in industry but the education process has not always kept up with the pace. Through specialized programs, such as The Partners for Terrific Science Program offered through Miami University funded by major grants, teachers are learning more about industrial processes so that they can impart this to their students to better prepare them for the work force and to encourage more students to enter scientific fields. The presenters will be demonstrating actual classroom units on various industrial topics that can be taken back and used in YOUR classroom. Topics will include: consumer testing, industrial chemicals, food and drug chemistry, stell production, and others.

SECTION H. Science Education in B212 Second Afternoon 1:30 p.m. Saturday, April 29, 1989 Spencer E. Reames, Presiding

2:30 INTRODUCTION TO THE OPERATION OF THE GELTEACH SYSTEM. Gregory S. Bambeck, Patricia J. Cockrell and Scott A. Hite. Geltech, Inc., 934 Salem Parkway, Salem, Ohio, 44460.

High resolution gel electrophoresis is the most commonly used technique employed by today's life science researchers. It is estimated that some ten million gels are run annually in the U.S.A. by more than a quarter of a million scientists and technicians, but that over 95% of college students graduate without ever having been exposed to this powerful technology. The reasons for this lack of training are that it is too expensive, too time consuming and that existing educational systems are of such a low resolution quality that they do little more than teach the basic principals.

The Gelteach System is a low priced, rapid, pre-packaged very high resolution electrophoresis teaching system that uses real world biological samples and obtain results that are superior to the majority of gels published in the scientific literature. Prepacked Gelteach laboratories span a broad range of electrophoretic techniques and the system is heartily endorsed by the Biological Sciences Curriculum Society (BSCS), the National Association of Biological Teachers (NABT), and the National Science Teachers Association (NSTA).

2:45 THE GELTEACH SYSTEM: A REVIEW OF THE INTRODUCTORY LABORATORY KIT SERIES. Daniel R. Barnes, Gregory S. Bambeck, Scott A. Hite and Patricia Cockrell. Geltech, Inc., 934 Salem Parkway, Salem, Ohio, 44460.

The three introductory Gelteach laboratories are referred to as the Commonality and Diversity of Life series. The general thrust of all three kits is to train students in the procedures for preparing real biological samples from plant and animal origin, and then to separate a mixture of genetically coded products by their molecular size. The object of each lesson is to provide visible and tangible proof of the abstract notion of genetic inheritance as it is taught through the use of mathematical symbolism in the classroom lecture.

The Gene Interaction kit demonstrates the gene products in the tetraploid triticale offspring of its diploid wheat and rye parents. The Genetic Distance kit compares the gene products of closely and distantly related fish species, a process that uses gene products to taxonomically key organisms in a process we call "evolutionary molecular archeology." Our Animal vs. Plant kit demonstrates how life scientists use electrophoresis to investigate the polypeptide substructure of holoproteins.

3:00 THE GELTEACH SYSTEM: A REVIEW OF THE INTERMEDIATE LABORATORY KIT SERIES. Patricia J. Cockrell, Gregory S. Bambeck, and Scott J. Hite. Geltech, Inc., 934 Salem Parkway, Salem, Ohio, 44460

The three intermediate Gelteach laboratories are referred to as the Human Serum Protein Series. The general thrust of all three kits is to expose the students to the analysis of electrophoresed and stained gels, to demonstrate the current real world applications of the technology in clinical diagnostics and to introduce the student to the potential futuristic medical benefits of the advanced electrophoretic techniques that they are actually performing themselves.

The Serum Protein Survey kit separates human serum into twenty-eight identified and diagnostically significant serum proteins, and the superiority of the diagnostic value over the five component separation system in present clinical diagnostics, is demonstrated. The Cardiac Risk Assessment kit demonstrates a state of the art separation

of the "bad cholesterol" LDL lipoproteins and the "good cholesterol" HDL lipoproteins. The Protein Structure kit demonstrates how life science researchers use electrophoresis to investigate the individually gene coded polypeptide substructure of serum holoproteins.

3:15 THE GELTEACH SYSTEM: A REVIEW OF THE ADVANCED LABORATORY KIT SERIES. Scott A. Hite, Gregory S. Bambeck and Patricia J. Cockrell. Geltech, Inc., 934 Salem Parkway, Salem, Ohio 44460.

The three advanced Gelteach laboratories are referred to as the Life Science Research series. The general thrust of these three kits is to demonstrate the varieties of physical parameters of electrophoretic separation, to teach new and powerful gene and gene product imaging technology and to train students to be competent in performing the most sophisticated gene product separation methodologies known to modern science. The prepackaged, ready-to-use kits give the students the power to perform front line research right in their own classroom laboratory.

The Isoelectric Focusing kit demonstrates both the separation of proteins by charge and the ability of the technique to distinguish between highly inbred genetic strains. The DNA Fingerprinting kit demonstrates DNA separation, highly sensitive silver stain technology and discusses the fundamentals of DNA sequencing. The 2D Electrophoresis kit thoroughly discusses the styles and applications of 2D electrophoresis and then permits the students to perform incredibly dazzling 2D separations and comparisons of their own.

3:30 CURRENT UNIVERSITY LEVEL EDUCATION IN THE BIOLOGICAL SCIENCES IN THE GERMAN DEMOCRATIC REPUBLIC. George E. Klee, Kent State University, Stark Campus, 1000 Frank Avenue, N.W., Canton, OH, 44720

The author spent 2 semesters & a summer of field research as an official guest Professor in the Biological Science section of the University of Leipzig-Karl Marx in the G.D.R. The professional & teaching aspects of his experiences will be summarized.

3:45 THE IMPACT OF SUPPLEMENTAL INSTRUCTION ON ATTRITION AND PERFORMANCE IN TWO NON-MAJORS UNIVERSITY BIOLOGY COURSES. Lowell P. Orr, J. David Glass and Keith L. Ewing, Department of Biological Sciences, Kent State University, Kent, OH 44242.

Supplemental Instruction (SI), a teaching model designed to improve critical thinking skills, was implemented in two high attrition lecture courses which stress application, synthesis, and analysis of concepts as opposed to recall. Neither course has labs or recitations. The model involves voluntary attendance at discussion sections led by senior biology majors trained in SI. At these sessions, students are encouraged to interact with each other and with course concepts by interrelating terms, applying concepts to unique situations, processing notes, and by other methods that encourage self-sufficient learning. Students who attended 11 or more sessions in BSCI 10001 had a final course average of 81.3% versus 70.6% for those who did not attend. The average attrition (D's, F's, and W's) among the former group was 4% and 41% for non-SI students. In BSCI 10002, 42% of students who attended SI sessions received A's and B's; 21% of non-SI students received A's and B's. The average attrition among 10002 SI students was 31% compared to 71% in non-SI students. As ACT scores were not significantly different between SI and non-SI students in either course, the marked enhancement of achievement in the SI students attests to the potential of this model in improving overall student performance.

4:00 OFFERING PHYSICS IN A DIFFERENT FORMAT. Myra R. West, Kent State University, Stark Regional Campus, 6000 Frank Rd.N.W., Canton, Ohio 44720

This academic year Kent State University has offered the telecourse THE MECHANICAL UNIVERSE and BEYOND THE MECHANICAL UNIVERSE on the Stark and Trumbull Campuses. Each semester the twenty-six 30-minute programs are televised on Saturday mornings for 13 consecutive weeks. The class meets on six 3½ hr. Saturday mornings every 2 to 3 weeks. The 3 credit nonprerequisite course is taught conceptually with an emphasis on the historical development of physics. Although the math background varies, the students were working simple derivatives and integrals the first semester. Class sessions begin with a quiz over TV programs discussed at the previous class. A lecture-demonstration is presented for the next set of programs with time provided for discussion and questions on the televised programs, class material, and problem assignments. A take-home midterm and final exam are required. This format is very different from our traditional delivery. The reasons for taking the course range from a review of physics to the first physics course ever taken to the first college course taken. The students are enthusiastic about the course.

4:15 A COLLEGIAL APPROACH TO STUDENT RETENTION

E. Jean Harper and Mary Ann Flowers
The University of Akron, College of Education
219 Zook Hall, Akron, Ohio 44325

By the year 2000 it is projected that the demand for teachers will outweigh the supply. Although this shortage will impact all disciplines, the problem will be more acute in the disciplines of mathematics and the sciences. Therefore, it becomes imerative that colleges of education train and retain students in greater numbers to increase the pool of potential teachers. The University of Akron, College of Education has developed a model for the retention of preservice teachers. This four-prong, collegial approach to student retention is in the initial year of implementation. The model includes the identification of students who demonstrate academic difficulties, inadequate study and test taking skills, poor time management behavior, and the inability to negotiate the demands of higher education. This paper will discuss each of the following components: evaluation, implications and replication of this model.

4:30 CAREER EDUCATION: LOOKING TOWARD THE TWENTY-FIRST CENTURY Linda D. Hayes and Mary Ann Flowers 4541 Granada Blvd. Suite 112 Warrensville Hts., Ohio 44128

Current trends in the American work force suggest a need to upgrade Career Education to better serve the present work force as well as the future one for the changing needs of an informational society. For example, future projections indicate that two million workers from basic industry need retraining for job re-entry by 1990; one to two million workers per year will be displaced by new technology and/or foreign competition; and eighty percent of America's jobs will require vocational or technical training for the twenty-first century. Based upon such employment trends and job market demands, Career Education cannot be viewed as a stepchild to college preparatory schooling, a tracking system for the underachieving student, or a stop-gap measure for the low achieving student. Career-vocational Education is not terminal, but encompasses a lifespan integration of knowledge and skills of technology to enhance the abilities of all workers in the work force. The emphasis of this paper is to discuss three issues of Career Education. First, the lag between education and projected industry needs. Second, how literacy should be defined for a technological and informational society as it emerges into the twenty-first century. Third, why the concept of Lifespan Education is essential to the evolution of Career Education.

SECTION H. Science Education in B213
Third Afternoon 1:30 p.m.
Saturday, April 29, 1989
James Walker, Presiding

2:30 EXTENDING THE ELEMENTARY SCIENCE CURRICULUM TO THE OUTDOORS: Grades 1-5 PROGRAM DESCRIPTION. John Miller and Sharon Hosko, Biology Dept. Baldwin-Wallace College, Berea, OH 44017

This cooperative program involving Baldwin-Wallace College, Cleveland Metroparks and Berea City Schools was supported by the National Science Foundation. The objective was to provide teachers with the training, support, and confidence to conduct investigative field trips. Twenty-seven teachers participated in a 10-day training session in June 1987. The subject areas were: Grade 1-Animals, Grade 2-Plants, Grade 3-Forest, Grade 4-Pond, and Grade 5-River (Stream). Unit plans for two 1987-88 school year field trips were prepared by each teacher during the summer. The plans consisted of

three parts: (1) Pre-Trip orientation to the locale, life, scientific principles, vocabulary, sampling techniques and equipment for the specific grade level (2) Field Trip organization, observations and collection of data (3) Post-Trip analysis of data, compilation of report, further study of principles, and environmental/societal relationships. Two winter meetings were held to review the experiences from the fall activities and to plan the spring trips. Staff members worked with the teachers and students during each part of the program. Curriculum guides written during a 5-day session in June 1988 are available at the Rocky River Nature Center of the Cleveland Metroparks.

2:45 EXTENDING THE ELEMENTARY SCIENCE CURRICULUM TO THE OUTDOORS: GRADE 5 - RIVER ECOSYSTEM. Sharon Hosko and John Miller, Biology Dept. Baldwin-Wallace College, Berea, OH 44017

The grade 5 study of the river ecosystem is an example of the investigative field trips that were the objective of this program. Six teachers worked with a program staff member to jointly conduct fall and spring field trips to the Rocky River in the Berea area of the Cleveland Metroparks. In pre-trip orientation classes were divided into seven research teams: (1) Transect (2) Rate/Sediment (3) pH/Temp/Oxygen (4) Seine Nets (5) D-nets (6) Rocks (7) Shore. The students were given a specific job, trained to use collecting equipment, and shown how the data they collected would be used. The pre-trip instruction also involved study of the five Kingdoms of living things and the major animal phyla. Living specimens of some of the kinds of organisms that would be encountered were brought into the classroom for practice in identification and observation with hand lenses. The teachers led the trips, while the staff member was assigned a supportive role with the research teams. Careful organization was critical to success. The post-trip activities included compilation, reporting and discussion of each team's data. Ecological niche and energy transfer in ecosystems were emphasized in post trip work. Additional activities included writing, geography, sociology and a trip to the Berea Water Plant.

3:00 A NOBLES POND EXPERIENCE: MIDDLE SCHOOL STUDENTS UNEARTH PALEO-INDIAN ARTIFACTS.

Jim Walker 8717 Wales Ave. NW., North Canton, 44720-5357

The Nobles Pond archaeological site in northern Stark county may well represent the first human dwelling places in our state. Organic materials from hearths there have been dated at about 11,000 years B.P.

Over 700 sixth, seventh, and eighth-grade students from Jackson Middle School (Jackson township) were given the opportunity to assist in the actual excavation of over 200 square-meter grids at the site last fall. The project was funded through a grant from the Martha Holden Jennings Foundation in Cleveland. Hundreds of lithic artifacts were "bagged" by the students who visited the site, one class at a time, accompanied by their science teacher and supervised by several experienced amateur archaeologists.

A community program on November 30th was the finale to the fall portion of the project. A wrap-up presentation will be given to each science class in May, after the cumulative data of their efforts has been completely compiled and evaluated.

3:30 THE USE OF DIDACTIC MATHEMATICS MATERIALS AS AN AID IN MAINSTREAMING STUDENTS WITH PHYSICAL IMPAIRMENTS. Jeanne Kathleen Catalano, Department of Special Education, Kent State University, Kent, Ohio 44242.

Children who suffer from cholestatic liver disorders often develop skin xanthoma which persist throughout the elementary school years. When these cover the extensor surfaces of the hand, the fingers, and the palmar creases, xanthoma become a great obstacle to small motor movement and most conspicuously to writing. Learning environments which place heavy emphasis on writing for teaching and expression of mathematics activities may burden the child with an additional handicap. It is important to establish a firm foundation in mathematics during these early years, both for future mathematical learning, and for extension into other science studies. Children with this physical impairment can be successfully integrated in regular classes with the aid of didactic materials. Attractive, concrete materials allow the child to explore and understand abstract concepts, while providing for spatial learning experiences and encouraging interaction with peers in small groups.

3:45 Desk Top Experiments For Elementary Schools. Theodore L. Miller, Department of Chemistry, Ohio Wesleyan University, Delaware, Ohio 43015.

Several years ago I started to visit elementary schools with a Chemistry Magic Show. A variety of chemical reactions were used to illustrate the magic of chemistry while relating the demonstrations to the world of children. For example, we would bake brownies (sulfuric acid on sugar) while preparing grape Kool Aid (Blue bottle reaction) and orange juice (a timed clock reaction). More recently, I have designed a series of desk top experiments for elementary students. These experiments include qualitative analysis and chromatography, and provide hands-on lab experience for children in a classroom environment. These experiments will be discussed in the context of advocating a specialized science teacher in the elementary school system.

4:00 *THE CLARK TAC COMPUTER: A SWEET WAY TO ENCOURAGE KIDS TO STAY IN MATH.* *Kylene Norman & John Bailey, Instructors, Clark State Community College, P.O. Box 570 Springfield, OH 45501*

Over 3000 7th through 12th grade students in over 100 different classrooms have seen the Clark Tac Computer Show. Each student has built his/her own working model of a binary computer using Tictac candies and plastic heart-shaped candy molds. But more than that, each student has found that math can be fun. The show is presented by a mathematician and an engineer appearing in costume. It is designed for all ability levels and teaches the binary number system and binary arithmetic. Students become involved in the humor and banter of the show and leave having had (in many cases) their first successful and fun experience ever in a math class. The show is presented in two different performances every Friday of the school year and is booked through May of 1989. With the current national emphasis on math and science, Clark State Community College supports the activity and offers it free of charge to schools in its service area. Teacher evaluations of the show have been totally positive. The show has received widespread media coverage, articles about the show have appeared in several statewide and national professional journals, and the Clark Tac team has shared the idea with educators at many state and national forums.

SECTION H. Science Education Poster Session in Theater Lobby Saturday, April 29, 1989

Board F @ 10:00 a.m. THE GELTEACH SYSTEM: A ONE SEMESTER COURSE IN HIGH RESOLUTION ELECTROPHORESIS. Gregory S. Bambeck, Patricia J. Cockrell, Scott A. Hite and Daniel R. Barnes, Geltech, Inc., 934 Salem Parkway, Salem, Ohio 44460.

Over a quarter of a million life scientists run about ten million gels a year in the U.S.A., but 95% of our college graduates have never been exposed to this technology. Students are not taught this technology because it is perceived as too expensive and time consuming. Geltech, Inc., working with educators, scientists, BSCS, NABT and NSTA have developed a research grade very high resolution electrophoresis laboratory teaching system that exposes students to a relevant variety of uses of many very powerful electrophoretic technologies. Results obtained are superior to most of what is published in the scientific literature, take less than two hours, cost less than five dollars per student per lab and permit front line research to be performed in the classroom. Students are exposed to SDS polyacrylamide gel electrophoresis (PAGE), Isoelectric Focusing PAGE, 2D PAGE, DNA Fingerprinting, Coomassie staining, silver staining gradient gels, etc. We intend future kits to include protein mapping, blotting, enzyme assay and DNA sequencing. Gelteach is a literal clone of Geltech, Inc.,'s research grade system.

Board G @ 10:00 a.m. A REPORT ON A STATE FUNDED PROJECT "TEACHERS TRAINING TEACHERS..." FOR THE EASTWOOD SCHOOL DISTRICT IN NORTHWEST OHIO. Dr. Evan McFee, Bowling Green State University, Bowling Green, Ohio 43403

This is a presentation to describe the implementation of a grant entitled "Teachers Training Teachers: Modeling Effective Techniques for Incorporating Problem Solving and Inquiry in the K-8 Classroom." This grant was designed to increase both the amount and the quality of problem solving and inquiry experiences in elementary and middle grade classrooms. The project started during the fall of 1988 and continued throughout the academic year. Teachers were selected and given hands-on laboratory experiences with mathematics and science. Participants then developed a series of inquiry lessons for their particular grade level. These lessons then became the basis for a sharing program with other teachers of the district. Also these participant leaders arranged to teach demonstration lessons in each of the other classrooms at their grade level. They also worked with other teachers to assist them in developing their own inquiry oriented lessons. This component was aided by the mathematics and science education faculty associated with the project.

Poster Boards PRESENTATIONS OF WINNERS OF 1987-88 BATTELLE AWARDS FOR PROFESSIONAL DEVELOPMENT.

In 1988 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 Board J	Shelia Kegg North Olmsted High School North Olmsted $2,500 Mathematics Teacher Award Winner
10:00 a.m. Board K	Pam Blaha Highland Middle School Medina $5,000 School Award Winner
2:30 p.m. Board L	Diane-Ruth Bombaugh Langston Middle School Oberlin $2,500 Science Teacher Winner

SECTION I. Anthropology & Sociology in G206
First Morning 9:00 a.m.
Saturday, April 29, 1989
Richard O' Toole, Presiding

9:00 INFANT MORTALITY IN CLEVELAND, OHIO.
John Holian, Social and Behavioral Sciences Division, Cuyahoga Community College, 11000 Pleasant Valley, Cleveland, Ohio 44130

Examination of published vital statistics since 1960 reveals that Cleveland's infant mortality rate has generally been declining as it has for Ohio's other large cities (Akron, Cincinnati, Columbus, Dayton, Toledo and Youngstown). Analysis of matched birth-infant death records for Cleveland resident birth cohorts 1979-1984 shows that the probability of an infant death is greater if the mother is young, black, single, poorly educated or has received little prenatal care. The infant mortality rate also varies greatly among the city's neighborhoods. Recommendations are made for further reducing Cleveland's level of infant deaths.

9:15 CHILD CARE: DIVERSITY IN INFANCY
William F. Laurie, U. S. General Accounting Office, Suite 350 Plaza None, 55 Erieview Plaza, Cleveland, Ohio 44114

Our national study of child care focused on obtaining a "real world" picture of the extent of services provided nationally and locally in two states -- Michigan and Ohio.

Overall we identified 46 federal programs that support child care or $7 Billion in 1986. However, no major program is considered sufficient nationally to meet the needs of our working population. State and local governments and private contributors, also provide significant child care services. All fall short of the demand for child care services.

Child care is in its infancy as far as development. Little is known about it. Some officials say there is enough; others say not enough. Still others indicate there is a system in place; others say no system exists. Our perspective indicates that tremendous diversity and complexity characterizes child care services in the United States. This diversity has come about in only a few years -- significant in light of the considerable time that is needed to evolve social programs in our diverse and unregulated society. Details on our findings will be shared in this paper.

9:30 "EGALITARIANISM AND DISTRESS." John M. Hazy
Department of Sociology and Anthropology, Kent State University, Kent, OH 44242

From a review of the literature involving work and family, there exists many trends and changes today that demand attention. Among them are these three: 1) dual-earner families now outnumber traditional families 2 to 1; 2) over half of married women today are in the labor force; 3) half of mothers of preschool children are employed outside the home. Furthermore, there is conflicting research which examine the notion that recent gender role changes lead to an improvement in women's mental health and a simultaneous distress level increase in men. As a result, this paper investigates the relationships between gender role atttitudes (measured by a Likert-type scale constructed by this author, Alpha reliability = .82) and distress (measured by the General Well Being Scale). The hypothesis is the higher the level of egalitarianism the respondent has, the lower the level of distress will be. In this study, data was obtained utilizing questionnaires given to a quota sample (n=80). Besides gender role attitudes and orientation, age, sex, presence of children, SES, income, and education will be looked at as independent variables affecting distress (dependent variable). Along with multiple regression and canonical correlations, discriminant and factor analyses are employed to describe and explain the acquired data. Further research would benefit in using a longitudinal-type format, and measuring social support.

9:45 GENDER & DEPRESSION: EVALUATING ALTERNATE SOCIAL ROLE EXPLANATIONS. Janet A. Michello, Wayne College, The University of Akron, 10470 Smucker Road, Orrville, OH 44667

The literature consistently reports higher depression rates among women when compared with men. The theories that have gained the widest support in explaining this phenomena have been the "social in origin" theories, and specifically social role theory. This study views social role theory as having three distinct themes--(1) the role occupancy perspective, which focuses on the actual roles held by men and women, (2) role fulfillment, which focuses on the level of satisfaction individuals have with their roles, and (3) multiple roles, which focuses on the number of roles held by individuals. This study considers how each of these perspectives explain higher depression rates of women by simultaneously testing the relative importance of each of these social role explanations. Data is from the Albany Area Health Survey, collected in the Fall of 1979 and 1980, and consists of 871 adults. The sex ratio is closely evenly distributed. Using regression analysis, the results demonstrate that women, when compared with men, are at greater risk of being depressed due to different role stressors and role combinations.

10:00 A COMPARISON OF HEALTH CARE SYSTEMS IN JAPAN, GREAT BRITAIN, AND THE UNITED STATES. T. Neal Garland, Department of Sociology, University of Akron, Akron, Ohio 44325.

Health care systems throughout the world must deal with the issues of access to care, the cost of care, and the quality of care. This

paper examines the ways in which the health care systems of Japan, Great Britain, and the United States attempt to cope with these issues. The costs and the levels of effectiveness, as measured by standard health indicators, of the three systems are compared.

10:15 WHO PARTICIPATES? WHO DECIDES? CARE OF THE FRAIL AGED
Kathleen G. Mastrian
The Pennsylvania State University
147 Shenango Avenue
Sharon, PA 16146

Issues associated with the care of the frail aged have important implications for decision-making about that care. This presentation will review recent literature to define issues and outline factors which should be considered in decision-making. These will be compared with the social histories of eight patients in a long term care unit to examine in more detail decision making as it actually occurs. This preliminary comparison of what ought to happen with what actually happens may suggest directions for future empirical study.

10:30 CULTURE, SOCIETY & COGNITIVE DISSONANCE
John D. O'Brien

Sociology and Anthropology
Kent State University
Kent, Ohio 44242

This paper examines the role of 'culture' and cognitive dissonance on the probability of individual religious experience. A non-deterministic, neo-Durkheimian model of 'culture' in interaction with the 'self' is proposed. Some indicators of 'cultural' superstructure are proposed, and a methodology to examine the effects of these indicators on the individual is presented. Durkheim's hypothesis that superstructure effects individual social acts (and thus the social structure) is operationalized. Predictor variables are determined to be 'cultural' indicators, and criterion variables are 1) individual religious experience and 2) individual participation in an organized religious activity or group. Results of a pilot study are presented which support the hypothesis and indicate that individuals prone to 'religious' experience can be predicted. While statistical analysis cannot determine cause, it is concluded that there is evidence to support Durkheim's contention that superstructure (cultural values) can inhibit individual social acts or experiences, and thus influence social structure.

SECTION I. Anthropology & Sociology in G229J
First Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Jonathan Bowen, Presiding

2:00 33ER30: A LATE WOODLAND SITE IN ERIE COUNTY, OHIO. George DeMuth, Sandusky Bay Chapter, Archaeological Society of Ohio, 4303 Nash Road, Wakeman, Ohio 44889.

33ER30 is located on a bluff of the Huron River in Erie County, Ohio. One pit feature yielded fire-cracked rocks, carbonized grease, 28 deer bones, Upper Mercer flint, and 4 pottery vessels, one almost complete, which suggest a date of A.D. 500-800. A set of two roasting pits which contained complete Cole-like and Springwells-like vessels have yielded radiocarbon dates of A.D. 1250±170 (Beta-28447) and A.D. 1100±50 (Beta-28448), respectively. Another pit feature yielded Mixter Tool-impressed and Parker Festooned ceramics, suggesting a date of A.D. 1300-1400. It also contained Pipe Creek bifaces and debitage, corn kernels, hickory nutshells, and over 1500 vertebrate faunal specimens. This pit feature differs from a contemporary set of features at nearby 33HU37 by its lack of raccoon bones and its great abundance of turkey remains. Other verteberates recovered include deer, elk, beaver, canid, woodchuck, squirrel, chipmunk, snapping turtle, box turtle, freshwater drum, walleye, and sucker. Invertebrates include Amblema plicata plicata, Ptychobranchus fasciolaris, and Goniobasis livescens.

2:15 EARLY ARCHAIC IN SENECA COUNTY, OHIO. Donald Weller, Jr., Seneca Arrow Hunter Chapter, Archaeological Society of Ohio, 3232 SSR 53, Tiffin, Ohio 44883.

For several years the author has been conducting archaeological survey in Seneca County, Ohio. Over 70 new sites have been added to the Ohio Archaeological Inventory as a result of this work, and numerous previously known sites have been re-examined. Many Early Archaic (8000-5000 B.C.) bifaces have been recovered, including Kirk Corner Notched, Kirk Stemmed, MacCorkle, St. Albans, and LeCroy points. While most of the larger specimens were made from east-central Ohio flints, many of the smaller ones were manufactured from more locally available Pipe Creek or Delaware materials. One component (33SE325), which is located on a bluff of the Sandusky River, has yielded at least 10 LeCroy points, along with a fair amount of debitage.

2:30 ARCHAEOLOGICAL SURVEY IN ROSS COUNTY, OHIO. Carmel G. Tackett, Mound City Chapter, Archaeological Society of Ohio, Route 4, Box 410, Chillicothe, Ohio 45601.

In March of 1988 members of the Mound City Chapter of The Archaeological Society of Ohio commenced a program of archaeological survey. Initial work has focused on the Chillicothe East Quadrangle in Ross County, Ohio. During the first nine months of the project 21 new sites were added to the Ohio Archaeological Inventory, an increase of over 40 per cent. Test excavations were conducted at three of these (33RO488, 33RO489, 33RO490). Also, portions of the Highbanks Earthworks (33RO24) were resurveyed using a 2.1 meter transect interval, which resulted in the location of five discrete intrasite lithic concentrations.

2:45 ARCHAEOLOGICAL SURVEY IN WESTERN ASHLAND COUNTY, OHIO. Charles Fulk, Johnny Appleseed Chapter, Archaeological Society of Ohio, 419 Sandusky Ave., Fremont, Ohio 43420.

The author has recently completed a preliminary surface survey of a portion of western Ashland County, Ohio. A total of about 10 new sites were added to the Ohio Archaeological Inventory as a result of this project. A component which has yielded several Late Archaic/Early Woodland (ca. 1200-200 B.C.) stemmed points and much debitage of Upper Mercer flint was discovered. This survey also shows that Pipe Creek flint from western Erie County, Ohio was used by prehistoric peoples in the project area.

3:00 THE EARLY ARCHAIC OF SOUTHERN RICHLAND COUNTY, OHIO. Carl Mooney, Johnny Appleseed Chapter, Archaeological Society of Ohio, 419 Sandusky Ave., Fremont, Ohio 43420.

Recent archaeological surface survey by the author has added over 40 new sites to the Ohio Archaeological Inventory files for southern Richland County. Numerous Early Archaic points, including MacCorkle, St. Albans, LeCroy, Kirk Stemmed, Kirk Corner Notched, Thebes, and St. Charles types of the period of ca. 8000-5000 B.C. were recovered. The vast majority have been manufactured from Upper Mercer flint. A major concentration of LeCroy points appears to occur on a glacial outwash terrace near a major stream.

3:15 MORTUARY ARCHAEOASTRONOMY AT THE PEARSON CEMETERY (33SA9). Daniel Fox, Archaeological Society of Ohio, 7603 Wahl Road, Vickery, Ohio 43464.

During excavations at the ca. 1300-1450 cemetery associated with the Pearson village site complex, it became apparent that nearly all of the burials were oriented with their heads pointing roughly toward the east. Of the 127 burials well enough preserved for use in this study, 62% were oriented within 20° of due east, while 19° were actually pointing due east. The remaining deviated from due east between 20°-60°. By comparing the axial orientation of the bodies, as well as their

ages, sexes, and the directions of their faces with specific astronomical objects, such as the sun's and moon's declinations, the moon's age, and highly visible planets on certain days during the cemeteries period of use, it is hypothesized that the seasons of individual deaths and burials, as well as sociological/demographic differences in the mortuary program may be able to be reconstructed. This is being tested by: 1) entering mortuary information into a specially modified computer program which can depict potentially relevant astronomical variables, 2) cross-referencing these data to find matches, 3) extracting those matches, and 4) disposing of junk data

3:30 33HR111, AN ARCHAIC SITE IN HARDIN COUNTY, OHIO. James Lightner, Scioto Marsh Chapter, Archaeological Society of Ohio, 419 Sandusky Ave., Fremont, Ohio 43420.

Archaeological site 33HR111 is located on a broad terrace of the Scioto River in Hardin County, Ohio. Analysis of ca. 1820 General Land Office survey field notes suggests that this terrace formerly supported an oak/hickory forest. Surface survey of 33HR111 has revealed the presence of at least five discrete loci. These spatially discontinuous loci include an intense concentration of Cedarville-Guelph chert debitage, a concentration of Cedarville-Guelph Brewerton-like points, a cluster of grooved hammerstones, a spot where notched butterfly bannerstones were manufactured, and a sparse cluster of ca. A.D. 1200 triangular arrow points. This site is very similar to site 33SE1, which has produced virtually identical finds, and is located in a similar physiographic and floral setting on the Sandusky River in Seneca County. The main occupations at both 33HR111 and 33SE1 probably date to ca. 3000-1200 B.C.

3:45 ARCHAEOLOGICAL SURVEY IN THE PORTAGE RIVER REGION OF NORTHWESTERN OHIO. David J. Snyder, Archaeological Society of Ohio, P.O. Box 388, Luckey, Ohio 43443.

The author has just completed a preliminary archaeological survey of the Portage River region of northern Ohio. A total of approximately 250 new sites have been added to the Ohio Archaeological Inventory files for Wood, Ottawa, and Sandusky counties as a result of this survey. Diagnostic bifaces of the pre-7800 B.C. period are scarce, although Early Archaic (7800-5000 B.C.) points are common, including the MacCorkle, Thebes, and LeCroy styles. Neither Adena Stemmed, Ashtabula, Satchell, Snyders, nor Stringtown points of the 2000 B.C.-A.D. 400 period are represented in this sample by more than a vey few specimens. Similarly, late prehistoric triangular arrowpoints (post-A.D. 1000) are very rare, and only one ceramic site was located. Small notched or stemmed points of Upper Mercer, Ten-mile Creek, and Pipe Creek flints are abundant, and a meaningful temporal placement of these poorly understood but very common specimens will be necessary for an adequate understanding of post-Early Archaic land use patterns.

SECTION I. Anthropology & Sociology in G225
Second Afternoon 1:30 p.m.
Saturday, April 29, 1989
Richard O' Toole, Presiding

2:00 THE BLUE BANKS SITE REVISITED. Timothy J. Abel. The University of Toledo, 2801 W. Bancroft Street, Toledo, Ohio 43606.

The Blue Banks site (33-SA-10) is located just south of Fremont, Ohio, on the Sandusky River. In past presentations and reports it was stated that the site was a continuous victim of looting and erosion, and thus almost totally destroyed. However, recent research has proven this to be wrong. While much of the site is indeed destroyed due to the above mentioned forces, much still remains which has vastly altered our understanding of the late prehistory of the Northwestern Ohio region.

2:15 THE NETTLE LAKE PROJECT: NEW PERSPECTIVE ON THE SETTLEMENT AND SUBSISTENCE OF WESTERN BASIN LATE WOODLAND POPULATIONS, CA. 1000-1300 A.D. Susan Bechtel, 7910 Jeffers Rd., Whitehouse, Ohio 43571

Survey work conducted during the fall of 1988 in Williams County, Ohio, has generated new information regarding the settlement and subsistence of Late Woodland Western Basin Tradition populations in extreme northwestern Ohio, northeastern Indiana, and southern Michigan. Several new sites discovered during the course of the Nettle Lake Project have not only contributed to the existing Western Basin data base but have raised new questions about site size, function, and distribution during the Late Woodland period, ca. 1000-1300 A.D.

2:30 THE GREEN CREEK PHASE: AN EARLY LATE WOODLAND CULTURAL MANIFESTATION IN NORTH-CENTRAL OHIO. David M. Stothers, Ph.D.; Director, The Western Lake Erie Archaeological Research Program, University of Toledo, Ohio 43606.

Until recently, the period of time intermediate to the north-central Ohio Middle Woodland Esch phase (ca. 1-500 A.D.) and the Eiden phase (ca. 1000-1200 A.D.), the earliest defined phase of the Sandusky tradition, has been problematic and unperceived. However, new information pertaining to a series of sites distributed on islands and shoreline locales in the Sandusky Bay and lower Maumee River Valley regions have begun to bring this enigmatic period of time into focus. Based upon information derived from these sites the early Late Woodland Green Creek phase (ca. 500-1000 A.D. has been defined. Predictive modeling based upon settlement and subsistence parameters as well as ceramic, lithic and radiometric information suggest that this manifestation represents an 'in situ' cultural development which emerges from the Middle Woodland Hopewellian Esch phase. Rim, neck and shoulder sherds from water eroded surface contexts, in addition to reconstructed vessel segments and whole vessels included in burial, refuse and cache pit contexts, indicate that the Green Creek phase is temporally and ceramically analogous to the Newtown phase of southwestern Ohio and northern Kentucky. These distinctive cordmarked vessels are stylistically, and temporally intermediate to the Esch Cordmarked and later Mixter Cordmarked ceramic types. A vertical "arrow" motive links these vessels to the Sandusky Tradition.

2:45 MULTIFACTORIAL DETERMINATION OF SKELETAL AGE AT DEATH: ACCURACY AND BIAS IN SMALL SAMPLES. Stephen M. Duray, Dept. of Anthropology, Kent State University, Kent, Ohio, 44242.

The accurate assessment of age at death in skeletal populations is essential for the reconstruction of prehistoric survivorship curves. The present study was initiated to test the applicability of multifactorial aging to small samples. A sample of 30 skeletons of known age at death was selected from the Hamann-Todd collection. The composition of the sample in regard to age, sex, and race was left completely unknown to the investigator. Age was assessed independently on five indicators. These included pubic symphyseal face, auricular surface, dental wear, cranial suture closure, and trabecular involution of the proximal femur. Principal Components Analysis was used to generate weightings for each indicator. The final estimated age for any individual was taken to be the weighted average of all age indicators for that specimen. Accuracy and bias were calculated based on the difference between real and estimated age for each specimen. Results indicate that multifactorial aging produced a more accurate and less biased estimate of real age than any of the individual indicators alone. It is concluded that multifactorial age estimation is a robust technique which retains its effectiveness in small sample applications.

3:00 **SOCIAL SCIENCE DIVERSITY AND 21st CENTURY ANTHROPOLOGY. Barry E. Thompson. Dept. of Liberal Arts, P.O. Box 1027, Rio Grande College, Rio Grande, Ohio 45674.**

Since the 17th Century many scholars have sought a common language or unity in the social sciences. Bacon, D'Alembert, Condorcet, and others helped shape both an organizational perspective and a future-oriented goal for the social sciences. Anthropology and the other specialized disciplines of the 19th Century helped change these earlier ideas, but the drive for a more integrated and coherent study of human organisms remains real. The idea of a unified theory of human behavior is an elusive myth. The role of Anthropology and other specialized fields will be challenged by increasing intersdiciplinary interaction among the social sciences which will obscure the reasons

for these separate fields. Advancement of knowledge will appear to result from these interdisciplinary efforts, but the politics of social science education and research will continue to be an obstacle. The role of Anthropology will be to balance the interests of the specialized fields by increasing clarification and commitment to the basic tenets of the scientific attitude, including tolerance and respect, rather than the dream of either a unified theory for all the social sciences or a more centralized education and research structure both of which limit human understanding. Anthropology should focus on the need for a different bio-cultural study of the human species.

3:15 ILLNESS WORK CONDUCTED BY SPOUSES OF HEMODIALYSIS PATIENTS. Mary B. Scott, RN, MSN, 1987 Wiltshire Road, Akron, OH 44313

This study examined the illness work undertaken by spouses in providing care to their mate who is receiving hemodialysis treatments. Through semi-structured interviews, data was collected as to the care involved in activities of daily living, articulation of work, resource management and the emotional burden encountered in providing care. The findings of this study were similar to those reported by Anslem Strauss and Juliet Corbin with the exception as to the reason why spouses continue to provide care.

SECTION J. Natural Resources in B217 Only Morning 9:00 a.m. Saturday, April 29, 1989 David Todt, Presiding

9:00 A PROPOSED MATRIX APPROACH TO DESCRIBING PUBLIC AGENCY COLLECTION, ANALYSIS, AND REPORTING OF DATA ABOUT WATER RESOURCES IN OHIO. Dr. Robert L. Vertrees. School of Natural Resources, The Ohio State University, 2021 Coffey Road, Columbus, OH 43210.

State of Ohio agencies have recently initiated efforts to inventory water resources data management activities in the state and to coordinate them through a computerized multi-agency water information system. The author has recently developed a matrix approach to describing the collection, analysis, and reporting (i.e., management) of data about water resources in Ohio by federal and Ohio agencies. Rows of the matrix present categories of water-related topics about which data have been managed. Columns present a categorized listing of agencies (and appropriate divisions within agencies) involved with this data management. A system has been designed to briefly indicate in cells of the matrix various types of agency data management activities. A brief survey form has been prepared to obtain information from agencies to insert into the cells. This approach was developed as part of an effort being coordinated by the O.S.U. Water Resources Center to obtain funds for publishing an Ohio water atlas. In addition to uses related to the atlas, it is proposed that the matrix approach could also be used in the efforts to establish an Ohio water information system and in efforts initiated through the newly created Ohio Land Information Program to coordinate the management of computerized, spatial, land-related information.

9:30 IMPLEMENTING NONPOINT SOURCE POLLUTION AND WATER QUALITY MANAGEMENT PROGRAMS THROUGH SOIL AND WATER CONSERVATION DISTRICTS. Jill Deibel Ohio Department of Natural Resources, Division of Soil and Water Conservation, Fountain Square, Building E-2, Columbus, OH 43224.

A 1989 survey of Soil and Water Conservation Districts in Ohio indicated that districts are deeply involved in nonpoint source pollution management practices. In fact, no other agency boasts this variety and degree of involvement in nonpoint source activities. Land treatment has long been recognized as the most cost-effective method for improving water quality, and Soil and Water Conservation Districts have a long history in application of land treatment practices. The survey of Ohio's Soil and Water Conservation Districts indicated that each district is devoting two and one-half work years to nonpoint source management, with top priorities being agricultural erosion control, hydromodification, urban stormwater, and animal waste management. Currently, states are setting in place mechanisms for implementing nonpoint source management programs. This survey indicates that the mechanism for controlling nonpoint source pollution is already well established in Ohio in conservation districts. Responsibility for and funding of districts to implement nonpoint source programs should be increased since they have the necessary technical expertise, local credibility, and good working relationships with landowners and local units of government.

10:00 A NEW APPROACH TO WATER RESOURCES TRAINING. Henry H. Smith, Ph.D., Central State University, Wilberforce, Ohio, 45384

Central State University in Wilberforce, Ohio has developed a unique curriculum which leads to a Bachelor of Science degree in Water Resources Management. This program, offered through the newly established International Center for Water Resources Management at the historically Black university, is designed to give the student a solid foundation in the technical aspects of water resources management while at the same time creating an understanding of the social, economic, political and other factors impacting water resources management. Additionally, non-majors are provided the opportunity to supplement their major coursework with courses in water resources. This allows Central State students to obtain degrees in traditional fields with an advantage of being able to orient their training to a specialized area in which there is great demand. Marketing of the program to potential students and employers has been challenging, but successful. Potential graduates of the program have proven to be in great demand and interest has been shown nationally and internationally in duplicating this novel approach to training of a new breed of managers of the world's critical water supplies.

10:30 COMPUTER OPERATED WEATHER STATION

Robert Priddy, Biology Dept., Mt. Vernon Nazarene College, Mt. Vernon, OH 43050

In 1984, a Title III educational grant funded a computer operated weather station for use with the curriculum in the natural resources' program. It required three years of programming and testing, 1984-87, during which time nine weather probes were established: temperature, relative humidity, barometric pressure, wind speed and direction, solar radiation, tipping bucket rain gauge, soil temperature and soil moisture. In 1988, five additional probes were added: soil temperatures at four and ten inches, soil temperature and moisture under mulch, and a back up tipping bucket gauge. A standard rain gauge is also used during the summer. In March of 1988, the Station was approved as a monitoring station for the Ohio Agriculture Research and Development Center (OARDC).

Mt. Vernon Nazarene College is located between the Weather Stations of Port Columbus and Mansfield. Student analyses of the temperature, relative humidity and barometric pressure showed a significant correlation with both of those stations. During 1988, students studied the wind direction, velocity and wind deviation for a report to the Professional Center of Agriculture. A current project is the study of soil temperature and moisture under mulch, and under bare soil, for a report to the Soil Conservation Service.

10:45 THE HARDIN COUNTY BIOLOGICAL SURVEY
Terry Keiser, Eric Nelson, and Nelson Moore Dept. of Biological Sciences, Ohio Northern University - Ada, Ohio 45810

The Hardin County Biological Survey was formed in 1981 with the goal of cataloging the flora and fauna of the county as well as identifying critical habitat areas. A comprehensive survey of the Caudata of the county identified eight species. Two, Plethodon c. cinereus and Hemidactylium scutatum occupy very restricted habitats in single locations.

Current ongoing projects include an extensive survey of stream-dwelling fishes as well as surveys of reptiles, plants, and wintering kestrel populations. Future projects include a survey of butterflies and aquatic insects.

Extensive use of volunteer cooperators and student help has been used since the inception of the survey. The Hardin County Biological Survey could be used as a model for similar projects in discrete geographical areas

SECTION J. Natural Resources in B217 Only Afternoon & Business Meeting 1:30 p.m. Saturday, April 29, 1989 Melvin Hathaway, Presiding

2:00 A UNIFYING PRINCIPLE FOR BIOLOGY
C. A. Hilgartner & David L. Johnson
254 Kensington Place, Marion OH 43302

Humans time-bind. They accumulate human knowledge (in the form of tested guesses or theories) at exponential rates. This, the defining mark of the species, permits humans to survive in the biosphere: by cooperating to apply what they know, they come to know more. We maintain that this principle unifies all human knowledge, including biology.

(A) Premises: In order to test guesses, humans must hold them as inaccurate and incomplete. As living systems, humans form a part of the "subject-matter" of biology, which makes it self-referential. These constraints yield a setting of radical uncertainty, which systematically includes the observer or self. Traditionally, however, humans secretly tend to hold knowledge (theory) as "accurate," "complete," and "objective." These tenets yield a setting of presumed absolute certainty, which systematically eliminates the self from consideration.

(B)Transacting: What happens between an organism and its environment leaves both fundamentally altered. Since actions necessarily follow from theory, what happens when humans deal with their environment depends on what kind of theories the humans operate from. Transacting from self-eliminating theories leaves the environment less hospitable to organisms, and the humans more like machines; while self-including theories permit humans to make the biosphere more hospitable to organisms, and themselves more responsible and life-enhancing as stewards of the biosphere.

2:15 OHIO'S ROLE IN GREAT LAKES EDUCATION.
Rosanne W. Fortner. School of Natural Resources, The Ohio State University, 2021 Coffey Rd., Columbus, OH 43210.

Research conducted through the Ohio Sea Grant Education Program has indicated a continuing need for education about the Great Lakes and their importance to the region. Student knowledge levels as indicated by a statewide surveys are low (38% in Grade 5 and 48% in Grade 9), and some basic information about important Great Lakes concepts is apparently not being acquired in schools. The Education Task Force of the Great Lakes Commission, a group of formal and nonformal educators and agency representatives, worked throughout 1988 to develop goals and strategies for enhancement of Great Lakes precollege education. The summary report and implementation plans include recommendations for development of networks, compilation of information about curricula, funding of regional efforts, and information dissemination campaigns. Ohio's leadership role in these efforts will be described and participation invited through this report.

2:30 SUMMER YOUTH LITTER CORPS (SYLC); ADMINISTERED BY ODNR'S DIVISION OF LITTER PREVENTION & RECYCLING; AN EFFECTIVE EDUCATIONAL PROJECT - DAN ATZENHOEFER, ODNR, E-1, FOUNTAIN SQUARE, COLUMBUS OH 43224

A joint effort between the Divisions of Litter Prevention & Recycling and Civilian Conservation SYLC, began in 1982, through a cooperative agreement with local elected officals using Job Training Partnership Act (JTPA) qualifying youth to collect litter from Ohio's roadways. It has operated in all major cities and 87 of Ohio's 88 counties. It enjoyed wide public support and received outstanding media coverage. During its seven successful years, 457 crews of six to ten youth and a crew leader, cleaned litter from over 77,000 miles of roadways and collected more than 405,000, 30-gallon bags of litter. Over 4,000 JTPA youth participated in the program. The youth and the program received commendations from Township Trustees, County Commissioners, Mayors, Ohio General Assembly, Governor Celeste, and was recognized nationally as a first place winner in the Take Price in America Program. As a result of SYLC efforts, a greater public awareness of the litter problem was created. The youth learned about the importance of clean environment, usable skills and the work ethic. Roadways and public lands are cleaner and the public awareness of the need for cleaner communities is evidenced by new legislation and landfill closures.

3:00 SHAWNEE ENERGY EDUCATION PROJECT.
David Todt, Shawnee State University, Portsmouth, OH 45662.

Residents of southcentral Ohio are neighbors to a major facility in the nuclear fuel cycle (PORTS Gaseous Diffusion Plant), but are largely unaware of energy in society issues in general and PORTS plant concerns specifically. The Shawnee Energy Education Project (SEEP) is a collaborative effort between Shawnee State University, Martin Marietta Energy Systems, and area schools to increase energy awareness, enhance environmental understanding, and improve science literacy among middle school students. SEEP includes teacher inservice workshops, mini-grants of $400 to participating classroom teachers, field trips to energy facilities, implementation of energy teaching units, and an evaluation of the program.

SECTION K. Genetics and Cell Biology in A237 Only Morning 9:00 a.m. Saturday, April 29, 1989 Jong S. Yoon, Presiding

9:00 ACUTE PRODUCTIVE INFECTION OF HUMAN ENDOTHELIAL CELLS WITH TWO STRAINS OF CYTOMEGALOVIRUS. WJ Waldman, WH Roberts, JM Sneddon, RE Stephens. The Ohio State University College of Medicine, Department of Pathology, M-368 Starling-Loving Hall, 320 West Tenth Avenue, Columbus, Ohio 43210.

Endothelial involvement has been implicated in human cytomegalovirus (CMV) infection, a major complication in immunosuppressed individuals (e.g. AIDS and organ transplants). To characterize CMV/endothelial cell interaction, cultured human umbilical vein endothelial cells (HUVE) were inoculated with CMV AD169, or a recent clinical isolate (CMV-VHL), at titers of 0.001-1.0 PFU/cell. In situ hybridization using a biotinylated, CMV-specific DNA probe confirmed the presence of CMV DNA in cells inoculated with either strain of virus. Immunofluorescent staining for CMV-specific antigen expression was consistent with hybridization studies. Infection of HUVE by VHL was accompanied by dramatic cytopathology, whereas AD169-infected cells appeared morphologically unperturbed. Production of infectious virus in HUVE cultures infected with either strain of CMV was demonstrated by plaque assay of culture supernatents on human fibroblast monolayers; however, productivity levels varied between strains. These studies demonstrate productive infection of human endothelial cells by two strains of CMV, while suggesting significant strain-dependent differences in infectious properties on both the qualitative and quantitative levels.

9:45 STUDY OF STARFISH SPERM MOTILITY
Kweon Yu, Leann Fitch and Harold H. Lee
Department of Biology, University of TOLEDO
Toledo, Ohio 43606

Microscopic observation aided by video recodings make possible the calculation of the percentage of sperm motility in artificial sea water (ASW). Viewing grids make possible the measurement of sperm's forward motion within a sample as well. The addition of 1-methyladenine, a reproductive hormone of starfish maturation, into ASW will be studied by measurement of starfish sprem motility.

10:00 DIFFERENTIATION OF MATURATION-INDUCING HORMONE RECEPTORS IN Patiria miniata. W. G. Liu and Harold H. Lee, Department of Biology, The University of Toledo, Toledo, OH 43606

During oogenesis the reinitiation of meiosis of fully-grown oocytes from the blocked first meiotic prophase is induced by a maturation hormone, 1-methyladenine (1-MA). Oocytes that are small and not fully-grown do not respond to 1-MA stimulation and they do not dilute the 1-MA effectiveness in the incubation medium by serial absorption experiments as the fully-grown ones will. Cytoplasmic maturation is therefore accompanied by the differentiation of a factor responsible for 1-MA induced maturation. This factor(s) can be isolated by washing with triton-X 100 and they can be reincorporated back onto the washed fully-grown oocytes which again will respond to 1-MA. We have recently used different carbohydrates to probe the nature of the factors.

The inhibition of maturation by different carbohydrates indicates that one or more of these compounds may be an important part of the factor, the hypothetical hormone receptors, in the differentiation starfish oocytes.

10:15 INDUCIBILITY BY TOLUENE OF ABNORMAL SPERM IN SPRAGUE DAWLEY RATS. Carmen Herron, Constance Shanklin, Scott Parham, Cherly Lyons and Willie J. Washington. Department of Biology, Central State University, Wilberforce, Ohio 45384.

The sperm abnormality analysis can be used as a rapid method to determine the mutagenic potential of xenobiotic agents. Toluene, an organic solvent was investigated for its potential mutagenicity in male Sprague Dawley rats via the sperm abnormality assay. Adult male Sprague Dawley rats were exposed by intraperioteneal (ip) injection to three concentrations (0.4, 0.8 and 1.67 ml/kg) of toluene per day in corn oil for five consecutive days. Corn oil was given as the control agent. Animals were sacrificed three and five weeks after treatment for an analysis of the products of spermatogenesis. This represents an analysis of cells exposed at late and early spermatid stages, respectively. The number of normal and abnormal sperm heads were determined in an average count of 500 sperm per treated animal. The average percentage of abnormal sperm heads was greater after three weeks of exposure than after five weeks of exposure for each dose level. A dose-related increase in abnormal sperm heads was observed; however, the dose response curve was nonlinear. The results of this investigation indicate that the late spermatid stage of spermatogenesis is more sensitive to the mutagenic action of toluene than the early spermatid stage. Supported by NIH Grant #RRS8052

10:30 ANTIOXIDANTS, SYNERGISM AND MAXIMUM LIFESPAN IN DROSOPHILA MELANOGASTER D. Campbell and P. McCarthy. Department of Biology, Westminster College, New Wilmington, PA 16172

In the free radical model of aging, free radicals cause organismic aging and death. Free radicals are natural high-energy by-products of oxygen consumption that damage membranes, mitochondria and DNA. Free radical scavengers are enzymes that bind free radicals and render them harmless. Scavenger enzyme production becomes reduced or defective with age. Antioxidants (in the diet) can serve the same scavenger function, but research into the life-extending possibilities of individual antioxidants has yielded mixed results. It may be that an organism has a fixed level of free radical scavengers and dietary antioxidants only lower that level with no net effect on lifespan.

This study was conducted to test for a possible synergism between antioxidants. In a 2X2X2 factorial design, fruit flies were raised on media containing three different antioxidants in various combinations: 1.0 mg/ml alpha-toconherol (vitamin E): 0.01 M ascorbic acid (vitamin C); and 0.1 mg/ml biotin (vitamin H). In all, ten groups of about 100 flies each were tested and data were analyzed using ANOVA. Preliminary results indicate no synergistic effect.

10:45 AGING AND LIPOFUSCIN CONTENT IN CNS TISSUES OF MERIONES UNGUICULATUS R. Busch, P. McCarthy and M. Rudzik. Department of Biology, Westminster College, New Wilmington, PA 16172

Lipofuscin accumulation is the most obvious histological manifestation of aging in the nervous system of all animals studied. Lipofuscin granules are thought to be non-functional postlysosomes or partly active telolysosomes. During aging, the lipofuscin:free lysosome ratio has been shown to increase. CNS accumulation of lipofuscin has been noted in many mammalian species. The present work involved transmission electron microscopic observation of the cerebrum, cerebellum and medulla from male gerbils of different ages (1, 6, 12 and 18 months). The number of lipofuscin granules increased with age. In addition, several granule shapes were observed which may be related to the aging process and/or different development stages of individual lipofuscin granules.

SECTION K. Genetics and Cell Biology in A237
Only Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Jong S. Yoon, Presiding

2:00 RIBOSOMAL DNA AMPLIFICATION DOES NOT OCCUR DURING OOGENESIS IN THE COPEPOD CRUSTACEAN, ACANTHOCYCLOPS VERNALIS. David M. Standiford and Thomas Gregg Miami University Oxford, Ohio 45056

A central feature of oogenesis in the copepod, Acanthocyclops vernalis, is the formation of a very large nucleolus in the oocytes. This nucleolus has been shown to be the sole source of rRNAs for inclusion in the egg and appears to have a high rate of rRNA synthesis. Due to its large size and high activity, we have hypothesized that the germline genome of this organism contains a number of "supra-somatic" rDNA sequences which are used solely during oogenesis to increase rRNA production. These sequences would not be necessary for somatic function and could therefore be eliminated from the pre-somatic cells during chromatin diminution, which occurs during the sixth cleavage division in A. vernalis. An alternative hypothesis to account for the formation of the large nucleolus would be rDNA amplification; a feature of oogenesis in many other organisms. The present study was designed to test this latter hypothesis. Adult females containing oocytes in all stages of development where allowed to take up 3H-thymidine (100 uCi/ml) for 90 min. Other adult females were treated similarly with 3H-uridine. Ovaries from both groups were dissected out, squashed on a glass slide, and treated for autoradiography. The results from this study showed that 3H-uridine was incorporated into nucleoli at a high rate, but 3H-thymidine was not, even though it was incorporated into dividing somatic cells and oogonia. This indicates that rDNA amplification does not occur during oogenesis in this organism.

2:15 GENETIC POLYMORPHISM OF SUPEROXIDE DISMUTASE (SOD) IN WHITE-TAILED DEER, ODOCOILEUS VIRGINIANUS Stephanie J. Shaw and Bonnie L. Lamvermeyer, Department of Biology, Denison University, Granville, Ohio 43023

Superoxide dismutase (SOD) is a metalloenzyme that protects against the toxicity of superoxide radical accumulation by catalyzing the dismutation of free oxygen radicals to yield hydrogen peroxide and molecular oxygen. Cytoplasmic eukaryotic SOD A contains two subunits, one of copper and another of zinc. Superoxide dismutase polymorphism was assayed by polyacrylamide isoelectric focusing in a 4.0-6.5 pH range gel. SOD banding patterns were generated from the light reduction of nitroblue tetrazolium in the presence of the catalyst phenazine methosulfate. The result is a blue formazan background with yellowish bands representing the superoxide dismutase. The rare allele SOD A2 was found in an isolated population of white-tailed deer, Odocoileus virginianus, from the Plum Brook Station of the National Aeronautics and Space Administration near Sandusky, Ohio. Evolutionary mechanisms such as genetic drift and natural selection may have contributed to the establishment of the rare allele at a polymorphic frequency of 0.257.

2:30 MICROPROJECTILE BOMBARDMENT OF EMBRYOGENIC SUSPENSION CULTURES OF SOYBEAN (GLYCINE MAX), COTTON (GOSSYPIUM HIRSUTUM), AND PINE (PINUS SP.). John Finer[1], Howard Kriebel[2], Michael McMullen[1,3], Barbara Norris[1], and Judith Smith[2]. [3]USDA-Agricultural Research Service, [1]Department of Agronomy, and [2]Department of Forestry, OARDC/The Ohio State University, 1680 Madison Ave., Wooster, OH 44691.

Before gene transfer in certain plants can become routine, transformation and regeneration must first be well characterized for those plants. Embryogenic suspension cultures have been developed for soybean (*Glycine max*), cotton (*Gossypium hirsutum*), and pine (*Pinus sp.*). These cultures are being used for microprojectile bombardment, where high density microprojectiles carrying DNA are accelerated towards and penetrate regenerable plant cells. Microprojectile bombardment is being optimized using transient expression of the scorable marker β-glucuronidase (GUS). The presence of the GUS gene in embryogenic cells was detected following addition of the histochemical substrate for GUS. A localized blue histochemical stain results from substrate addition.

Due to the large surface area-to-medium ratio of the proliferating embryogenic liquid cultures, selection for stable transformants is much more rigorous than with solid-support systems.

2:45 FREQUENCY OF INCORPORATION OF Hind III LAMBDA FRAGMENTS INTO THE pUC 8 VECTOR Irma Santoro and Valerie Flechtner, Department of Biology, John Carroll University, University Heights, Ohio 44118

This project examined whether, during the shot-gun cloning of the Hind III digested lambda genome, there is a preferential insertion of specific Hind III fragments into the pUC 8 vector or whether all fragments are inserted with equal frequency. Shot-gun cloning was performed by ligating Hind III lambda fragments into the pUC 8 vector digested with the same enzyme. Following transformation of the Escherichia coli JM83 ampicillin sensitive, beta-galactosidase negative host, ampicillin resistant, beta-galactosidase negative clones carrying putative recombinant plasmids were detected on X-gal plates. Representative clones were amplified and plasmid DNA was prepared using the miniprep technique. Plasmid DMA from each clone was digested with Hind III restriction enzyme and the fragments were separated by agarose gel electrophoresis. The results showed that the fragments were not incorporated with equal probability and that the 1,549 kDa and the 1,353 kDa fragments showed preferential incorporation.

3:00 THE EFFECT OF HEAT-SHOCK ON VEGETATIVE AND GAMETIC CELLS OF CHLAMYDOMONAS REINHARDTII. Valerie R. Flechtner, Department of Biology, John Carroll University, University Heights, OH 44118

When either vegetative or gametic cells of Chlamydomonas reinhardtii are heat-shocked at 42,5°C or 45°C, a reversible loss of motility occurs. Prolonged exposure to these temperatures results in cell death. The mt^- gametes are more sensitive to heat-shock induced loss of motility and killing than mt^+ gametes. Heat-shock provides an efficient technique for improving the matability of hard-to-mate strains. Some gametic cultures of mt^+ nonphotosynthetic and antibiotic resistant mutant strains had low motility and grew in clumps in liquid culture. They mated poorly. When these cultures are exposed to heat-shock at 42.5°C to 44°C for 45 to 60 minutes and are allowed to recover in N-free medium overnight, competent gametes capable of efficient mating are obtained.

3:15 A NEW DNA-BINDING PROTEIN INTERACTING WITH DNA POLYMERASE-β Michael P. Reed, Ralph R. Meyer and Diane C. Rein Dept. of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221

The integrity of the DNA molecule and fidelity of it's transcription and replication are of the utmost importance to all organisms. Potentially mutagenic alterations arise by spontaneous hydrolysis under physiological conditions and by exposure to chemical mutagens and radiation. Failure to repair DNA damage can have catastrophic effects. Identifying the components involved in DNA repair is crucial to understanding the mechanisms of the various repair pathways. It is clear from recent experimental evidence that DNA polymerase-β is involved in DNA synthesis at damaged sites. Our laboratory is attempting to reconstitute an *in vitro* repair system using polymerase-β and accessory proteins purified from the Novikoff hepatoma. A recently purified accessory factor, a DNA binding protein (DBP-29), has been shown to increase the ability of DNA polymerase-β to incorporate nucleotides into DNA substrates with low primer to template ratios. Gel retardation assays indicate DBP-29 will reversibly bind both single- and double-stranded DNA substrates. These data suggest DBP-29 may be acting as a damage recognition signal to polymerase β, thereby increasing the ability of the polymerase to identify and repair DNA damage.

3:30 PRODUCTION OF MONOCLONAL ANTIBODIES TO DNA POLYMERASE-β. Anthony J. Recupero, Ralph R. Meyer, and Diane C. Rein. Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221

The physiological role of DNA polymerase-β remains unknown. Many correlative studies have implicated that polymerase-β is involved in DNA repair, a role it appears to share with polymerase-α and polymerase-δ. Polymerase-β is mechanistically distinct from any other characterized DNA polymerase and appears to be simple *in vitro*. However *in vivo*, we believe that its enzymatic mechanism and modulation are very complex. From the Novikoff hepatoma we have isolated six stimulatory proteins to polymerase-β, one of which (DNase V) interacts directly with the polymerase. We believe that *in vivo*, some or all of these proteins may interact with the polymerase in a DNA repair complex. In an attempt to probe this complex, we have produced monoclonal antibodies to polymerase-β. Efforts by others to raise polyclonal antibodies have been of limited success largely due to the high degree of evolutionary conservation of this enzyme. For this reason and that limited quantities of the enzyme are available, we have used an *in vitro* immunization system. At present, at least five monoclonal antibodies to hepatoma polymerase-β have been isolated, one of which, AJR3B5-β-1, cross-reacts with DNase V, terminal transferase, and DNA polymerases I and III from *E. coli*. This suggests that it may react with a common epitope, such as a nucleotide binding domain. These antibodies will prove valuable to understanding the protein-protein interactions of polymerase-β.

SECTION K. Genetics and Cell Biology Poster Session in Theater Lobby Saturday, April 29, 1989

Board A @ 2:00 p.m. AN IN VIVO INVESTIGATION OF THE INTERACTION OF SINGLE-STRANDED DNA-BINDING PROTEIN (SSB) AND THE HEAT-SHOCK RESPONSE IN ESCHERICHIA COLI. Phyllis S. Laine and Ralph R. Meyer, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221-0006.

The single-stranded DNA-binding protein (SSB) of E. coli functions in DNA replication, repair and recombination. Use of strains carrying suppressors to the temperature-sensitive (ts) ssb-1 mutation provides a means to study the numerous protein-protein interactions of this molecule in vivo. Recently, data from our laboratory (Ruben, et al., PNAS, 85: 3767, 1988) have indicated an interaction of SSB with the major heat-shock protein, GROEL. Subsequent studies of DNA synthesis after temperature shift have indicated that heat-shock induction is required for suppression of the ts phenotype of ssb-1, since prior addition of chloramphenicol prevents recovery of DNA synthetic ability. Induction of GROEL alone is not sufficient though, indicating at least one other heat-shock protein is involved. At present, 17 heat-shock proteins have been identified biochemically in E. coli, and for ten of them the genetic locus is known. Current work is directed at identifying the other heat-shock protein(s) involved in suppression of ssb-1, and identifying the genes for these proteins.

Board B @ 2:00 p.m. ULTRASTRUCTURAL ANALYSIS OF CHORION MUTANTS IN DROSOPHILA. R.L. Ludwiczak and E.M. Underwood. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

A great deal of information concerning early development of Drosophila embryos can be gathered through analyzing mutants. Initial studies on a group of female-sterile mutations in cytological region 52A indicated that the nonviability of eggs produced by mutant females may be due to structural abnormalities in their chorions (egg shell). This poster presents the ultrastructural chorion analysis of eggs laid by wild-type (OR) and three female-sterile mutants (fs(2)27, fs(2)PA77, fs(2)QL46). The normal chorion consists of a uniform exochorion and an endochorion composed of a roof and floor with pillars joining the two. The chorions of eggs laid by fs9(2)27/XTE11 mothers are like wild type, only there are areas where the pillars are lacking. fs(2)PA77 homozygous females produce an endochorion lacking pillars with a thin roof, which has collapsed in places. fs(2)QL46 homozygous mutants have a regular pattern of pillars, but these are thinner and have holes in them. Eggs from fs(2)QL46/XTE11 mothers have a poorly defined exochorion. The pillars of the endochorion are frequently missing, the roof is thinner, and the floor contains breaks.

Board C @ 2:00 p.m. CYTOGENETIC ANALYSIS OF BALB/c MOUSE CELL LINES ESTABLISHED FROM A PRIMARY FORESTOMACH CARCINOMA AND ITS SIX PULMONARY METASTASES. M. Ye and R.J. Jamasbi, Bowling Green State University, Department of Biological Sciences, Bowling Green,OH 43403

A diethylnitrosamine-induced (DEN3) carcinoma cell line and its six metastatic progenies, designated M2, M4C, M4D, M4E, M4F, and M6, were analyzed cytogenetically to determine whether any difference in chromosomal feature could be established. Using the conventional Giemsa staining, 100 metaphase spreads of each cell line were analyzed. The average chromosome number and distribution varied from line to line. Abnormal centromere position and chromosomal

fragments were found frequently. The G-banding was conducted on at least 30 metaphase spreads of the M6 line. This line displayed a hypotetraploid modal karyotype with a variety of numerical and structural abnormalities. Increase or decrease in chromosomal copies appeared in each spread. The most frequent findings were the augmentation in copies of chromosome 19 and the reduction in copies of chromosome X. Structural alterations such as translocation, insertion, deletion, and fragmentation were also present. The most prevalent structural abnormality was the Robertsonian translocation involving chromosome 7 or 19. We conclude that the metastatic lines are most likely originated from different progenitor cells.

Board # 2:00 p.m. WAYS TO FIND CAUSES OF CLEFT PALATES, Patrick Greer, 20276 Whitebark Drive, Strongsville, OH, 44136

Each year many children are born with cleft palates. A cleft palate is an opening in the roof of the mouth. A child born with this is likely to suffer from physical and emotional pain, as I have. To prevent this defect it is important to find the causes. There may be two ways to find out. One is to do a complete case study of the parents and grandparents to see if their environment, body chemistry, or genes have any positive correlation between them and the defect. The other way to find possible causes is to do karotype of the parents and grandparents. By doing this there may be signs in the parents and grandparents chromosomes that could trigger the defect in the child. If there are some relations, then researchers could experiment with the variables and see if the variables are causes. By finding the causes, the defect can be reversed. Overall, doing complete case studies of parents and grandparents and karotypes of parents and grandparents may be helpful to determine causes of cleft palates.

SECTION M. Psychology in G225
Only Morning 9:00 a.m.
Saturday, April 29, 1989
Robert Deitchman, Presiding

9:00 A MODEL FOR SENIOR CITIZENS HEALTH EDUCATION AND MAINTENANCE OF PHYSICAL WELL-BEING Susan Benya Negron University of Akron, Memorial Hall, Akron,Ohio 44325

In recent years, the cost of medical care for the elderly has come under criticism. Therefore new approaches to dealing with the elderly in sickness and wellness need to be investigated. The purpose of this paper is to examine a model program designed to aid the elderly in maintaining optimum levels of well-being. Over a six year period (1981-87) courses were offered to senior citizens covering the following topics: diet, exercise, stress, relaxation, common health care problems, medical tests & life style habits. A significant number of the senior citizen participants attended many subsequent offerings of the course over the six year period. Numerous improvements in their health were reported. Additionally, they demonstrated much interest and motivation in learning about heart disease, heart function, cancer, diabetes, prescription medications, vitamins and mineral supplementation. The model implementation and implications of utilizing various interdisciplinary professionals in the delivery system model will be discussed.

9:15 THE INFLUENCE OF A WINTER CONDITIONING PROGRAM UPON SELECTED PHYSICAL AND MOTOR FITNESS PARAMETERS OF COLLEGIATE FOOTBALL ATHLETES. Mark Lyberger, Robert Gandee and Bruce Hollering, The University of Akron, Akron, Ohio, 44325.

The purpose of this study was to examine the influence of a Winter Conditioning program upon isokinetic muscular strength/muscular endurance, free weight strength (bench press, squat and power clean), flexibility, speed (40 yd dash) and body composition of collegiate football players. Twenty-five (25) varsity football players were randomly selected from a squad of fifty. Age(yr), $\bar{X}$=20.1±0.97; ht(cm), $\bar{X}$=185.7±6.7; wt (kg)=100.2±14.7. A dependent t-test (alpha=.05) was used to analyze pre and post-training variables. Subjects participated in an 8-week program 4 x/wk using free and machine weights along with aerobics, interval training and skill drills. Results indicated significant strength improvement as measured by the squat and power clean. Bench press was non-significant. Isokinetic measurements of quadricep/hamstring strength were improved, although significance was not found in all measurements. Flexibility was not altered and body weight remained unchanged. Body fat percentage decreased significantly and muscle mass increased. Forty yard dash time was not influenced. Coaches, trainers and athletes need to recognize the specificity of physical and motor fitness components when designing training programs.

9:30 EFFECTS OF MUSCULAR FATIGUE ON THE ACOUSTICAL & ELECTRICAL CHARACTERISTICS OF CONTRACTING HUMAN SKELETAL MUSCLE. Michielli D.W., Oster G., Samardzija M., Cohen K. Dept. of Physical Education Brooklyn College, Bedford Ave & Ave H. Brooklyn, N.Y. 11210.

The purpose of this study was to determine the effects of localized fatigue on the spectrum of the electromyograph (EMG) and acoustic myogram (AMG) which is largely subsonic in the human Vastus Lateralis (VL) muscle. Fourteen healthy, undergraduate men and women volunteered as subjects. Subjects were tested for a maximal voluntary contraction (MVC) of the quadriceps group on a cybex isokinetic orthotron. On a subsequent day, fatigue was defined as the time when subjects could not sustain a contraction equal to 75% of MVC. EMG and AMG records were taken when the subjects reached 75% of MVC and at the onset of fatigue. Fast fourier transform (FFT) using an accelerometer and bipolar surface electrodes were used for AMG & EMG measurements, respectively. Paired t-Test was used for statistical analysis of peak dB means every 10HZ. Results: 1-AMG has a lower frequency band with than the EMG and is distinct from it. 2-dB significantly increased at 10HZ ($p<.05$) in the AMG but decreased at 80HZ ($P<.01$) when the VL muscle fatigued. 3-dB significantly increased at 20HZ & 100HZ ($p<.05$) in the EMG when the muscle fatigued. Conclusions: 1: AMG is primarily a low frequency phenomenon that is distinct from the EMG signal. 2: AMG & EMG exhibit different dB characteristics at the high end of the spectrum during muscle fatigue. 3: Future non-invasive studies may lead to distinction between fast twitch & slow twitch fiber distribution in skeletal muscle.

10:00 MOTOR SKILL PROFILE OF AGE IN MEN AND WOMEN. Helen Knierim and Robert Gandee, Slippery Rock University, Slippery Rock, PA 16057; and The University of Akron, Akron, Oh 44325.

The purpose of this study was to profile the motor performance of seventy-five aging volunteers ($\bar{X}$ age = 71.7 + 5.9 yrs; $\bar{X}$ ht. = 64.7 + 4.4 in.; $\bar{X}$ wt. = 158.7 + 28.2 lbs.) attending senior centers in Western Pennsylvania. The selected performance items involved flexibility, agility, eye-hand coordination and strength. Back and hip flexibility was measured using a modification of the traditional "sit-n-reach" test ($\bar{X}$ = 24.6 + 4.3 inches). The subjects' agility were quantified in seconds required for the individuals to move from a chair, across a prescribed course and return to the chair ($\bar{X}$ = 27.7 + 12.9 sec.) and the "pickup of pennies" ($\bar{X}$ = 15.3 + 3.4 sec.). Grip ($\bar{X}$ = 22.9 + 9.6 kg.) and the "jug lift" ($\bar{X}$ = 18.4 + 8.3 reps) were used to assess strength. One repetition of the "bent-knee abdominal curl" was used as an assessment of abdominal strength, and was scored as follows: unable to lift head (30%), lift head only (18%), lift head and shoulders (43%) and touch elbows to knees (9%). These data may have implications for those individuals working with the elderly in the maintenance of their well-being. The assessment protocol will be summarized.

10:15 ANNIVERSARY REACTIONS AND DUE DATE RESPONSES OF SOME WOMEN WHO UNDERGO ABORTIONS. FRANCO, Kathleen, CAMPBELL, Nancy, JURS, Stephen, TAMBURRINO, Marijo, PENTZ, Judith. Medical College of Ohio, P.O. Box 10008, Toledo, OH 43699.

Since Freud's first description in 1895, psychiatrists have been intrigued by patients who have experienced physical or emotional pain on the anniversary date of a previous traumatic event. The use of repetition compulsion as a tool to master unresolved conflict has been helpful in our clinical understanding, as well as the concepts of unresolved mourning and physiologic imprint of trauma.

By far the majority of women adapt well post-abortion, but a smaller percentage continue to describe dysphoria and ambivalence. A sample (n=71) of this particular subpopulation identified nearly half of the group as having experienced anniversary reactions. These ranged from depression, suicidal behavior, and nightmares to abdominal pain and other physical symptoms. Strong feelings of ambivalence and fears that they were verbally abusive to their own children were significantly more associated with women who reported anniversary responses then those who

did not. Dependency and somatoform symptoms were also more prominent as measured on the Millon Clinical Multiaxial Inventory. Recommendations for early identification and psychiatric care of these women will be described.

10:30 THE RELATIONSHIP BETWEEN COMMUNITY ORGANIZERS AND UNIVERSITY FACULTY UNION ORGANIZERS. Robert Deitchman, University of Akron, Department of Social Work, Akron, Ohio 44325-8001

There are an increasing number of campus activists on College campuses attempting to organize University Faculty. This report is based on the general experience of the author who has been an active organizer of one of Ohio's public University's faculty in association with the Teamsters Union. The overall presentation will include information and reports from other organizers and other Union efforts.

In brief, Labor Union organizers more often than not are tied to very specific fixed and predetermined issues. These issues include such issues as wages, pensions, vacations, number of classes taught, input on what is generally considered administrative decision areas and affirmative action concerns. Community organizers, while they would not exclude any of the above concerns, are generally less tied to fixed time points and/or specific issues. Community organizers are committed to changing social conditions. In the early days of labor organizers, ten percent of the agenda was on union business and the other ninety percent were based on conditions in society that need improving (also considered Union Business).

There is, however, one union that has continued the tradition and that is the Internation Brotherhood of Teamsters. This relationship will be discussed.

SECTION M. Psychology in G205 Only Afternoon & Business Meeting 1:30 p.m. Saturday, April 29, 1989 Robert Gandee, Presiding

2:00 THE TEACHING/LEARNING PROCESS: STATE OF THE SCIENCE CIRCA 1989 Ralph F. Darr, Jr., 301A Zook Hall, The University of Akron, Akron, Ohio 44325-4205

This paper is a report of on-going research into the factors that influence the teaching/learning process in the classroom. In particular, the author is attempting to assess the impact of recent calls for educational reform on educational practices. The primary source of data for this paper is the literature of school psychology. Focus is upon the relationship between student learning and (1) teacher characteristics, (2) student characteristics, and (3) instructional/organizational characteristics in the classroom. Teacher characteristics are reviewed from the perspective of: (1) student evaluations of instructors, (2) demographic data, and (3) instructors' personality traits. Student characteristics are viewed in terms of: (1) personality traits, (2) past academic performances, and (3) learning styles. The instructional/organizational section will consider selected instructional factors: (1) control techniques of the instructor, (2) course structures (3) instructional styles, and (4) use of instructional support systems, e.g. computers, programmed instructions. The direction of further integrative research will be reviewed.

2:15 THE RELATIONSHIP BETWEEN SELECTED VARIABLES AND STUDENT PERFORMANCE ON A MEDIA TASK. Charlene D. Nelson and Ralph F. Darr, Jr. The University of Akron, Zook Hall 301, Akron, Ohio 44325-4205.

This study investigated the effect of two types of feedback--global vs. specific--on the final rubber mounting project of 41 students in a media production class. Students completed a practice project after watching a demonstration by the instructor. The instructor then scored each project on 7 variables. Students were randomly assigned to feedback groups. Global feedback consisted of general unqualifying statements--e.g., "Okay." Specific feedback provided instructions for improvement. At the next class session, students received these projects with appropriate feedback and then began their final project. Scores on the final projects were significantly higher than scored on the practice projects. There were no significant differences on any of the 7 variables between the specific feedback group and the global feedback group on their final projects. Significant gender differences were found for only one variable--"Quality of Border." Females performed better than males. Sophomores tended to perform less well than their more experienced classmates on the variables "Trim" and "Centerness." Elementary Education majors tended to perform significantly better than physical education majors on the variable "Excess Cement."

2:45 PERCEIVED QUALITY OF ACADEMIC LIFE: A REPLICATION AND EXTENSION. Christie Partlo and Sara Staats. The Ohio State University at Newark. Newark, OH 43055.

Students' perception of college life may influence their retention in college and their academic performance. Okun, et.at. (1986) developed an instrument to measure perceived quality of academic life (PQAL). They reported statistics for several samples of varied ethnic composition, collected in the south-west. The present study tests the geographic consistency of the PQAL and compares samples taken at different times of the academic year. We also examine the association of PQAL scores with students' intent to obtain a college degree.

Our mid-west samples yielded means well within the range described by Okun et.al. in their south-west samples. Administration time did not influence sample means. In both of the present samples the PQAL was significantly correlated with intent to stay in college ($p < .01$). We therefore conclude that the PQAL is consistent across geographic locations, several ethnic groups, and the time of the academic year. The validity data presented here indicates that the PQAL is an instrument of considerable merit.

3:00 THE RELATIONSHIP BETWEEN TEMPERAMENT AND HUMOR TO IQ AND SPECIAL EDUCATION CLASSIFICATION. Alba Cook, Field Local Schools, 1473 Saxe Rd., Mogadore, Ohio 44260.

Special education students will be independently rated by three different raters on temperament and humor. Temperament and humor ratings will be related to IQ and the prediction of special education classification.

3:15 FACTOR ANALYTIC STUDY OF THE DYSFUNCTIONAL ATTITUDE SCALE. Christopher L. Edmonds, Dept. of Psychology, The University of Toledo, Toledo, Ohio 43606.

The Dysfunctional Attitude Scale was administered to 100 volunteers from an Introductory Psychology class. The resulting data were subjected to a principal components factor analysis with varimax rotation. Rotation to simple structure converged upon a solution in nineteen iterations. The twenty variables introduced into the analysis yielded seven factors with eigen values greater than unity, but a scree test on the same factors suggested retaining only the first six. The six and seven factors extracted accounted for 54.8% and 59.9% of the variance respectively. The factors were interpretable and subsequently named. Caveats regarding small sample sizes, using the components analysis for exploratory purposes, and using split-half forms in analyses were reviewed.

SECTION N. Junior Academy in G04A&B First Morning 9:00 a.m. Saturday, April 29, 1989 Rodney Hartman, Presiding

9:00 MICROWAVE STERILIZATION, AN ALTERNATIVE TO STEAM/PRESSURE METHODS. Jason Halsey, Perry High School, 3737 Harsh Ave. S.W., Massillon, Ohio 44646

The basis of this research was to find an alternative to the old pressure cooker form of sterilization. Because of its availibility and ease of use, the microwave oven was employed as a media sterilization device.

Flasks containing 250 mls of undissolved nutrient agar mixture were heated using various temperature and timing regimens. It was found that great care must be

taken to prevent the liquid from boiling out of the flask. It was also found that care must be taken not to allow the nutrient agar solution to boil to the point where it touches the cotton plug. Heat settings and cooking times must be carefully adjusted. Realizing that many microwave ovens have different wattages, (the unit used was 1500 watts) it is important to note that different wattages call for varied amounts of heating. The most successful amount of heating time on the 1500 watt microwave oven was 3:00 minutes at a medium setting.

9:15 THE EFFECTS OF CHEMICAL DEMONSTRATIONS ON ELEMENTARY STUDENTS
Molly Mulcahy and Tracy Voelkerding, 5569 Breezewood Drive, Cincinnati, Ohio 45240

Chemical demonstrations were presented to elementary school children in order to conclude the effects of a presentation to enhance learning. The demonstrations included acid-base color changes, forming and dissolving foam, and studying states of matter. Through their participation in answering and interrogating questions, helping with explanations and identifications, and actually doing some experiments, these children gained a better understanding about chemistry in their everyday lives. Through observation, student response, and teacher evaluation, data was gathered in order to prove our hypothesis: DEMONSTRATIONS WILL ENHANCE LEARNING, INCREASE PARTICIPATION, AND BROADEN THE ATTENTION SPAN OF ALL STUDENTS.

9:30 PASSIVE SMOKE INHALATION VS. NO SMOKE
Bruce A. Barker
65 Canyon Rd. S.E.
Carrollton, OH 44615

The study dealt with is "Does Passive Smoke cause the health afflictions which Mainstream Smoke is known to cause and if the influence of the Passive Smoke is removed, will the tissues affected heal?"
My hypothesis is that passive smoke will cause the health afflictions which mainstream smoke causes and if the influence is removed before irreversible damage occurs, the tissue should return to normal.
Rattus Norvegicus is the test subject used during the experimentation. The three types of groups used are control (no.1), smoked (no.2), smoked half of the time and removed (no.3). They are in two chambers, one control, one with smoke. The smoking chamber's dimensions were determined by comparing the average rat's mass and chamber size to an average human's mass and an average two-desk office.
The controls are monitored daily and the experimentals are exposed to passive smoke for 150 days. The test subjects are then removed at intervals of 30, 90, and 150 days, dissected; slides are then prepared of the lung tissues. The cells under question are 1) respiratory epithelium and 2) the macrophages in the aveoli and these are reviewed for cellular changes. At the 90-day interval, set no.3 is removed and placed in a controlled environment to be examined at the 150-day interval.

10:15 CHARACTERIZATION OF RIBOSOMAL RNA GENE PROMOTERS IN NORTH AMERICAN TREE FROGS
Elizabeth A. Carroll
P.O. Box 366, Rushsylvania, OH 43347

It is suspected that all vertebrate species are phylogenetically polyploid and that over a period of time, the multiple genes have lost their expression and returned to a diploid level through the process termed "diploidization". Characteristic of this process is Hyla versicolor, a species of tree frog. It is a tetraploid species whose population is undergoing diploidization, and its genome is becoming very similar to that of another species, Hyla chrysoscelis, especially within a set of rapidly diverging ribosomal RNA genes.

The functioning of the promoter region of the gene is inherent in this process of diploidization. Study of the promoter region should yield the knowledge of why some genes lose their expression. The diploidizing, and therefore malfunctioning, rRNA promoter can be compared to the normal rRNA promoter to explain how the promoter functions.

Before they can be compared, the promoter regions of the rRNA genes of H. versicolor and H. chrysoscelis must be located and characterized. This was the specific focus of this research, and was accomplished through the hybridization and end-labeling of the molecule, and determination of the length and relative position of the promoter region by the use of specific endonuclease cuts and gel electrophoresis.

10:30 ELECTROPHORETIC PATTERNS OF ENZYMES IN CANDIDA ALBICANS AND SIMILAR YEASTS.
Sandesh Dev, St John's High School, Toledo, and Department of Microbiology, Med. Coll. Ohio, P.O.Box 10008, Toledo, OH 43699-0008

Enzyme and protein profiles were obtained after polyacrylamide gel electrophoresis of extracts of yeasts grown in sucrose-mannitol broth. Six enzyme systems were studied for 54 strains of Candida albicans (**Ca**), and 3 strains of each of C. tropicalis (**Ct**) and the sucrose-negative (*Suc-neg*) variants of these two species. Significant amounts of variation were found within **Ca** and this was most notable with both acid and alkaline *phosphatase; however, isocitrate dehydrogenase* showed no variation between strains. Most enzyme profiles could not be used to separate the *Suc-neg* **Ct** strains from the regular **Ct** isolates; but the α-glucosidases were found to be distinct. *Suc-neg* **Ca** strains were separable into two types with distinct enzyme patterns. One type seemed more closely related to **Ca** than did the other. Variations in protein banding patterns separated **Ca** from **Ct** but were not useful in identifying *Suc-neg* variants. Enzyme patterns should be useful in following the spread of medically important yeasts in hospitals and other settings. (Work performed in lab of Paul F. Lehmann, Ph.D.)

10:45 "HAVE THE AMOUNT OF SPECIFIC MATERIALS CHANGED IN BLACKLICK CREEK FROM A STUDY OF 1970-76 COMPARED TO 1987-88?"
Billy G. Duffer JR.
4099 Platte Ave., Groveport, Ohio 43125

Initual tests over one year, 1987, indicate amounts of the following harmful materials have indeed increased by an amount of more then 25% in Blacklick Creek. Tests performed were: BOD-COD, nitrogen ammonia residue total/NFLT, and fecal Coliform. The dissolved oxygen content has decreased by 10%. This may be due to a waste water *mangement* plant that discharges into Blacklick Creek.This plant is now under investigation by the Ohio E.P.A. for dumping more fecal Coliform than is allowed by law in the state of Ohio.This pollution level shows that only 5.6 miles of the total 25.5 miles fully supports water life. Follow up from 1987 and 1988 will be compared to tests from 1970 through 1976. A 12 mile segment of Blacklick Creek is tested at three locations. Test sight #1 is 12 miles downstream from the management plant, sight #2 is 200 yards downstream from the plant, and control sight #3 is 2 miles upstream from the plant. The samples are taken once every 3 weeks and are tested by the EPA Water Lab. If the control sight has normal levels of test materials and the exprimental sights are abnormal it can be assumed that the waste water plant is causing the disturbance in Blacklick Creek.

SECTION N. Junior Academy in G05E
Second Morning 9:00 a.m.
Saturday, April 29, 1989
David M. Weaner, Presiding

9:00 The Effect of Precocene on Insects. Aaron S. Reames. 546 S. Madriver, Bellefontaine, Ohio 43311.

In 1976, William Bowers and his colleaguesdescribed the discovery of two newly isolated, highly reactive chemicals with potential for controlling the growth rate of insects. These chemicals were isolated from the bedding plant and were called precocene I and II. Precocene II was found to be ten times more powerful than precocene I.

In this study, the effects of precocene II on the milkweed bug, the cabbage looper, and the yellow mealworm were looked at. Eggs, nymphs, larvae, or adults were exposed to precocene II by placing 640 micrograms of the chemical dissolved in acetone into petri dishes. The solvent was allowed to evaporate before the test organism was placed in the dish.

Precocene II did prove to cause precocious adults to develop when eggs and nymphs of the milkweed bug were exposed. Precocious adults did not develop in the cabbage looper as a result of exposeure to precocene. It does appear that precocene has the potential to serve as a new class of organic chemical in the control of certain insects.

9:15 THE TRANSVERTED AND POLYVERTED NUMBER SYSTEMS William White 7774 Country Club Road Athens OH 45701

The Transverted and Polyverted number systems are two new number systems I developed which differ from existing systems in that division by 0 is defined. In the Transverted system, the constants s and 1/s (representing infinity and 0) are used with complex numbers, eg $3.5s^2$. In the Polyverted system, addition is possible and the result set may contain several elements (each with a different power of s). Both systems are internally valid and consistent, and may have applications in quantum mechanics theories which are unsolvable due to the presence of infinities. This system may be visualized as a string of spheres, each one of the spheres is a complete copy of the Complex number plane. For a number to "move" to a higher or lower sphere, it is multiplied by s or 1/s. In the Polyverted system, the elements of a number may occupy several spheres.
The basis of addition in the Polyverted system is that a sum as^x with a=0 becomes $1s^{x-1}$, and only like terms may be added. To add in many cases requires re-extraction which is a process which changes as^x into $(a-1)s^x + 1s^{x+1} + -1s^{x+1}$; this is used when two numbers to be added lack a term with an s coefficient (s^x) where x lies between values present in powers of s in the two numbers. In both systems, multiplication is done as if s were an ordinary variable in a polynomial.

10:15 NICKEL AND COBALT COMPLEXES OF 2,4-PENTANEDIONEDIOXIME AS OXYGEN CARRIERS
Rebecca A. Roesner
Ohio Wesleyan University, Memorial Union Building Box 1760, Delaware, Ohio, 43015

The synthesis of the B-dioxime, 2,4-pentanedionedioxine, was accomplished via the Schiff Base reaction of 2,4-pentanedione with hydroxylamine hydrochloride. This novel ligand was employed to synthesize transition metal complexes that mimic the oxygen binding ability of hemoglobin. Nickel (II) chloride was the first metal of choice owing to its diamagnetism of a square-planar four-coordinate complex. Cobalt (II) chloride will also be examined and the synthesis, chracterization and physical properties of these complexes will be reported.

10:30 THE AFFECTS OF ABNORMAL SERA ON IMMUNOPRECIPITATION PATTERNS.
By Mark Wilson, 1087 Asbury Road, Cincinnati, OH., 45255

The affects of abnormal sera on Immunoprecipitation patterns was studied to advance research concerning protein abnormalities in diseased body fluid.

The abnormal serum was synovial fluid obtained from a rheumatoid arthritis patient and the experimental control was purified blood plasma taken from the same patient and at the same time. The sera were precipitated against a single antihuman serum in a noble agar-hemmaglutination buffer mixture. A petri dish was filled with the agar mixture and the medium was allowed to solidify. Three wells were then cut into the agar in a triangular arrangement and then filled with the sera.

The results showed that after twenty-four hours, five bands had precipitated from both the synovial fluid and the blood plasma, each band representing a protein in the given serum sample. In both of the sera precipitation zones, an albumin, an alpha globulin, a beta globulin, and a gamma globulin band precipated; and, because the bands were the same protein, they merged to form a "V" shaped band. The fifth band in each was different, demonstrated by the fact that they did not merge, therefore, were not the same protein. In the synovial fluid zone, the fifth band was presumably orosomucoid and the fifth band in the blood plasma zone was presumably the coagulating agent. These results agreed with my predictions of the appearance of an abnormal protein band in the synovial fluid zone, based on previous results from Immunoelectrophoreses experiments. The results confirmed the diagnostic value of Immunoprecipitation in the biomedical field as a technique for detecting protein abnormalities in body fluid.

10:45 CORN GROWTH RETARDATION DUE TO SOYBEAN HERBICIDE RESIDUES Melissa Beuerlein, 469 Willow Lane, Mt. Gilead, Ohio 43338

Scepter (Imazaguin), a new broadleaf weed herbicide, was used on 15 percent of Ohio's 1987 soybean acreage and 40 percent in 1988. Drought conditions in 1987 retarded the decomposition of Scepter leading to damage of corn (Zea Mays L.) crops grown in fields previously treated with Scepter. Ohio's farmers are concerned that the 1988 drought caused even more Scepter carryover jeopardizing the 1989 crop. Another soybean herbicide, Prusuit (Imazethapyr), is chemically similar and is expected to be labeled for use in 1989.

For two of Ohio's major corn producing soils, Hoytville and Crosby, no data exists indicating the concentrations of Scepter or Prusuit which may retard corn growth should there be carryover. A greenhouse study was conducted to measure the effect of six concentrations (0, 7.5, 15, 30, 60, 120ppm) of both Scepter and Prusuit on corn germination and seedling growth. The twenty-four treatments (2 soils, 2 herbicides, 6 rates) were arranged in a completely randomized design with four replications. Corn plants were grown in each of 96 pots filled with either treated or untreated soil. Data on percent emergence, plant height, root and foliar dry matter were subjected to an analysis of variance.

Neither herbicide affected germination, but medium and high rates reduced plant growth. There were "herbicide by soil type" and "herbicide by rate" interactions. Proper use of these herbicides is manditory if problems due to carryover are to be circumvented.

SECTION N. Junior Academy in G04A&B
First Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Rod Hartman, Presiding

2:00 CRYOGENIC STORAGE OF EPITHELIAL TISSUE.
Rolf N. Barth. 2670 Crafton Park, Columbus, Ohio 43221.

The purpose of this two year study was the selection of the most effective cryopreservative for the storage of living cells and the application of this knowledge to the storage of human epithelial tissue. The first year of the research dealt with determining the most effective cryopreservative with which to protect Chinese Hamster ovary cells frozen in liquid nitrogen. The cryopreservative's effectiveness was measured by a trypan blue dye exclusion test and a colony forming efficiency test. At the end of the first year's research, it was determined that an inverse relationship exists between the duration of time that cells are frozen and both their viabilities and survival, and that a 5.0% DMSO concentration appears to be the most successful cryopreservative. The second year, epithelial tissue was grown in vitro and then prepared for storage in liquid nitrogen. The tissue was frozen intact, as an entire sheet, for a period of seven days and was then thawed. The viability was then determined by means of a trypan blue dye exclusion test. This part of the research demonstrated that the epithelial tissue can be frozen and stored with a cell viability of approximately 65%. The research was carried out at The Ohio State University Cell Culture Lab under the supervision of Dr. Ralph Stephens with funding from two research grants from The Ohio Academy of Science.

2:15 "HOW DO PRESSURE DIFFERENTIALS AFFECT THE VOLTAGE OUTPUT OF A SIMPLE H_2/O_2 FUEL CELL WITH A NaOH ELECTROLYTE?"
JOE OURS
2740 TIARA AVE., COLUMBUS, OHIO 43207

This experiment will consist of building a pressurized fuel cell to test the relationship of pressure differential to the voltage output. Previously this experimenter built cells showing that electrolytic percentages affect the voltage output. This year's cells will determine how pressures (between 1 and 3 atmospheres) of the gases affect the voltage output. Library research indicates the voltage will be inhanced.

In a fuel cell the fuel is ionized at the anode, which releases electrons to an outside circuit, and the oxidizer is ionized at the cathode, which recieves the electrons at the other end of the circuit and uses those electrons to combine the ionized fuel and oxidizer to form a waste product. The waste can be determined through half-cell reactions if the fuel, oxidizer, and electrolyte is known. Hydrogen and oxygen have been choosen as the fuel and oxidizer respectivily. A H_2/O_2 fuel cell can work at room temperature, producing a harmless waste product, water.

This procedure will build a H_2/O_2 pressurized fuel cell to discover if the relationship between gas pressures and voltage output is similar to that reported for fuel cells using a molten carbonate electrolyte.

3:45 "A COMPARISON STUDY OF MUTATIONS INDUCED BY GAMMA RADITION IN BRASSICA RAPA, CONTRASTING SEEDS IRRADIATED PRIOR TO GERMINATION WITH PLANTS IRRADIATED UPON INITIAL GERMINATION."
DARREN E. HUFF
5266 SEDALIA DR., COLUMBUS, OHIO 43232

The Department of Plant Pathology at the University of Wisconsin-Madison has recently developed many varieties of the Brassica genus which have rapid life cycles making them valuable research subjects. Because of the wide variations existing in Brassica rapa, the species used this past two years in botany classes, it is possible that many more variations may be induced. This experiment consists of exposing both B. rapa seeds and seedlings to a gamma radition source. The control groups of seeds and seedlings will be grown in the same conditions as the irradiated groups. Data from two or more generations of these subjects will be collected. The type and number of physically observable mutations occuring to the irradiated seeds will be compared to those occuring naturally to the control seeds. Data of the same nature will be compared between the germinated seed groups. It is expected that after both sets of data are examined the control groups will show fewer mutations than their counterparts and that between the variable groups the seeds, having been irradited earlier in developement than the seedlings, will exhibit more numerous and more obviously observable mutations.

4:00 "Does Styrofoam Ash Have an Effect on Drosophila melanogaster?"
C. Steven Compton II
4007 Hendron Ct.
Groveport, OH 43125
(614)836-5085

Incinerated cafeteria waste with a high styrofoam content is used to test for phenotypic mutations in Drosophila melanogaster. It is expected that the rate of observed phenotypic mutations will be higher in those drosophila raised in a mixture of banana mash and incinerator ash, compared to D. melanogaster raised in a medium of only banana mash.

The experiment will consist of four experimental cultures in which drosophila are raised in a combination of banana mash and incinerator ash. The rate of phenotypic mutation will be related to that of two cultures of drosophila raised in only banana mash.

Based on previous research, it is this researcher's hypothesis that the mutation rate will increase markedly as a direct result of exposure to styrofoam-rich incinerator ash. Using results from this experiment, one can make a valid assumption regarding the effects of styrofoam ash on other living systems in the environment. However, further experimentation involving exposure to airborn degradation particles from styrofoam would be required to extrapolate these findings.

4:15 MELANIN; THE KEY TO MELANOMA
Mark Olsen 229 Highgate Ave.
Worthington Ohio 43085

This investigation was designed to utilize specific compounds made by the melanoma cell during the synthesis of melanin as selectively cytotoxic agents.

Malignant melanoma is often associated with an early metastases and a short survival. In order to combat the sarcoma, a careful investigation of melanoma cells was conducted. The study revealed that mouse B-16 cells produced excesive amounts of melanin. The first step in the synthesis of melanin uses the amino acid Tyrosine, which is oxidized into l-Dopa.

I wished to stimulate the melanocyte into ingesting large amounts of Dopamine, an l-DOPA analog, to study the cytotoxic effect of melanin precursors. An attempt was made to enhance this effect; intracellular levels of Cyclic-AMP must be elevated. The proposed method involved the Phosphodiesterase Inhibitor, Theophylline. It was hoped that the Theophylline would simulate a-MSH, the Melanocytic Stimulating Hormone by "protecting" Cyclic-AMP from degradation.

In vitro, Dopamine produced large quantities of melanin and proved a potent cytrocidal agent at higher concentrations. Theophylline did not enhance melanin production in vitro.

SECTION N. Junior Academy in G05E
Second Afternoon 1:30 p.m.
Saturday, April 29, 1989
David M. Weaner, Presiding

2:00 DOES THE STORAGE VESSEL CATALYZE H_2O_2 DECOMOSITION?. Eric Snyder (Perkins High School) 1308 Melody Lane, Sandusky, Oh 44870

Hydrogen peroxide, H_2O_2, is an unstable compound and must be stored in containers that limit its decomposition. This investigation determined if the storage vessel can itself catalyze the decomposition of hydrogen peroxide. Glass is known to have a slight catalytic activity in this system. Plastic, however, is not known to have any catalytic characteristic.

Samples of hydrogen peroxide were stored at 52°C for 168 hours individually in the presence of finely divided polyethylene, polypropylene, and glass, and compared with a control (lacking finely divided particles). Percent decomposition was determined by titration with potassium permanganate

As expected glass was shown to catalyze hydrogen peroxide decomposition. Sample in contact with finely divided glass had a 51.31% loss. Unexpectedly polyethylene and polypropylene had a marked catalytic effect over the control. Sample in contact with finely divided polypropylene had a 60.29% loss. Sample in contact with finely divided polyethylene had a 49.01% loss. The control sample had a 11.43% loss.

These results show that the reaction or storage vessel itself should not be considered inert, as these in fact catalytically increase decomposition of hydrogen peroxide.

2:15 "HOW WILL THE GROWTH AND DEVELOPMENT OF Xenopus laevis TADPOLES BE AFFECTED BY THE SUBSTITUTION OF A COMMERCIAL WEIGHT GAINING PROTEIN FOR CONVENTIONAL NETTLE POWDER?"
JEANNINE L. TAYLOR
3490 DEMINGTON RD., COLUMBUS, OHIO 43232

Protein nutrition is investigated by using the Xenopus laevis, the African Clawed Frog. A group of X. laevis tadpoles raised on the weight gaining protein will have an increased rate of growth and development compared to the group raised on the normal diet of nettle powder, a commercially produced tadpole food.

The experimental procedure consists of separating the tadpoles into a control group receiving a specific amount of nettle powder and a variable group receiving a specific amount of weight gaining protein. There are three variable tanks and three control tanks, containing thirty fertilized eggs at the beginning of the experiment. The data will be collected twice a week on the growth and development, and be charted. The results will be compared to the previous year's data.

The results are expected to validate last year's data, where the groups of X. laevis fed the weight gaining protein had a fifty percent increase in their growth and development, compared to the groups of tadpoles receiving the nettle powder.

3:45 CAN LUBRICATION INCREASE PROJECTILE VELOCITY? David Ulbrich, 126 West Dixon Ave, Dayton, OH 45419

Theoretically, it can. An 18 - 24% increase was claimed on previous tests by a ballistics consultant on military hard-nose rounds with Tribolube 2, a high-pressure, high temperature bearing lubricant. My high school science project attempted to verify these results on .22-cal. lead soft-nose rounds. No velocity increase was found, and it was concluded that lead has enough natural lubricity that a lubricant would make no significant difference in velocity. An additional test was performed on .308-cal. military hard-nose rounds. Again there was no velocity increase, and it was speculated that this may have been due to a difference in bore tolerances compared with gun barrels used in previous tests. Further considerations also developed the hypothesis that there was an actual increase in muzzle velocity, which was offset, however, by a decrease in barrel pressure as the round moved faster down the gun barrel. A follow-on test project is necessary on a gun barrel with pressure taps and tranducers to record barrel pressures. If there is pressure decrease, then more powder or a faster burning powder could increase muzzle velocity with lubricated rounds.

4:00 THE SYNERGISTIC EFFECTS OF ULTRAVIOLET RADIATION AND SODIUM NITRITE ON CHROMOSOMES OF THE HUMAN LYMPHOCYTE Suzanne Connolly, 8129 Township Road 150, West Liberty, Ohio 43357

Chromosomes are string-like structural units of the nucleus that carry the hereditary determinants known as genes. Chromosomes are composed of double-helix DNA, RNA, and structural proteins.

This experiment was conducted to determine if synergistic action occurred between ultraviolet radiation and sodium nitrite when the chromosomes of the human lymphocyte were exposed to both agents simultaneously. When using parameters of cell density and the number of observed chromosomal aberrations, synergism did take place. Aberrations which did occur included chromosome breaks, chromatid breaks, fragile sites, centromeres pulling apart, and chromatid deletions.

4:15 "HOW WILL HIGH LEVELS OF ULTRAVIOLET RADIATION AFFECT THE GROWTH OF BRASSICA RAPA?"
CHRISTOPHER A. GAVORCIK
5410 SIMS RD., GROVEPORT, OHIO 43125

The affects of increasing ultraviolet radiation on crop growth is researched using Brassdica rapa, a new educational plant. A group of Brassica rapa plants grown under ultraviolet lights in a greenhouse are expected to have an increased rate of growth and a decreased concentration of chlorophyll compared to the Brassica rapa grown under normal sunlight.

The experimental procedure consists of growing fifty B. rapa under ultraviolet lights in a commercial greenhouse. The experimental group will also recieve normal sunlight. A control group of fifty B. rapa plants will be grown in identical conditions including normal sunlight, except they will recieve no supplemental ultraviolet radiation. Data will be collected once a week. Growth rate will be monitered by measuring heights of the plants. The chlorophyll levels will be measured using a spectrophotometer. These data will be compared to last year's data.

These results are expected to validate last year's data, where a group of soybean plants were grown under ultraviolet lights. The soybeans exhibited an accelerated rate of growth in height and a decreased concentration of chlorophyll compared to a control group in sunlight.

SECTION N. Junior Academy Poster Session in Theater Lobby Saturday, April 29, 1989

Board E @ 2:00p.m. THE PROCESSES OF OSMOSIS AND DIFFUSION IN LIVING CELLS

Miss Lesley Wiseman
325 Sherman Street
Galion, Ohio 44833

Many factors are involved with living cells carrying on the normal functions necessary for life. As early as 1877, William Pfeffer studied diffusivity and osmotic pressures in cell tissue. Both processes create balance, both chemically and physically, in cell structures.

Osmosis is comprised of two major movements: endomose and exosmose. The movement is accepted as that through a semi-permeable membrane from a solvent, but not solute, standpoint. The entire process of osmosis can be stopped by increasing the pressure in the solution by a specific amount, called the osmotic pressure. The processes of cellular fluid absorption and membrane permeabilities demonstrate the osmosis principle.

Diffusion, on the other hand, involves the distribution of matter throughout the cell. The demonstration of diffusion involves the diffusion pump and diffusion-transfer methods. Research, diagrams, and demonstrations will be used to describe and clarify these processes.

Board H @ 2:00 p.m. DOES YOUR HOME HAVE RADON?
JEFF TURNER, 6435 Scarff Rd., New Carlisle, Ohio 45344

Radon is an odorless, tasteless, radioactive gas that occurs naturally in the soil. High levels are found in confined areas such as homes. Radon has its highest levels in houses setting on an underlay of gravel. Radon comes from the natural breakdown of uranium in the soil. This radioactive gas enters homes through cracks in floors and basement walls and in drains or sump pump holes. It may be responsible for up to 20,000 lung cancer deaths per year which makes radon the second leading cause of lung cancer. Radon causes lung cancer by giving off small bursts of energy in the tissue of the lung, which later can lead to lung cancer. In my research I conducted a test of 12 homes and my school in Miami County. I found levels from 1.9 to 78.5 Pci/l. My tests used a charcoal substance that traps radioactive molecules. If a test indicates a high level, retesting with an Alpha-track test kit is recommended. The safe level of radon is 2.5 Pci/l. The level at which action should be taken is 4.0 Pci/l. I hope I have brought the radon issue to the attention of many people by testing their homes and through the publicity of the science fair projects.

SECTION O. Engineering in B132 First Morning 9:00 a.m. Saturday, April 29, 1989 Tom Hartley, Presiding

9:00 MISCONCEPTIONS ABOUT INDUCTANCE
F.P.Gram
Cuyahoga Community College
Metro Campus
2900 Community College Ave.
Cleveland, OH 44115

Many of our commonly used elementary physics texts define inductance as $N\Phi/i$. Since this is valid only for the case of constant flux, it leaves the student in a quandary about other cases. Some texts claim that inductance is linked flux/current, which is true only if all flux is linked. It will be argued that a better definition is $\Sigma\Phi/i$.

9:15 A MICROCONTROLLER APPLICATION IN PROTECTIVE RELAYING SYSTEM. Manit Vichitchot and Adel A. Ghandakly, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606.

This paper investigates the application of a microprocessor protective relaying system for a power system generating plant substation. The system is based on a three level dedicated configuration; the Data Acquisition Controller (DAC), the Relay Function Controller (RFC), and the Plant Relay Control Computer (PRCC). The DAC and the RFC are stand-alone units of microcontrollers where the IBMPC/XT286 is employed at the top level as the PRCC. The system is designed to provide the main protective functions to the substation equipment as well as the out-going-line. The system is tested by applying some relay algorithms selected from the literature. Modifications and simplifications of the algorithm as well as additions are made as needed. The system is designed to achieve high performance, flexibility and economical feasibility. The 16-bit CHMOS version of the MCS-96 family of Intel Embedded Controllers is designated as the main hardware component and demonstrated to be adequate. This paper will focus on the design aspects and criteria involved in the above system design. System configuration and interface features at each level will be proposed and discussed.

9:30 A DIGITAL RELAY SCHEME FOR DISTANCE PROTECTION OF TRANSMISSION LINES. S.R. Kolla, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606.

Distance relays that measure the apparent fault impedance are the most commonly used devices for protecting transmission lines. Recently, use of digital processors for distance protection has been receiving considerable attention.

This paper describes a digital relay scheme for the protection of transmission lines. Different funotional blocks of the relay scheme are explained. In particular, the use of a recently developed relay algorithm [1] for the distance protection is described. The performance of the relay scheme is evaluated using the simulated

fault current and voltage waveforms of a 230 KV, three-phase transmission line.

1. S. R. Kolla, "Application of block pulse functions for signal recognition in power system relays," Proc. IEEE, vol. 75, pp. 1695-1696, December 1987.

9:45 **AN EMPIRICALLY DERIVED SET OF DESIGN RULES FOR FERRITE ROD ANTENNAS**

Susan E. Hall and George T. Shoemaker
Loral Defense Systems Division
1210 Massillon Rd.
Akron, OH 44315

Ferrite rod antennas have been widely used for many years in low frequency applications where physical size constraints make the use of electric dipole antennas impractical. The well known relationship which governs the behavior of such antennas in freespace is $v=\omega\mu NAB$. Here v is the induced voltage, ω is the radian frequency, μ is the relative permeability of the ferrite rod, N is the number of turns, A is the cross sectional area, and B is the component of flux density along the sensitive axis of the antenna. Although this relationship is completely accurate, it suffers from a number of weaknesses in a practical sense. First, the permeability of the ferrite core must be experimentally determined. Second, if there are significant quantities of conductive material in the vicinity of the antenna, as frequently occurs in practice, this relationship may yield results which vary significantly from the actual performance of the antenna. This paper presents a simplified set of design rules which accurately predict the behavior of the antenna. This technique relies on a minimum number of experimental results and the physical parameters of the design. This procedure significantly simplifies the design process, allowing a basic design to be established without the need for extensive experimentation.

10:00 BIT BY BIT ERROR RATE PERFORMANCE OF LAND MOBILE SATELLITE SYSTEM UNDER FADING CHANNEL. Junghwan Kim, The University of Toledo, Dept. of Electrical Engineering, 2801 W. Bancroft St., Toledo, OH 43606.

Aspects of error performance of Land Mobile Satellite System (LMSS) using QPSK and MSK under fading channel have been studied. Contrary to the sole use of average bit error rate (BER) as a performance measure, bit by bit error rates are calculated for the long sequence of transmitted data under various fading conditions such as LOS (Line of Sight), man made blockage, mild fade, deep fade, and partial fade under the vegetative shadowing by the computer simulation. Set of empirical fade data base is used as the fading channel rather than the analytical model of various fade to avoid the possible inaccuracy of the mathematical model. Under the condition of moving vehicle at the speed of 55 mph at 1.5 GHz transmission, series of 256 bits data stream at the rate of 2.4 Kbps are simulated by using coherent QPSK and MSK. Total of 203.2 wavelength fade data is used to give actual fading effects. Results show that bit by bit error rate under fast varying fade can predict the exact location of error bit among the sequence of transmitted data, which cannot be possible by using average BER. By using the prediction capability of bit by bit BER, it is possible to avoid the burst of errors under fast varying fade once we can simulate the anticipated fading conditions in which land mobile system is used.

10:15 **ECHO IDENTIFICATION USING PHASE INFORMATION**

Nurgun Erdol*, Louis Roemer, Nathan Ida, and Ke-Sheng Huo

*E. E. Department
Florida Atlantic University
Boca Raton, FL 33431

E. E. Department
The University of Akron
Akron, OH 44320

The signal waveforms chosen for reflectometry, based on attenuation and resolution constraints, often result in overlapping echo waveforms. Phase information can be used to estimate echo contributions in reflectometry using the Maximum Entropy Method. The phase estimate is constructed from the power spectrum of the even components (S_{ee}) of the signal and the power spectrum of the odd components (S_{oo}) of the signal. The cosine of the phase, $\Theta(\omega)$, follows the relationship

$$\mathrm{Cos}[2\Theta(\omega)] = \frac{S_{ee}(e^{j\omega}) - S_{oo}(e^{j\omega})}{S_{ee}(e^{j\omega}) + S_{oo}(e^{j\omega})}$$

By computing the spectrum of the above relation, the echo delay, t_d, can be determined using

$$\mathrm{Cos}[2\Theta(\omega)] = \mathrm{Cos}[2\omega t_d]$$

in the frequency domain. The method of analysis is presented, along with experimental verification for a simple reflecting structure using ultrasound.

SECTION O. Engineering in B133
Second Morning 9:00 a.m.
Saturday, April 29, 1989
James Farison, Presiding

9:00 COMPUTED TOMOGRAPHY AND ITS NONMEDICAL APPLICATIONS. James B. Farison, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606-3390 and Behrouz N. Shabestari, Machine Vision Program, Edison Industrial Systems Center, Toledo, OH 43607-1207.

This paper reviews the principles and history of computed tomography (CT) and its historical and contemporary nonmedical applications. CT is one of the most significant developments in medical imaging since the discovery of x-rays in 1895. Pioneering work by Cormack (1963-64) and Hounsfield (1967-69) led to the 1979 Nobel prize in Physiology and Medicine. Earlier mathematical developments include work in gravitational theory by Radon (1917) and radio astronomy by Bracewell (1956).

The principles of tomography, originally applied to x-ray imaging, have now been applied to other medical imaging modalities (ultrasound, nuclear medicine and magnetic resonance) and such diverse fields as electron microscopy, seismology, mining and reservoir engineering. In recent years, the medical CAT scanner has been adapted to engineering applications in nondestructive testing and product inspection. Military, space and industrial applications, including turbine blades, automotive parts (metal and rubber) and food items, are discussed. Current commercial CT system design parameters and system specifications illustrate the limitations, challenges and potential for future industrial inspection applications.

9:15 **THE DEVELOPMENT OF A MACHINE VISION PROBLEM SPECIFICATION SYSTEM**

Mary Lou Dorf and James B. Farison
Department of Electrical Engineering
The University of Toledo, Toledo, Oh 43606

In the coming years, machine vision systems will be widely used in applications such as dimensional measurement, on-line inspection, sorting, process control, and robot guidance. In order to develop a successful machine vision system for any of these applications, accurate and timely specification of the problem is critical. This might be a new and potentially difficult requirement for many businesses. This paper discusses the machine vision program of the Edison Industrial Systems Center (Toledo). The Edison Center is part of the state of Ohio's Thomas Edison Program that provides funding to match private capital and promotes cooperation between industries and educational institutions. One of the Edison Center's supported projects at The University of Toledo is the development of a machine vision problem specification system for dimensional measurement. This project is discussed in detail, including case studies illustrating the need and a description of the approach used to define accurate specifications for a machine vision application.

9:30 SIMPLE ORIENTATION COORDINATE TRANSFORMATIONS FOR ROBOTS. Malcolm R. Railey, Department of Electrical Engineering, The University of Akron, Akron, Ohio 44325-3904.

In order to direct the control of a robotic arm one must know the relationships between the robotic end-effector and the work piece as well as the work station. These relationships are expressed in terms of homogeneous transformations that contain translations and rotations. Any robotic arm can be considered to consist of a series of links connected together by joints. Each link will have one coordinate frame and one-degree-of freedom about its joint axis. If the link also has a twist angle, then a pseudo frame will be added to handle the twist angle. Therefore, it is easy to see that robot control can become complex very quickly. The objective of this study is to illustrate a simple technique of deriving these homogeneous transformations. Included in this study is the effects of Pieper's solution for the case where all six robotic joints being revolute, with the last three axes intersecting.

9:45 **GAUSSIAN ELIMINATION FOR PARALLEL COMPUTATION**

Mr. Srivasan Anand and Dr. James Grover
Department of Electrical Engineering,
University of Akron, Akron Ohio 44235

For large speedup and high efficiency of the parallelization of the Gaussian elimination both the triangularization and

back-substitution must be partitioned properly. While parallel partitioning of triangularization has been popular, the back-substitution has always remained serial. An approach is presented for a parallel back-substitution for a shared memory architecture. This back-substitution allows each processor to perform intermediate calculations based only on local memory data. In turn, each processor completes the back-substitution on the key row and places the solution vector element in global memory. This process continues in a round-robin manner until the complete solution vector is obtained. The algorithm was implemented on both 8-bit and 16-bit systems. On the 8-bit system the floating-point calculation were emulated and on the 16-bit system a floating-point coprocessor was used. Speedup ranged from 1.8 to 3.6 with this algorithm on a 2 to 4 processor system.

DISTRIBUTED BLIND SEARCH STRATEGIES

10:15 Antonije D. Jovanovic
EE Dept, The Univ. of Toledo, Toledo, OH 43606

Breadth-First (BFS) and Depth-First Search (DFS) strategies had initialy a widespread use among AI researchers. Later on they gained recognition by designeers of sequential graph-processing algorithms in various engineering fields. As paralel processing became feasible, applications of BFS nad DFS have been given appropriate consideration in the fields that were using them for sequential processing already. Computer and and digital communication networks with distributed processing power at network nodes have opend a new field of application for the same two basic blind search strategies. Solutions to various network communication problems require algorithms that have to search the network graph using distributrd processing ressources in an asynchronous environment. New attributes of the distributed processing environment: asynchronous actions, absence of shared memory ressources, limited amount of information at processing nodes, and the need for communication, present quite a new arena for competition between BFS and DFS. Efficiences of distributed algorithms are measured in terms of time and communication complexities, and in the number of different messages they are using. Time efficiency is not determined as a computational complexity at processing nodes, but rather as the number of communication-time intervals needed to complete the search. Communication complexity is determined by the total number of messages that have to be transmitted over the network during the search. This paper presents an overview of distributed BFS and DFS algorithms.

10:45 AN ORDER STATISTICS CLASSIFIER: THE SUPERVISED LEARNING CASE. Mounir S. Merhi, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606.

The field of Order Statistics deals with the properties, and applications of ordered random variables, and of functions involving them. The novel idea of applying those concepts to the area of pattern recognition is explored in this paper. An Order Statistics clustering algorithm is presented, and tested with a simple numerical example first, and then by computer simulation on the Fisher's Iris data.

SECTION O. Engineering in B134
Third Morning 9:00 a.m.
Saturday, April 29, 1989
Y. T. Hung, Presiding

9:00 PHYSICO-CHEMICAL TREATMENT OF DYE WASTEWATERS WITH SAWDUST ADSORPTION PROCESS. Mohsen Yekta-Fard, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

The objectives of this laboratory study were to determine the feasibility of using sawdusts in the physico-chemical adsorption process for the removal of dyes in the dye wastewater and to determine the factors affecting sawdust adsorption process. Two types of synthetic dye wastewaters were prepared using Acid Blue 25 (Telon Blue) and Direct Red 28 (Congo Red). Sawdusts were prepared from 6 hardwood and 2 softwood.

Among 8 sawdusts tested, Beechwood, Red Oak and Whitepine were found to have high capacities for these dyes. The adsorption capacities increased with decreasing particle size. The increasing temperature increased the adsorption of Congo Red dye but decreased the adsorption of Telon Blue dye indicating physisorption of the latter and chemisorption of the former.

9:15 AN OPTIMAL TEST OF POTATO WASTEWATER TREATMENT BY YEAST. Nian-Fa Tang, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

Potato wastewater can be treated by yeast under aerobic condition. Organic removal of yeast treatment process is affected by the growth environmental factors of yeasts including temperature, pH and air supply. The relationship between treatment efficienicies and these factors could not be determined by ordinary test method. In this study, an advanced mathematical method, regressive orthogonal method, was applied to design an optimal test based on 3 main factors and 4 interactive factors. An optimal batch test of 8 reactors was conducted. The results of the optimal test are equal to the results of a full-scale test with 128 reactors (i.e. 2^7=128). A series of mathematical equations, which can be used to describe the importance of the factors in certain range, were set up. The relationship between factors and different analytical items are expressed by the equations. Based on the analysis , it is concluded that the treatment efficiencies are not significantly affected by pH (between 6 and 9), but are significantly affected by temperature and air supply.

9:30 INFLUENCE OF FACTORS AFFECTING AEROBIC BIO-AUGMENTATION PROCESS IN POTATO WASTEWATER TREATMENT. Nian-Fa Tang*, Yung-Tse Hung*, Frank L. Horsfall**, *Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115, **General Environmental Science Corp., Cleveland, Ohio.

Nitrification, total organic removal and sludge production are important information in the aerobic bio-augmentation treatment of potato wastewaters. These are affected by three major factors including influent organic loading, ammonia nitrogen and dosage of bacterial culture product addition. To evaluate the influence of these three factors and their interaction, a batch reactor test with 11 aerobic reactors was conducted at room temperature. Type N-1 of LLMO, manufactured by General Environmental Science Corp., was used in the bio-augmentation process. The test results indicated the influence of the factors are expressed by three sets of equations which were set up by optimal statistic calculation. TOC (total organic carbon) removal, ammonia nitrogen removal and S.S. (suspended solids) variation are used as evaluation parameters. At the end of 48 hours reactor run, the TOC removal efficiency was 86.6 to 88.1%, and 95.6 to 96.2%, for influent TOC of 119 to 134 mg/l, and 451 to 481 mg/l, respectively,

9:45 TREATMENT OF MILK WASTEWATER BY A TWO-STAGE ANAEROBIC-AEROBIC LAGOON PROCESS. Jerry R. Taricska, 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 lagoon on the treatment of milk wastewater and to examine effects of bio-augmentation on treatment performance. The experimental setup consisted of 3 pairs of parallel trains of two-stage lagoon units. Bio-augmentation was applied to one train of each parallel train. The influent milk wastewater contained 906 mg/l of TOC. The two-stage anaerobic/aerobic lagoon processes had TOC removal efficiencies of 96.4, 97.3 and 96.9%, for trains 1, 2 and 3, respectively. While for the trains with bio-augmentation, the efficiencies were improved to 97.2, 97.7 and 97.2 % for trains 1, 2 and 3, respectively. Stage 2 removal efficiencies were improved with bio-augmentation from 69.8 to 78.2%, 77.3 to 82.3% and 74.2 to 93.7% for trains 1, 2 and 3, respectively.

10:00 MULTI-STAGE ANAEROBIC FILTER FOR TREATING MILK WASTEWATER WITH AND WITHOUT BIO-AUGMENTATION. Frank C. Mbachu, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

Experiment was conducted with a four-stage anaerobic filter process for treatment of milk wastewater with and without bio-augmentation. The primary filters were fed at a COD (chemical oxygen demand) loading range of 15 lb/1000 ft^3/day to 220 lb/1000 ft^3/day. The primary and secondary filters have a non-clog plastic media with specific surface of 44 ft^2/ft^3 while the tertiary filters consisted of pal rings and fourth stage filters consisted of activated carbon and charcol media for each train. The filter system achieved up to 98% COD removal and bio-augmentation improved the primary filter performance by about 5%. The kinetic analysis showed that milk waste agree with Monod type of equation for substrate utilization. In linerized form the observed data correlated to more than 95%. The observed gas production rate suggested that steady state was reached for each of the six loading rates studied. The influent concentration ranged from 276 to 4000 mg/l. The pH value during the course of the study ranged from 6.52 to 8.30. It is concluded that four stage anaerobic reactor could be used to achieve complete treatment for milk wastewaters.

10:15 BIOLOGICAL TREATMENT OF POTATO WASTEWATER WITH BIO-AUGMENTATION PROCESS. Pi-Chang Jen, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

A two-stage anaerobic-aerobic process was used to determine its effectiveness in the treatment of potato wastewater with bio-augmentation process. Synthetic potato wastewater amended with synthetic sugar wastewater was used as feed. The bacterial culture product used in the bio-augmentation process in this study contained heterotrophic and nitrifying microorganisms. A short hydraulic detention time, 6 hours, was used in the anaerobic pretreatment process to reduce the volume requirement for the anaerobic filter. Results indicate the TOC (total organic carbon) removal was about 30% for both bio-augmented and non-bio-augmented anaerobic filters. In the aerobic process, the TOC removal were between 84.1% and 93.6% for the bio-augmented reactors, and between 78% and 92.1% for the non-bio-augmented reactors. Statistical analysis showed significant difference on the organic removal between the bio-augmented reactors and non-bio-augmented reactors. Bacterial population was between 25.3 and 63.1*10^7 cells/ml for bio-augmented reactors and between 12.2 and 45.8*10^7 cells/ml for non-bio-augmented reactors. The bio-augmented reactors had higher bacterial population than the non-bio-augmented reactors.

SECTION O. Engineering in B211 First Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Tom Hartley, Presiding

NOTE: Following the Business Meeting, a Plenary Session will be held in this room from 2:00 - 3:00 p.m. featuring the following abstract:

2:00 AERO-PROPULSION CONTROLS RESEARCH
Carl F. Lorenzo
NASA Lewis Research Center
21000 Brookpark, Road, Cleveland, OH 44135

The demand for increased functionality and performance for future aircraft has lead to a large increase in system complexity and dynamic coupling between the aircraft and propulsion systems. These factors increase pilot workload and decrease system reliability unless specific measures are taken. Advanced controls can help alleviate pilot workload and allow optimal aircraft performance to be achieved, however, this necessitates that an integrated design approach to aircraft flight controls and propulsion control be evolved. The NASA Lewis Control program addresses the above issues. Integrated Controls design methodologies are being developed, for SSTOVL aircraft, which integrate subsystem controls to achieve optimal aircraft performance and reduce pilot workload. The Sensor Failure Detection and Accommodation program attains control reliability through the use of Analytical Redundancy (AR). Available sensor information and reference models of the engine detect and accommodate sensor failures The method has been successfully applied to the F-100 engine over the flight envelope. The Intelligent System Control program is an interdisciplinary thrust which combines Artificial Intelligence, Materials and Structural science with Controls to extend life of state-of-the-art engines such as Space Shuttle Main Engine or Hypersonic Propulsion Systems where transient effects on engine life are important.

3:00 AN APPLICATION OF REDUCED ORDER MODEL TECHNIQUES Mark S. Ruetty Loral Systems Group D/472/C2E 1210 Massillon Rd. Akron OH 44315 and Dr. J. Alex De Abreu University of Akron Dept. of Electrical Eng. Akron OH 44325

Numerous techniques for approximating the Transfer Function of a Higher-Order system with one of a Lower-Order Model have been developed. The intent of this paper is to summarize the various methods for finding a Reduced Order Model. The Flight Dynamics of the F-8 Oblique Wing Research Aircraft is used as a basis for exercising different Reducing algorithms. It will be evident that each method has a certain degree of complexity. This results in Reduced Order Models that differ characteristically. Conclusions are drawn on each method for purposes of comparison.

3:30 LYAPUNOV CONTROL THEORY: AN INTRODUCTION A. Sarantopoulos, T. Hartley, A. DeAbreu Dept. of Electrical Engineering, The University of Akron, Akron, OH 44325-3904.

A novel state feedback control approach based on Lyapunov theory is presented for linear systems. The resulting controller is guaranteed to be stable, somewhat optimal, robust, readily able to alter the convergence rate of a given state, and reconfigurable if actuators fail. The design requires no equations to be solved and is easily done by hand, however, the resulting closed loop system will be nonlinear. The derivation is easy and follows below. Consider the system to be controlled to be $x' = Ax+Bu$. A Lyapunov function for this system can be chosen as $V=x^TPx$ with P arbitrarily chosen as the identity matrix or diagonal with energy normalization. Its time derivative is then $V' = x'^TPx + x^TPx'$. After substituting for x', this becomes

$$V' = x^TA^TPx + x^TPAx + 2x^TPBu = -x^TQx ,$$

where the term on the right forces stability if Q is P.D.. This equation can be solved for u to give

$$2x^TPBu = -x^T(Q+A^TP+PA)x$$

. If u is a scalar, then the term multiplying it is also a scalar and u is readily obtained. If u is a vector, then the left side of the equation is a sum of scalar-input products. Thus any input combination will work. The resulting system is then guaranteed stable.

3:45 DESIGN OF ADAPTIVE STABILIZERS FOR POWER SYSTEMS

Peter Idowu Dr. Adel Ghandakly
Department of Electrical Engineering
The University of Toledo
Toledo, OH 43606

An adaptive Power System Stabilizer (PSS) design concept is proposed for a multimachine electric power system. The adaptive stabilizer determines a new set of control parameters as changes occur in system configuration and load levels, assuring controller parameters to be optimal for different operating conditions. This design philosophy involves application of decentralized and model reference adaptive control theories.

PSS control signals are derived at the inputs of generating units by utilizing system variables available at the machine bus. The locally derived stabilizing signals are such that a global objective specified in the form of a reference system is satisfied. The adaptive PSS signal inputs are coordinated and asymptotic stability of the interconnected system is assured.

The proposed PSS scheme was tested on a computer simulated system.

4:00 A LABORATORY ELECTRICAL GENERATING UNIT TWO LEVEL DIGITAL CONTROLLER DESIGN. A. A. Ghandakly and M. E. Brihoum, Dept. of Electrical Engineering, The University of Toledo, Toledo, OH 43606.

An interface hardware to use two processors to control a synchronous generator is presented. All the components that process the feedback signals as well as the input signals are designed. Furthermore, the digital controller design hardware is emphasized. The master processor used is an IBM PC System/2 Model 80 which uses the powerful INTEL Microprocessor 80386. The slave processor is an embedded microcontroller, the INTEL 80C196. The latter samples 7 channels of the plant variables, digitizes them and finally transmits this data serially to the host computer. The host analyzes this data to determine the appropriate control to the plant. The control signal is sent directly to the plant through the personal computer parallel port.

4:15 A Laboratory Course in Digital Control Systems Amy Chicatelli, M. R. Railey, Dept. of Elec. Engineering, The Univ. of Akron, Akron, OH 44325-3904

Teaching digital control systems at the University of Akron is performed by class lectures and a support laboratory which is equipped with personal computers. Presented in this paper are only the laboratory concepts necessary to support the lectures. Four major subject areas are presented in fourteen experiments that represent an undergraduate course. Topics covered are discrete-time systems, controller design methods, conversions between analog-to-digital systems, and system identification.

The experiments are performed on a PC computer using language Basic, and software packages such as Matlab and Program Classical Controls. The first three experiments contain the basics such as stability, approximations, sampling and hold devices, and nonsynchronous sampling. The next three include conversions between analog-to-digital systems such as system response and simulations. Stability for linear and nonlinear systems is covered in the seventh experiment. The next six experiments concentrate on controller design including PID, minimum time, minimum variance, state feedback, observers, and digital filters. System identification concepts are illustrated in the last experiment.

The above laboratory is designed to teach the student to use the PC computer and to reinforce and enhance the material learned in the classroom.

4:30 REVIEW AND APPLICATION OF THE FORCED OSCILLATOR

Tim Vierheller, Wayne College, 10470 Smucker Rd. Orrville, OH 44667

The physics and mathematics of the forced oscillator will be reviewed. Examples of oscillators include the Texas Tower, coupled oscillators on a linear air track, and LCR circuits. The solutions to these systems will be found by the following techniques: Introductory differential equations, Laplace Transformations, Lagrangian Dynamics, Runge Kutta Numerical Solutions, and the Analog Computer (integrating operational amplifiers). In addition to this review, the basic concepts of the forced oscillator will be applied to a model which describes the viscoelastic behavior of polymers.

SECTION O. Engineering in B201
Second Afternoon 3:00 p.m.
Saturday, April 29, 1989
James Farison, Presiding

3:00 FINITE ELEMENT MODELING OF INTERFACES

Mohamad Subhi Qatu, Department of Engineering Mechanics, 155 W.Woodruff , Columbus Ohio 43210

Modeling of interfaces between layers is a problem that arises in many fields of engineering like composite laminates, rock mechanics and many others. Interfaces can be three dimensional, two dimensional (plane stress or plane strain), or axisymmetric. When the method of Finite Elements is applied, numerical and physical problems; such as interpenetration between layers , may occure. Many Finite Element models were suggested to solve the problem.

In this paper, the literature on the subject is reviewed The stiffness matrices for different elements are derived. The Finite Element formulation for both plane strain and axisymmetric problems are given. One numerical example is studied extensively. The models suggested by Heuze et al and Desai et al are compared with the Modefied Quadrilateral Interface Element. It is concluded that the Modefied Quadrilateral Element gives the best results for interfaces that can permit slippage, while the Elastic, Thin Layer Solid Element is good for bonded interfaces.

Reference: Qatu M.S., " Finite Element Modeling of Interfaces ". Individual Study, Department of Eng. Mechanics, The Ohio State University, Columbus Ohio, Summer 1987

3:15 **FINITE ELEMENT ANALYSIS OF PIEZOCERAMICS**

Alan R. Barnett
Nagi G. Naganathan
Mechanical Engineering Department
The University of Toledo, Toledo, Ohio 43606.

Piezoceramics have found extensive use in vibratory applications such as sonar transducers, cooling fans, etc. However, their use in actuation (using their behavior in static modes) is rather limited despite their capabilities to generate precise motions (typical accuracy of 0.01 μm) together with appreciable forces (4000 N/m^2). Despite being in commercial use for several decades, very few attempts have been made to analyze piezoceramic configurations analytically. Development of such analytical methodologies will in turn lead to effective synthesis of piezoceramic microactuators.

The authors of this paper have developed a methodology to analyze three-dimensional piezoceramic configurations through a finite element approach. The methodology allows analysis of three-dimensional piezoceramic configurations of arbitrary geometry subjected to a combination of charge and displacement boundary conditions. The governing equations representing the nonlinear behavior of the material are linearized for the purpose of analysis. Tetrahedron finite element models with four and ten nodes have been derived. Special mesh generators and graphic post-processors have also been developed to facilitate easy analysis. The long-term goal of this research is to design methodologies for precision regulation of piezoceramic microactuators.

3:45 APPLICATION OF THE RITZ METHOD TO THE ANALYSIS OF LAMINATED COMPOSITE PLATES AND SHALLOW SHELLS.

Mohamad Subhi Qatu, Department of Engineering Mechanics 155 W. Woodruff Ave., Columbus OH 43210

The use of high performance materials is becoming more necessary and increasingly significant in structures subjected to sever loading conditions such as spacecraft, deep submersible vehicles and many others. The gross weight of structural components is becoming a controlling factor for both the designer and the stress analyst. The use of laminated composite materials in such structures is an interesting research topic.

Among the many types of structures, plates and shallow shells are of great importance. The present paper deals with the application of the powerful Ritz method to the static analysis and free vibrations of laminated composite plates and shallow shells. The strain and kinetic energy functionals as well as load potential are derived for a general laminated composite shallow shell. The formulation can be applied to many important boundary conditions, such as completely free and cantilevered laminated plates and shallow shells. The effects of many parameters like the lamination sequence, orthotropy ratio, curvature ratio and thickness ratio are studied. Results should be interesting to both design engineers and researchers.

Reference: Qatu M.S.," Static Equilibirium and Free Vibrations of Laminated Composite Shallow Shells", Ph.D. Dissert.

4:15 **NEW GENERATION OF MATERIALS FOR TOMORROWS AEROSPACE VEHICLES**

Dr. T.S. Srivatsan, Department of Mechanical Engineering, University of Akron, Ohio 44325.

The increasing need for higher speed, maneuverability, durability and reduced fuel consumption are factors which forced the aerospace industry to develop high strength, lightweight material systems for aircraft structures. New commercial and military aerospace vehicles will require major advancements in design, propulsion and structures. To meet these stringent demands improvements in material are sought in essentially all engineering properties including strength, stiffness, toughness, fatigue and corrosion resistance. The new aircraft materials meeting these requirements include the alloys belonging to the aluminum, titanium and magnesium families, metal-matrix composites and resin-matrix composites. Among these new generation materials, aluminum-lithium alloys have received a great deal of attention as a result of their low density, high stiffness, attractive manufacturing costs and the extensive previous use of aluminum alloys in stiffness-critical airframe structures. With the advent of novel processing techniques and superplastic forming, lightweight aluminum-lithium alloys have become competitive in terms of manufacturing costs. This presentation will given an overview of several of the most important of these developments with an assessment of the role this material is expected to play with respect to future aerospace applications.

4:30 A LASER LIGHT METHOD IN DETERMINING CONTACT CLARITY, D. L. Bujak and T. W. Taylor, Deptartment of Physics, Cleveland State U., Cleve., Ohio 44115

We have devised a method for determining the contact clarity of a material. Contact clarity refers to the quality of an image seen through the material when in contact with an object.

The apparatus used consists of a HeNe laser,a lens, a half blackened microscope slide and a variable slit mounted to a CdSe photoresistor. The slide provides for a transition from dark to light. The intensity of the transmitted light is measured as the slide is translated from the blackened side to the clear side. This allows a determination of the sharpness or clarity of the transmitted image.

The difference between the transmitted intensity with and without the material was determined as a function of the dark to light transition location. The variance of the difference curves as the slide to detector distance is changed determines the contact clarity of the material. We have measured the contact clarity of three different plastics.

4:45 **MATHEMATICAL ANALYSIS OF TWO NOVEL IMPLANTABLE BIOARTIFICIAL PANCREAS CONCEPTS**

Jeffrey G. Sarver and Ronald Fournier, Department of Chemical Engineering, University of Toledo, 2801 W. Bancroft St., Toledo, Ohio 43606

Two novel designs for an implantable bioartificial pancreas are evaluated by mathematically simulating their response to various glucose stimulation patterns. Results from the mathematical simulations indicate that both of these designs offer significant benefits over implantable devices considered by other researchers. The goal of this study is to develop an implantable device which can normalize blood glucose levels in insulin-dependent diabetics and thus prevent the chronic complications of diabetes.

This effort focuses on devices that contain an insulin secreting islets of Langerhans compartment separated from a blood flow compartment by a semipermeable membrane. Blood flow through the device is achieved by an arterio-venous shunt.

The two designs considered here seek to overcome the limitations associated with implantable devices considered in the past; namely the problems of a large mass transfer time lag and blood damage due to high blood shear rates within the device. A radial flow hollow fiber design yields extremely low blood shear rates while allowing a large amount of surface area in order to reduce the mass transfer time lag. A spiral wound membrane sandwich design offers ultrafiltration, a form of convective mass transfer, to completely overcome the limitations of diffusional mass transfer, while still having reasonably low blood shear rates. The effects of all important device design parameters (device length, blood flow rate, membrane thickness, etc.) are considered in evaluating both of these designs.

5:00 **TRUNK MUSCLE RESPONSE TO DYNAMIC LOAD LIFTING/PULLING.**

Kumar B. Kulkarni and Demetrios D. Raftopoulos

Department of Mechanical Engineering
University of Toledo, Toledo, OH 43606

Present-day methods of treating patients with acute or chronic low back pain are still suffering from lack of knowledge of true causes of these common pain syndromes. The mechanical factors are of importance and, in larger studies, it has been repeatedly demonstrated that more than fifty per cent of the patients claim that the onset of their symptoms occurred in connection with lifting heavy objects or in performing various strenuous mechanical tasks, and nearly all of them noted the increase of pain following mechanical stress. The majority of biomechanical research activities in manual material handling has focused on static models and ignored the effects of velocity and acceleration. However, it should be noted that most of our daily living activities are performed dynamically.

About 10 male subjects of age between 20 to 40 years participated in an experiment designed to study the effects of fast motions of the upper extremities on the trunk muscles during mechanical lifting and pulling of known weights. A 22 muscle model was used to predict the muscle forces to equilibrate the applied external loads. Since the problem is statically indeterminate, linear programming techniques were employed. The predicted muscle forces were then correlated with the recorded EMG activities. A good correlation and linear relationships were observed between the predicted muscle forces and measured EMG. Muscle intensities (stresses) and EMG activities were found to be very much higher during the dynamic tasks as compared to static tasks.

SECTION O. Engineering in B200
Third Afternoon 3:00 p.m.
Saturday, April 29, 1989
Y. T. Hung, Presiding

3:00 BIO-AUGMENTATION PROCESS FOR NITRIFICATION IN ACTIVATED SLUDGE TREATMENT OF MILK WASTEWATER. Ermelindo Gomes, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

A laboratory study was conducted to determine the effects of bio-augmentation on nitrification in the activated sludge treatment of milk wastewater. Parameters examined included TOC, COD, NH_3-N, pH, hydraulic detention time (HDT), sludge settleability, O_2 uptake, and sludge age. The bio-augmentation process involved the addition of a bacterial culture product which contained nitrifying and denitrifying microorganisms. Overall, the TOC removal efficiency ranged from 91.6 to 92.9%. The NH_3-N removal efficiency ranged from 49% at an HDT of 6 hours to 95% at an HDT of 24 hours. Bio-augmentation increased the NH_3-N removal by 4.4% at an HDT of 6 hours, but did not show a significant improvement for HDT at either 12 hours or 24 hours.

3:15 TREATMENT PERFORMANCE OF A MUNICIPAL WASTEWATER TREATMENT PLANT USING TRICKLING FILTER FOLLOWED BY ACTIVATED SLUDGE PROCESS. Aik-Heng Lee*, Yung-Tse Hung*, Ermelindo Gomes*, Frank L. Horsfall,III**, * Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115, ** General Environmental Science Corp., Cleveland, Ohio.

A field study was conducted to evaluate the treatment performance of municipal wastewater treatment plant using two-stage secondary treatment process, trickling filter followed by activated sludge processes. The design flow of the treatment plant was 3.6 MGD (million gallons per day). For the period of 3-month study, the average daily flow was 1.99 MGD, the overall removal efficiency of BOD (biochemical oxygen demand) of the plant was 98 %. In trickling filter, the average daily flow rate was 3.85 MGD with 37 % average recirculation flow of 1.42 MGD. The average organic loading and hydraulic loading applied to the trickling filter were 1210 GPD/SQ.FT. (gallons per day per square feet) and 16.52 LB BOD/1000 CU.FT.. In the activated sludge aeration tank, the average MLSS (mixed liquor volatile suspended solids) and MLVSS (mixed liquor volatile suspended solids) were 3306 MG/L (milligram per liter), and 2372 MG/L, respectively. The average SVI (sludge volume index) was 50.85 and the average F/M (food to microorganism ratio) was 0.164.

3:30 START-UP PERFORMANCE OF ROTATING BIOLOGICAL CONTACTOR IN MILK WASTEWATER TREATMENT. Aik-Heng Lee, Yung-Tse Hung, Civil Engineering Department, Cleveland,State University, Cleveland, Ohio 44115.

Two 4-stage bench scale Rotating Biological Contactor (RBC) units were employed to evaluate the start-up performance in treating milk wastewater. Synthetic wastewater was used as the feed for the RBC units. The two units were operated at constant hydraulic loading of 0.65 gpd/sq.ft.. The influent TOC (total organic carbon) ranged from 200 to 350 mg/l. The overall TOC removal efficincy by the 4-stage RBC varied from 71 % to 85 % with the major removal occurring in the first and second stages. The pH of the reactor contents ranged from 6.15 to 7.5, while the oxygen uptake rate ranged from 3.84 to 36.47 mg/l/hr.

A brief outline of the principles involved in nitrification is given. In addition, the growth kinetics and mass transfer principles that were used to develop the model for RBC nitrification is described. The biological treatment process for carbonaceous and nitrogeneous removal in RBC will be discussed.

3:45 ENVIRONMENTAL SANITATION PRACTICES IN DEVELOPING COUNTRIES WITH TROPICAL CLIMATE. Aik-Heng Lee, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

This paper is a detailed review of the currently available sanitary water supply and wastewater disposal practices in developing countries in tropical area, with a view to define technical and social problems. In developing countries, the techniques used for sanitary water supply and wastewater disposal are less advanced than western countries. The needs of reviewing current knowledge of techniques used in the sanitary practices of developing countries is described. A survey conducted by WHO (World Health Organization) in 1986 showed that only 24 % of the world's population surveyed had accessed to safe drinking water, while 14.2 % of the world's population surveyed had accessed to adequate sanitary facilities. For the decade from 1980 to 1990, WHO reported that 76 developing countries have targeted 71 % to 93 %, and 32 % to 86 % increase in urban water supply coverage, and rural water supply coverage, respectively. For the urban, and rural sanitation targets, the increase of 41 % to 76 %, and 12 % to 37 %, respectively, were proposed.

4:00 EFFECT OF PENTACHLOROPHENOL ON BATCH ACTIVATED SLUDGE TREATMENT OF POTATO WASTEWATER WITH BIO-AUGMENTATION. Majid Zarrinafsar, Yung-Tse Hung, Civil Engineering Department, Cleveland State University, Cleveland, Ohio 44115.

The effect of pentachlorophenol on bio-augmentation was studied in batch activated sludge reactor in treating potato wastewaters. Synthetic potato wastewater using potato juice was used as reactor feed. The feed contained 1500 mg/l COD (chemical oxygen demand), and 5 mg/l pentachlorophenol. The bacterial culture product was added at a dosage of 5 mg/l for bio-augmentation. The parameters pH, TSS (total suspended solids), VSS (volatile suspended solids), DO (dissolved

oxygen), and COD (chemical oxygen demand) were measured during 30 hours batch reactor study.

The kinetic parameters of the reactors were determined both in presence and abscence of bacterial culture products addition. The experiment showed no significant difference between the bio-augmentated and the non-bioaugmented reactors in treating potato wastewater containing 5 mg/l pentachlorophenol. The reduction in treatment efficiency of both in presence and absence of bio-augmentation was immediate and lasted throughout experiment.

4:15 EFFECT OF PHENOL AND SODIUM PHENATE ON BATCH ACTIVATED SLUDGE TREATMENT OF POTATO WASTEWATER WITH BIO-AUGMENTATION. Majid Zarrinafsar, Yung-Tse Hung, Civil Engineering Department, Cleveland, Ohio 44115.

In this laboratory study, toxic effects of phenol and sodium phenate on the batch activated sludge treatment of potato wastewater with bio-augmentation was evaluated. The feed was prepared using potato juice to give a COD (chemical oxygen demand) of 2000 mg/l. The concentration of phenol and sodium phenate was 10 mg/l. The bio-augmentation dosage was 10 mg/l using bacterial culture product, LLMO, manufactured by General Environmental Science Corp., Cleveland, Ohio. TSS (total suspended solids), VSS (volatile suspended solids), pH, COD, and DO (dissolved oxygen) were measured duri- the 48 hours batch reactor study. The kinetic parameters of reactors were determined and compared.

These experiments showed that there was no significant difference in treatment performance among reactors with various types of LLMO and the control reactor in treating potato wastewaters containing phenol and sodium phenate of 10 mg/l. The COD removal efficiency of treatment in all reactors dropped to 25 %.

SECTION R. Ecology in B214 Only Morning 9:00 a.m. Saturday, April 29, 1989 Horton Hobbs, Presiding

9:00 AN ECOLOGICAL BASELINE STUDY OF THE FORT ISLAND PARK AREA, FAIRLAWN, OHIO. Forrest J. Smith, Associate Professor of Biology, Wayne College, The University of Akron, Orrville OH, 44667.

The Fort Island area is a tract of low, swampy land adjacent to Griffith's Park in Fairlawn, Ohio. Plans have been made to extend the human usage of the park into this near wilderness area. During the summer of 1988, baseline characterization studies were made by archaeologists, geologists, and a biologist. This study concerns the biological censuses made, and includes the listing of over 160 species of plants in more than 60 families and the sighting of 40 species of birds. Other incidental species were catalogued. A number of distinct habitats were identified in and around this lowland built mostly on Carlysle muck soils. Some interesting unique "bog" species remain growing in the site. The park which results from this expansion will perhaps be a unique educational site with opportunities to study science in a natural laboratory.

9:15 ORDINATION ANALYSIS OF OHIO'S FORESTED PLANT COMMUNITY DATA. James G. Kooser. ODNR, Div. of Natural Areas & Preserves. Bldg. F-1 Fountain Square, Columbus, Ohio 43224.

A preliminary classification of Ohio's natural plant communities was developed by D. Anderson in 1982. This classification lists 45 plant community types, 15 of which are forested. The Division of Natural Areas & Preserves has used Anderson's classification as a guide in its county natural areas inventory efforts. Data have been acquired for 150 examples of the 15 forested types. These data were analyzed using Detrended Correspondence Analysis (DCA) and Two-Way Indicator Species Analysis (TWINSPAN), in an effort to refine the classification. DCA split the examples into broad categories of xeric upland, mesic upland, and lowland swamp and riverine forests. Further analysis of these broad categories largely supports Anderson's classification. However, the analysis suggests that the creation of a new community type, mixed oak forest, may be appropriate. DCA yielded 5 swamp and floodplain forest types, in agreement with Anderson. The first DCA axis depicts a gradient of soil moisture and elevation. The second axis appears to represent disturbance patch size and return interval. TWINSPAN was used to suggest indicator species for the existing types, and the mixed oak type. These analyses should yield a more robust classification of Ohio's plant communities.

9:30 REPORT ON PROGRESS IN DETERMINING FOREST COMPOSITION AND CONDITION IN WESTERN WASHINGTON COUNTY, OHIO AT TIME OF EUROPEAN SETTLEMENT.

ORTT, Marilyn. 701 Colegate Dr., Marietta, OH 45750

Significant natural areas are currently being identified and inventoried by staff of the Ohio Heritage Program, Div. of Natural Areas and Preserves, ODNR. Knowledge of presettlement forest conditions is important in the interpretation of present conditions especially in the ranking process. Western Washington County is predominately within the Permian portion of the Unglaciated Appalachian Plateau Region of Ohio. The 1796 Ohio Company Surveyors' maps and notes have been examined and witness tree species and diameters as well as the absence of corner trees have been plotted on topographic maps. In this area white oak was the dominant witness tree. Special attention has been given to conifers to try to determine the distribution and frequency of pines and hemlock in the original forests. Distances from section corners to witness trees have also been analyzed as an indication of variation in forest densities. Early deeds to these lands as well as other historical sources have been examined for similar data in order that all available information be included.

9:45 AN EVALUATION OF A NEW QUANTITATIVE METHOD FOR SURVEYING NON-FORESTED PLANT COMMUNITIES. R.J. Garono, Department of Biological Sciences, Kent State University, W.T. Rankin, and J. C. Kooser, Department of Natural Resources, Division of Natural Areas and Preserves.

The Ohio Natural Heritage Program (ODNR,DNAP) identifies and evaluates plant communities on a county-by-county basis. A modified point-centered quarter method has been used since 1981 to collect data on forested community composition and structure. Recently, the need to validate Ohio's existing community classification system has been recognized. Staff of the Natural Heritage Program have been evaluating methods for quantitatively sampling non-forested communities. In the selection of a new method, consideration was given to the following: the method should provide a quantitative representation of community composition and structure; it should be easy to learn; it should be quick to use and not require sophisticated or combersome equipment; it must provide consistant results among field staff, finally, the adopted survey technique should be similar to methods currently in use at DNAP. Presented here is a hybrid of the point-centered quarter and line intercept methods which meet our criteria. Preliminary data indicate that this method quickly and accurately estimates dominance of dominant species to within 5% of values obtained using traditional methods.

10:00 HABITAT INTERACTIONS OF HARPALUS PENNSYLVANICUS (COLEOPTERA: CARABIDAE) IN A STRIP-CROPPED SOYBEAN AGROECOSYSTEM. Patrick J. Bohlen, Department of Zoology, Miami University, Oxford, Ohio 45056.

I studied the habitat interactions of a ground beetle, Harpalus pennsylvanicus, in a strip-cropped agroecosystem with three distinct habitats: soybean (Glycine max) strips, sorghum (Sorghum bicolor) strips, and a grass field border of barnyard grass (Echinochloa crusgalli) and giant foxtail (Setaria faberii). The grass border had highest beetle densities followed by sorghum then soybean. Beetle densities in sorghum did not differ significantly between trapping periods. In soybean, beetle densities were significantly higher after soybean leaf drop than before. Beetle densities in the grass border increased greatly as the border grasses dropped their seed: a preferred food of the beetle. Mark-recapture data revealed that the beetles were more likely to move from inside the plot to the grass border than in the oppositedirection. Temporal changes in beetle densities were related to changes in microhabitat and food availability, and resulted from an interplay between patch location and quality and interpatch movement.

10:15 EFFECTS OF DIVERSIFIED CORN AGROECOSYSTEMS ON LEVELS OF INFESTATION BY THE EUROPEAN CORN BORER, OSTRINIA NUBILALIS (HÜBNER) (LEPIDOPTERA: PYRALIDAE). Daniel M. Pavuk and Benjamin R. Stinner, Department of Entomology, Ohio State University, Ohio Agricultural Research and Development Center, Wooster, OH 44691, U.S.A.

The European corn borer, Ostrinia nubilalis (Hübner), is a major pest of corn, Zea mays, throughout the corn growing region of North America. In this study, four different corn agroecosystems were examined for their effects on infestation by O. nubilalis: 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 agroecosystem type were set up in a completely random design. Preliminary sampling of corn plants during 1987 to determine the parasitoid fauna of the European corn borer in this experiment indicated that populations of the European corn borer were higher in weed-free corn than in weedy corn. Random sampling of corn plants in late summer of 1988 showed that O. nubilalis was more abundant in weed-free corn than in corn grown with broadleaf weeds.

10:30 THE INFLUENCE OF HOST COLONY SIZE ON KLEPTOPARASITE SUCCESS FOR THE SOCIAL SPIDER, ANELOSIMUS EXIMIUS. Karen R. Cangialosi, Dept. of Zoology, Miami University, Oxford, OH 45056

Because of the large amount of webbing they provide, social spider colonies often act as hosts for other satellite spider species referred to as kleptoparasites or food stealers. Kleptoparasites can take advantage of increased prey capture rates associated with large spider aggregations. This study investigated the relationship between a social spider species which lives in the undergrowth of tropical rainforests in Peru, Anelosimus eximius (Aranae: Theridiidae), and a kleptoparasite, Argyrodes ululans (Aranae: Theridiidae), which shares their web. To determine whether the impact of Argyrodes on Anelosimus changes with host colony size, a controlled experiment utilizing spider colonies in screened field enclosures was conducted. Anelosimus colony size and prey size were varied to see if kleptoparasite success is influenced by the number of defending social spiders. Argyrodes steals a greater total number of prey and a greater proportion of larger prey in smaller host colonies. Therefore, social spiders in large groups appear to offer better defense against kleptoparasitism.

10:45 ASSESSMENT OF HOSTPLANT EXPLOITATION IN AN OLIGOPHAGOUS POPULATION OF PIERIS VIRGINIENSIS (LEPIDOPTERA:PIERIDAE). John A. Shuey and John W. Peacock, Battelle Mem. Inst., 505 King Ave., Columbus, OH 43201 and Ohio State Univ., Dept. Entomology.

In the 55 years since the original description of the larva of the West Virginia White, this butterfly has been presumed to be facultatively monophagous on the mustard Dentaria. We studied oviposition preference in a population which has two hostplant genera available, Dentaria and Arabis. We compared oviposition and larval survival relative to hostplant location, height, and flowering condition. Significantly more eggs are deposited on Arabis than on Dentaria, but there was no difference in larval survival through third instar on these hosts. Significantly more eggs were deposited on Arabis growing on a south facing slope than on level ground above and below the slope. Dentaria in bloom were more attractive to ovipositing females than were non-blooming plants. There was a significant correlation between oviposition and plant height in Arabis; there was no correlation for blooming Dentaria. We suggest that long term selection pressures at this site have resulted in the preference of P. virginiensis for the less ephemeral host, Arabis, over the highly ephemeral plant, Dentaria.

SECTION R. Ecology in B123
Only Afternoon & Business Meeting 1:30 p.m.
Saturday, April 29, 1989
Robert Heath, Presiding

2:00 RACCOON (PROCYON LOTOR) POPULATIONS: IRRUPTIVE OR CYCLIC? John F. Wing, Robert W. Cunningham, and Jay L. Weppler, Department of Psychology, Wittenberg University, Springfield, OH 45501.

The P. lotor population is sometimes cited as a classic example of an irruptive population (Dasman, 1964). A graph in Seton (1909) which shows three "irruptive" peaks in Hudson Bay fur returns is the source of this idea. However, Seton clearly stated that the largest peak in 1867 was probably due to pelt accumulations (Sanderson, 1987). An alternative explanation is that it was a clerical error. This study explores both explanations; and a reanalysis of Seton's data under both alternatives suggests cycles of 5-6, 10-12, and 22-24 years. Perhaps more importantly, no modern data show irruptions. Instead, contingency periodogram analyses of fur returns from a number of northern U.S. states and Canadian provinces (Novak et al, 1987) confirm cycles in P. lotor and show them to be closely in phase with other key primary consumers who also are cyclic: Lepus americanus, Mephitis mephitus (Finerty, 1980), and Tamiasciurus hudsonicus (Wing and Bolls, 1987).

2:15 CONFIRMATION OF A TEN-YEAR CYCLE IN LEPUS CALIFORNICUS IN ITS NORTHERNMOST RANGE AND ITS SYNCHRONIZATION WITH L. AMERICANUS CYCLES. John F. Wing, Jay L. Weppler, & William F. Higgs, Department of Psychology, Wittenberg University, Springfield, OH 45501.

Keith (1983) has reported the black-tailed jackrabbit (L. californicus) as a 10-year cyclic species whose populations in the northern U.S. are in phase with the snowshoe hare (L. americanus) in the Canadian boreal. This study confirms these facts statistically. Stoddart's (unpubl.) L. californicus 19-year series from Curlew Valley, UT was correlated with Keith's L. americanus 17-year series from Rochester, ALTA, Canada. They correlated $r = .947$ ($n = 15$, $p < .001$). Both series also were significantly correlated ($p < .05$) with an L. californicus 11-year series from Snake River, ID (Steenhof & Kochert, 1988). In all cases the highest correlations occurred with no lag between the series. Contingency periodogram analyses of April-June precipitation and temperature at nearby Salt Lake City, UT yielded significant 10-year cycles ($n = 50$, $p < .05$); and both weather variables correlated significantly ($p < .05$) with the L. californicus series. Hot and dry springs preceded population crashes. These weather effects may be partly direct and partly mediated by effects on herbage. Summer temperature and snowfall also may be implicated.

2:30 CORRELATIONS BETWEEN SPRING PRECIPITATION, TREE-RING GROWTH, AND HARE (LEPUS AMERICANUS) AND LYNX (LYNX CANADENSIS) POPULATION CYCLES IN ONTATIO. John F. Wing and Michael A. Quan, Department of Psychology, Wittenberg University, Springfield, OH 45501 and Amy J. Wing, George Mason University.

May-June and May-August precipitation records for Petawawa, ONT from 1931-1980 show significant ($p < .05$ and $p < .005$) 11-yr cycles when the contingency periodogram is applied (Legendre et al, 1981). These precipitation cycles are directly in phase with precipitation cycles at nearby Chalk River where May-August precipitation has been related significantly ($p < .05$) to jackpine (Pinus barksiana) tree-ring growth residuals for nearly three decades (Linzon, 1961) and perhaps tree-ring growth of other species, as well (Fraser, 1956). Snowshoe hare (L. americanus) population cycles reported by MacLulich (1936, 1937) and others are also closely in phase with the precipitation and tree-ring cycles and are significantly related to them ($p < .05$); and, of course, lynx (L. canadensis) populations follow closely upon those of the hare and are significantly ($p < .05$) correlated with the other variables. Intercorrelations between all these time-series are discussed both in terms of direct interactions (weather → food → hare → lynx); and also indirect interactions (e.g., weather → hare). It is concluded that the precipitation cycle is probably an important but not sufficient factor in explaining the hare and lynx cycles.

2:45 NESTING ECOLOGY OF GREAT BLUE HERONS (Ardea herodias) AT THE KNOX LAKE HERONRY

Gary L. Burkholder and Dwight G. Smith
Mount Vernon Nazarene College
Mount Vernon, OH 43050

The Great Blue Heron colony studied between 1979-84 was located in the remains of a mixed mesophytic woodland destroyed when Knox Lake was created for flood control in 1955. Adults arrived at the heronry between mid-February to mid-March and soon commenced nest repairs or construction of new nests. Eggs were laid in late

March and early April and young were in the nest late April through June and sometimes into mid-July. Number fledged young per active nests ranged from 2.2 in 1979 (38 nests) to 2.0 young (20 nests) in 1984, but total productivity declined from 82 young to 40 young during this time, primarily due to loss of trees and thus potential nest sites. Inclement weather figured in delay of onset of nesting while severe storms destroyed nests and young.

3:00 THE EFFECTS OF WILDFIRE AND PRESCRIBED BURNING ON THE STRUCTURE AND FORAGING COMPOSITION OF AVIAN COMMUNITIES. Robert C. Frohn. Institute of Environmental Sciences, Miami University, Oxford, Ohio 45056.

The effects of wildfire and prescribed burning on the structure and foraging composition of avian communities were studied. Data were compiled from the published results of several authors. Species richness, species diversity and evenness increased slightly following prescribed burns and wildfire with the greatest increases following wildfire. Changes in foraging composition were minimal following prescribed burning. Wildfire resulted in significant shifts in foraging composition with a large increase in ground-brush feeders and a decrease in tree foliage searchers. Wildfire alters habitat structure to a greater degree than does prescribed burning and thus affects the structure and composition of avian communities to a much larger extent.

3:15 **USE OF ARTIFICIAL NEST CAVITIES ALONG OHIO INTERSTATE HIGHWAYS BY BLUEBIRDS (Sialia sialis) AND MICE (Peromyscus). Minna Hsu and Tony J. Peterle, Dept. of Zoology, The Ohio State University, Columbus, OH 43210**

Artificial nest cavities, created by drilling holes into wood fence posts along Interstate highways in Ohio, were evaluated as potential eastern bluebirds nestsites. The degree of utilization and associated habitat characteristics for nesting bluebirds were investigated. Of 296 nest cavities examined in 1985, 2% were occupied by Bluebirds and in 1986 utilization increased to 3.7% (n=374). Most of the bluebird nests were found along I-71 north of Columbus. House wrens, house sparrows, and Carolina chickadees also nested in these boxes. Peromyscus occupied 118 cavities (40%) in 1985 and 234 (62.6%) in 1986. About 91-88% of the nest cavities along I-70 west of Dayton and I-71 north of Columbus were occupied by mice especially nest cavities surrounded by vegetation and crop field. The number of empty cavities decreased from 52% in 1985 to 24.9% in 1986. Approximately 7.8% of the cavities were rotten; 16.3% were too shallow to be used by birds. Management of these nest cavities is essential to improve their use by the eastern bluebirds.

3:30 THE EFFECT OF MALATHION OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS OF AN ACID BOG LAKE. Kathryn L. Jones and Robert T. Heath, Depart. of Biological Sciences, Kent State University, Kent, Ohio 44243.

Phosphorus often limits the growth of phytoplankton and zooplankton in Triangle Lake, a glacial acid bog lake located in Portage County, Ohio. This study examined the effects of malathion, a commonly used organophosphorus insecticide, on the release rate of phosphate from dissolved organic phosphorus compounds (DOP) and the formation of DOP by biota. Two concentrations of commercial malathion were used in determining the release rate of phosphate (4.8 ug/L,480 ug/L). Release rates from phosphomonoesters (PME) were determined from the Vmax, Km, and the PME concentration of the surface water. Acid phosphatase activity (APA) was measured spectrophotometrically using p-nitrophenyl phosphate (pNPP) as a model substrate. DOP formation was measured using 480 ug/L technical malathion on freshly collected 5 ml samples radiolabelled with carrier-free ^{32}P-orthophosphate and size fractioned using Sephadex G-25 chromatography. APA was greater in whole lake water samples containing malathion. Technical malathion completely inhibited the formation of DOP compounds after 24 hour incubation. These results indicate that low concentrations of malathion may adversely affect phosphorus-limited aquatic systems.

3:45 CHARACTERIZATION OF DISSOLVED PHOSPHORUS COMPOUNDS RELEASED FROM PLANKTON IN AN ACID BOG LAKE. A.C. Edinger and R.T. Heath. Department of Biological Sciences, Kent State University, Kent, OH 44243

Phosphorus availability limits the growth of bacterioplankton and phytoplankton in Triangle Lake, an acid bog lake in Portage County, Ohio. A recent model of phosphorus dynamics states that because bacteria outcompete algae for orthophosphate, algae must obtain phosphorus from dissolved organic phosphorus (DOP) compounds. This study investigated the biotic and abiotic formation of DOP compounds over a 24 hour period using a radiotracer. 32P was added to whole bog water. After designated time periods (5 minutes, 30 minutes, 60 minutes, 2 hours and 24 hours), the water was centrifuged and the soluble phosphorus compounds in the supernatant were size-fractionated using Sephadex G-25. Radiolabel moved from the chromatographic position of orthophosphate at 5 minutes to compounds of moderate molecular weight and high molecular weight after 24 hours. Radiometric tests indicated the presence of complex P compounds, some capable of releasing phosphate when hydrolysed with acid phosphatase.

4:00 HEAT DEATH VERSUS SURVIVAL OF FISH IN SHRINKING STREAM POOLS. Neal D. Mundahl. Department of Zoology, Miami University-Middletown, 4200 East University Boulevard, Middletown, Ohio 45042

Heat death of up to 12 species of fish was observed in two shallow (less than 20 cm), isolated pools of Indian Creek, Butler County, Ohio, during July 1988 when maximum water temperatures reached 38.3-39.5° C. Mean critical thermal maxima (CTM) of six species of fish collected from one of the pools ranged from 36.2-38.8° C. Despite exposure to these high water temperatures on at least two separate dates, four and 14 species of fish survived in the two pools, respectively. Survival of fish was attributed to their relatively high thermal tolerances (CTMs) during this period, and the availability of thermal refugia (shaded areas up to 6.5° C cooler than maximum pool temperatures) in each pool.

4:15 LOSS OR BENEFIT: ECONOMIC ANALYSIS OF THE PROPOSED TIFFIN RIVER DRAINAGE IMPROVEMENT
By George Opdycke, Engr. ret'd.
Rt. 2 Box 177
Bryan, Ohio 43506

A $2 million drainage improvement for the Tiffin River was analyzed for its economic benefit/loss. Agricultural statistics, professional engineer's reports of floodland, along with project construction cost, maintenance cost, interest rates, and reasonable projections of inflation, yield growth, and depreciation were all collected. This information was applied through a computer to derive cost/benefit schedules. Doubtful issues were resolved in favor of the project, and all damage costs were ignored. One finding is that a negative benefit, i.e., loss, can be expected each year. The accumulated loss at 30 years becomes more than $5 million!

SECTION R. Ecology
Poster Session in Theater Lobby
Saturday, April 29, 1989

Board F @ 2:00 p.m. BREEDING AND MIGRATORY BIRDS OF A TAMARACK FEN IN NORTHEASTERN OHIO. Trevor F. Vidic, Department of Biological Sciences, Kent State University, Kent, Ohio 44242

A series of 178 year-round visits (1985-87) were made to monitor and evaluate bird species' appearances at Frame Lake (Herrick) Fen, a protected 30 ha mosaic of bog and fen vegetation in Portage County. The fen preserve is part of a fragmented corridor of historic and remnant boreal wetlands within post-Pleistocene Chagrin River and Tinker's Creek watersheds along the buried valley of the Teays-stage Ravenna River. Since 1969, at least 130 species have been observed using the inundated peatland and associate vegetation that includes tamaracks, shrubby cinquefoil, poison sumac and northern bayberry. In 1985-87, 110 species were detected using fen resources, which compares favorably with survey totals of larger, more heterogenous glacial wetlands of the Ravenna River corridor. Northern and historic northeastern Ohio breeding birds with affinities for nesting in boreal and northern conifer plant communities appeared in substantial numbers as migrants, but were generally absent as breeders. Despite its comparatively small size and management for rare plants, the boreal and structural character of Frame Lake Fen was determined to be a crucial habitat for pressured breeding and migratory birds of the fragmented Western Reserve landscape that are tolerant of bog and fen conditions.

Board G @ 2:00 p.m. AN ANALYSIS OF A FLORAL DIMORPHISM IN THE ANDEAN SHRUB, BEFARIA RESINOSA. Michael N. Melampy, Dept. of Biology, Baldwin-Wallace College, Berea, Ohio 44017

Befaria resinosa, a shrub found in the Colombian Andes, is dimorphic with respect to floral stickiness. About 95% of 388 shrubs examined produced flowers with sticky corollas and calices. The other 5% produced nonsticky flowers. Forty percent of 257 nonsticky flowers set fruit compared to 43% of 1351 sticky flowers. The lack of a significant fruit set difference between the two morphs suggests that insects trapped on the sticky flowers are not necessary as a source of nutrients for developing fruits. The stickiness may serve to prevent nectar-robbing insects from entering the corollas. Measurements of nectar volumes in 53 sticky flowers from 12 shrubs and 53 nonsticky flowers from 16 shrubs revealed means of 2.26 ul per sticky flower and 1.44 ul per nonsticky flower. Although this difference is not quite significant ($F=2.93$, $p=.09$), there may be a real difference in nectar production between sticky and nonsticky flowers. Twenty sticky flowers from 9 shrubs and 29 nonsticky flowers from 10 shrubs were bagged to exclude insects and hummingbirds. The mean nectar volume collected from the bagged sticky flowers was 21.1 ul; for bagged nonsticky flowers the mean was 10.4 ul. This difference is significant ($F=17.2$, $p=.0003$). As long as nonsticky shrubs are rare, they may be able to attract pollinators who mistake nectar-poor nonsticky flowers for the similar but nectar-rich sticky flowers.

SECTION S. Information & Library Sciences in Library Only Morning and Business Meeting 9:00 a.m. Saturday, April 29, 1989 Chris Miko, Presiding

9:15 EVOLVING GOALS IN BIBLIOGRAPHIC INSTRUCTION FOR THE SCIENCE/TECHNOLOGY PRE-PROFESSIONAL

Dr. Robert J. Rittenhouse
Physical Sciences and Engineering Bibliographer
Science and Technology Library ASC 104
The University of Akron
Akron, Ohio 44325-3907

This discussion of goals in bibliographic instruction defines information education in terms of the forms of bibliographic instruction. A listing of the science/technology pre-professionals are contrasted with the science/technology professionals. Various issues of information education are also defined. Library service trends over the past 100 years and more sophisticated library employee training indicate major influences on the trends in bibliographic training. Some experimentation in bibliographic training is also described. Model statements of objectives in bibliographic instruction are mentioned. Contemporary tools for training the science/technology pre-professional and library employee are summarized. The paper concludes with the concept of improving library literacy as the major goal of bibliographic instruction.

10:00 **REFLECTIONS ON ETHICS AND TECHNOLOGY TRANSFER.** **Thomas J. Froehlich. School of Library Science, Kent State University, Kent, Ohio 44242-0001.**

Technology, characterized as knowledge, skills and experience, is a marketable quantity, and its transfer to developing countries addresses many problems: poverty, ignorance, famine, etc. Such transfer raises ethical concerns about the role of technology and methods of assessment. The dominant, traditional psotures of ethical thinking, Kantianism and utilitarianism, are examined, compared and contrasted in relation to technology transfer as economic development. According to studies by Lawrence Kohlberg, these modes follow in the pattern of moral development of children, but Carol Gilligan in In a Different Voice, raising a feminine perspective argues that these positions are deficient and do not represent the feminine development and experience of morality. The feminine position argues for an ethics of responsibility rather than an ethics of rights (manifest in the traditional Kantian and utilitarian views). Such a perspective mediates against the strict profit motive in matters of technology transfer. It also raises questions about the technological imperative and the succession of technological fixes in addressing economic developmental needs.

SECTION T. Theme Related Poster Session in Theater Lobby Saturday, April 29, 1989

Board I @ 2:00 p.m. **Vision-21: A Forum for Speculative Ideas at NASA Lewis**

Marc G. Millis, Frank J. Hrach, Albert J. Pavli, G. Richard Sharp and Geoffrey A. Landis
NASA Lewis Research Center, 21000 Brookpark Rd., Cleveland, OH 44135

"Vision-21" is a group organized at NASA Lewis to examine and advocate new ideas and speculative thinking for the 21st century and beyond. This presentation evaluates the first year of the group, and discusses the lessons learned and results discovered.

In the first year, the Vision-21 group has focussed on three tasks: presentations to discuss idea formation and the creative process; establishing a conference on speculative ideas; and starting a "free idea forum" to present and discuss speculative ideas, with the hope of encouraging unconventional, speculative, and "visionary" thinking. The intent is encouraging and brainstorming concepts, rather than criticism or critical evaluation.

Ideas discussed to date at the free idea forum include: integration of propulsion with boundary layer control, interstellar spacecraft, controlled gravitation, satellite tether concepts, rocket engine heat transfer, advanced space suit design, missions to the sun, He3 fusion, the Fermi paradox, solar concentrators, fluid-dynamics of shark propulsion, and tether use for satellite relocation.