

Centennial Symposia Abstracts

100 or More Years of Changes in Ohio Flora and Vegetation

Arranged by: Ronald L. Stuckey

Hosted by: Tod F. Stuessy

FRIDAY, APRIL 26, 1991

The Ohio State University

Kottman Hall 104

2021 Coffey Road

8:45 AM

Ronald L. Stuckey, Presiding

9:00 CHANGES IN THE TOTAL NUMBER OF SPECIES IN THE KNOWN VASCULAR PLANT FLORA OF OHIO, 1860-1991.

Tom S. Cooperrider, Department of Biological Sciences,
Kent State University, Kent, Ohio 44240-0001.

In 1860, John S. Newberry published the first catalog of Ohio vascular plants. Since then, five other catalogs have appeared. The numbers of taxa listed in each are given in the chart below.

year	species		additional		taxa
	total	(native alien)	infra-specific taxa	inter-specific hybrids	
1860	1377	(1276 + 101)	17		1394
1874	1500	(1405 + 95)	113		1618
1893	1793	(1750 + 43)	104	2	1899
1899	1945		78	3	2026
1914	2068	(1590 + 478)	14	12	2094
1932	2309	(1730 + 579)	29	12	2350

In 1950, the Ohio Flora Project began. In 1961, working with preliminary lists of pteridophytes, monocots, legumes, and composites, distributed by the Ohio Flora Committee, I projected that the vascular plant flora of Ohio would prove to consist of about 2700 species. New species continue to be added to the flora today, but they are relatively few. Periodic exclusions have removed species incorrectly attributed to the Ohio flora.

9:20 100 YEARS OF CHANGING NOMENCLATURE AND
TAXONOMIC CONCEPTS IN THE OHIO FLORA. John
J. Furlow, Department of Plant Biology, Ohio
State University, Columbus OH 43210.

Over 680 of the 1,950 taxa of flowering plants listed by Kellerman and Werner in their Catalog of Vascular Plants of 1895 are known in the various parts of the current Vascular Flora of Ohio by different scientific names. About a third of these changes came about with the abandonment of the American Code of Botanical Nomenclature, used by Kellerman, and later by Schaffner. In their floristic reports, in favor of a return to the International Rules. Other changes, including the combination of previously separate taxa, the segregation of taxa, and the replacement of names have occurred gradually due to the attainment of a better understanding of the relationships and variational patterns of the species involved, to changing taxonomic concepts and philosophies, and to the discovery of nomenclatural problems with specific names.

Because of a high level of interest in experimental, revisionary, and other taxonomic research, it is likely that similar changes will continue to occur for the foreseeable future.

9:40 THE INVASION OF FOREIGN SPECIES "WEEDS" AS INDICATORS OF 100 YEARS OF FLORISTIC CHANGES.

Ronald L. Stuckey, Professor of Botany, The Ohio State University, 1735 Neil Avenue, Columbus 43210.

The invasion of non-indigenous species provides one measure by which changes in a flora can be assessed. These foreign or alien species (plants mostly considered as "weeds") have been invading Ohio since the beginning (about 1800) of its settlement by Europeans. Statewide, non-indigenous species have increased from 3.6% in 1835, to 6.6% in 1860, to 20.9% in 1900, to 22.4% in 1914, to 22.5% in 1932, and 23.8% by 1971. The percentage is higher in unglaciated Ohio, 24% (of 2071 species in 1977) and the glaciated Allegheny Plateau, 28% (of 2029 species in 1989). In western Lake Erie, the percentage is higher on the islands, at 33.6% (276 of 847) and in recently abandoned vineyards on South Bass Island, it increases temporarily to 50% (91 of 182), while in the marshes among obligate and facultative wetland species, the percentage is much lower, 11% (33 of 300). In the most thorough analysis of Ohio's non-indigenous flora (Kellerman and Kellerman, 1900), based on 430 species, 75.8% are from Europe, 10.7% from elsewhere in the United States, 7.0% from Asia, 4.8% from Tropical and South America, 1.2% unknown and 0.5% from Africa. With regard to stability in the flora, 11.86% were waifs, 38.84% occasionally escaped, and 49.30% thoroughly naturalized. Noteworthy among waifs then were Alliaria officinalis, Lonicera xylosteum, and Lotus corniculata, which are now thoroughly naturalized weeds.

10:20 LOSS OF WETLANDS: 100 YEARS OF CHANGES
IN OHIO PEATLANDS. Barbara K. Andreas,
Cuyahoga Community College, Cleveland,
Ohio 44122, and Jeffrey D. Knoop, The Nature
Conservancy, Columbus, Ohio 43212.

Since the time of European settlement, about 54 percent of the wetlands in the lower forty-eight states have been destroyed. About 2.7 million ha of Ohio's wetlands have been drained. This figure includes the loss of most of the Great Black Swamp in northwestern Ohio, most of the marshes along the Lake Erie shore, and most of the wet prairies in west-central Ohio. Peatlands, a type of wetland that occupied about 0.5 percent of Ohio's land surface at the time of settlement, have undergone dramatic changes. From field, herbarium, and literature surveys, 114 peatlands were located and each was later visited. Of these, 50 sites no longer resembled the peatland described as occurring at the turn of the century. These include Pymatuning Swamp (Ash-tabula Co.), New Haven Marsh (Crawford/Huron Cos.), and Atwater Bog (Portage Co.). Of the remaining 64 sites, approximately 90 percent have been reduced in size. These include such well-known sites as Cedar Bog (Champaign Co.), Castalia Prairie (Erie Co.), and Springville Marsh (Seneca Co.).

10:40 CHANGES IN THE VASCULAR FLORA OF CAMDEN (BOG)
LAKE, LORAIN COUNTY, OHIO. Roger Laushman,
Biology Department, Oberlin College, Oberlin,
Ohio 44074.

Camden Lake and Bog is a 19-acre aquatic community in southwest Lorain County. Since European settlement, trees and peat have been harvested, and the lake water has been drained many times, causing much of the original bog mat to collapse. At least 46 species of the original bog flora were subsequently lost. The last drainages were in the 1950's; since then the mat has shown some remarkable recovery. Four taxa that had not been observed at the bog since the 1890's were recorded in 1990. When compared with the flora of three other bogs of northeast Ohio, historic records (1883-1910) of Camden's flora showed an average similarity of 73%, which dropped to 56% in the 1950's, but has since recovered to 72%. Eighteen percent of the present flora are non-native species, and many native species have colonized the lake. The pH of the lake was 7.5 following the drainages in the 1950's, but pH 6.5 was the highest value in 1990, corresponding to recovery of the Sphagnum mat. Seed bank studies begun in 1990 indicate the potential for additional restoration of the bog.

11:00 A CENTURY OF CHANGE IN THE AQUATIC AND WETLAND FLORA OF THE MARSHES OF WESTERN LAKE ERIE.

Gregory J. Schneider and Ronald L. Stuckey. The Ohio State University, 1735 Neil Ave., Columbus, OHIO 43201

At least 300 species of aquatic and wetland vascular plants have been identified from western Lake Erie at 35 study localities. This great floristic diversity exists primarily because of the natural changing water levels over various substrates creating varied habitats which are available for plant colonization, and the continued natural and man-influenced changes to which these habitats are subjected. Drastic changes have occurred in the composition of this flora during the past century. Since Pieters (1901), 50% (20 of 40) of the species in Put-in-Bay Harbor have disappeared: 36% (24 of 67) at the western end of Sandusky Bay; 25% (22 of 89) at East Harbor State Park. Among the 22 submersed species at Put-in-Bay Harbor, 15 (70%) are no longer present. Of the total 28 native submersed species as reported by Moseley (1899) for the region, 13 (46%) have disappeared. Of 28 showy, native perennial emergents reported by Moseley (1899), 18 (67.5%) have declined in abundance. By contrast, many foreign species have invaded western Lake Erie. Of the total 300 species, 33 (11%) are new to the region. Most of the species that have disappeared have narrow ecological tolerances and are northern in distribution, whereas those species that have survived have wide ecological tolerances and are widespread in distribution.

11:20 CHANGES IN THE AQUATIC AND WETLAND VASCULAR-PLANT FLORA OF OHIO'S ABANDONED CANALS. Marvin L. Roberts, Biology Department, Salem State College, Salem, MA 01970.

The construction of a system of transportation canals contributed to the profound changes in Ohio wetlands in the 1800's. Over 1000 miles of canals were constructed to link the Ohio River and Lake Erie watersheds. Water supplies for the canals were constructed by damming and dredging existing wetlands. Original, new, and modified wetlands were linked by continuous corridors of flowing water and by disturbed wetland habitats suitable for plant colonization. An examination of distributional data and historical information, supplemented by studies of remaining canal habitats, indicates the canal system served as a transportation route for propagules of native plants as well as people and commodities. Among the submersed or floating plants which apparently spread through the canal system are *Azolla caroliniana*, *Najas guadalupensis*, *Nelumbo lutea*, and *Potamogeton richardsonii*. Emergent or mudflat taxa which have distributions correlated with the canal system include *Ammannia robusta*, *Bidens connata* var. *anomala*, *Heteranthera reniformis*, *Hibiscus laevis*, *Hibiscus moscheutos*, *Hibiscus palustris*, *Lophotocarpus calycinus*, *Sagittaria rigida*, and *Zizania aquatica*. Plant distributions corroborate evidence from several groups of aquatic animals for the role of canals in biogeographic change.

2:00 CHANGES IN THE VASCULAR-PLANT FLORA OF FRANKLIN COUNTY, OHIO. Richard M. Lowden. Universidad Catolica Madre y Maestra, Republica Dominicana.

A brief historical account documents the floristic work accomplished during the past 157 years in Franklin County, Ohio. Comparative data are presented for the indigenous and non-indigenous flora as it relates to Riddell's (1834), Sullivan's (1840), Selby & Craig's (1890), and Selby's (1899) treatments of the county's vascular flora. Respectively, the percentages of non-indigenous species are 15% (84 of 543), 12% (77 of 657), 18% (175 of 974), and 16.1% (184 of 1142). The more recent literature and herbarium surveys of the county's vascular flora (1988-1989) are discussed along with the actual progress being made to establish the extant flora of the county in order to determine the occurrence of floristic changes. At present, about 22% (314 of 1410) are non-indigenous.

2:20 LOSSES AND GAINS TO THE FLORA OF NORTHEASTERN OHIO DOCUMENTED BY THE CLEVELAND MUSEUM OF NATURAL HISTORY HERBARIUM James K. Bissell, The Cleveland Museum of Natural History, One Wade Oval Drive, University Circle, Cleveland, Ohio 44106

An examination of the 60,000 specimen vascular plant herbarium of The Cleveland Museum of Natural History was made to document gains and losses, as represented within the collection, to the extant, native flora of 11 northeastern Ohio counties since 1940. The 11 counties are Lorain, Medina, Wayne, Cuyahoga, Summit, Stark, Lake, Geauga, Portage, Ashtabula and Trumbull. The following 14 species are represented only by pre-1940 records:

Andromeda polifolia, *Carex tenuiflora*, *Helianthemum bicknellii*, *Hottonia inflata*, *Myriophyllum heterophyllum*, *Platanthera hookeri*, *Potamogeton vaseyi*, *Pyrola secunda*, *Scirpus purshianus*, *Scirpus torreyi*, *Scirpus verecundus*, *Sparganium chlorocarpum*, *Ulmus thomasi* and *Valeriana uliginosa*. The following 11 species are represented by post-1940 records only: *Ammophila breviligulata*, *Carex sartwellii*, *Eupatorium altissimum*, *Eupatorium serotinum*, *Oryzopsis asperifolia*, *Myriophyllum verticillatum*, *Nuphar variegatum*, *Poa paludigena*, *Poa saltuensis*, *Podostemon ceratophyllum* and *Ribes triste*. *Carex tenuiflora* is an addition to the flora of Ohio and *Myriophyllum verticillatum*, *Nuphar variegatum*, *Poa paludigena* and *Sparganium chlorocarpum* are additions to the flora of the Glaciated Plateau.

2:40 *PAXISTIMA CANBYI* IN OHIO. W. Stoutamire, D. Crawford* and M. Turner. Biology Department, University of Akron, Akron, OH 44325, and *Department of Plant Biology, Ohio State University, Columbus, OH 43210.

Two populations occur in Highland and Adams Counties. Plants reproduce vegetatively and flower at these sites but do not produce seeds. Sexual reproduction does occur in colonies outside Ohio. Meiosis occurs the summer previous to the March-April anthesis. Pollen has low viability. The self incompatible flowers are pollinated by *Sciara* flies. Hand pollinations are unsuccessful and fruits do not form when Ohio plants are grown with clones from other states. Allozyme analysis indicates that the Highland (7 samples) and Adams (6 samples) plants are each uniform and that the sites differ by only one allele at one of the six loci surveyed. The Ohio populations may be single clones. Allozyme variation does occur in certain other populations, indicating they are not single clones. The Ohio populations are most similar in isozymes to populations in West Virginia, Pennsylvania, and Virginia, and there is somewhat less relationship with several Kentucky populations.

3:00 VASCULAR PLANT SPECIES PRESUMED EXTIRPATED FROM THE INDIGENEOUS OHIO FLORA. Allison W. Cusick, Division of Natural Areas and Preserves, ODNR, Fountain Sq., Columbus, OH 43214.

The indigenous vascular flora of Ohio numbers ca 1800 total species. 95 of these species presently are presumed extirpated from the state, ca 5% of the total native flora. No populations of these species have been confirmed extant in Ohio since 1970. 34 presumed extirpated species are typical of forested communities and 61 of non-forested habitats. 37 species are characteristic of wetlands. 54 species are dicots; 37, monocots; and 4, pteridophytes. There is no strong pattern of extirpation within ecological or taxonomic groups, but a general diminution in all areas. Extirpated species formerly were distributed throughout Ohio. The counties bordering Lake Erie record the highest numbers, however. Causes of extirpation include habitat destruction by drainage, agriculture and urbanization, as well as competition by non-native species. 95% of the native flora has survived the anthropogenic changes in the Ohio landscape over the past 200 years.

3:40 VEGETATION CHANGE IN THE NORTHERN VIRGINIA MILITARY DISTRICT, OHIO. Michael N. DeMers, Geography, Ralph E. J. Boerner, Plant Sciences and John W. Simpson, Landscape Architecture, The Ohio State University, Columbus, OH, 43210.

Abandonment of marginal agricultural lands occupying what was once virgin forest has resulted in natural revegetation of these former open spaces. Additionally, recent changes in national agricultural policy combined with increased conservation efforts has led to a significant shift away from the historical trend in land clearing. As a result, the Ohio Landscape is beginning to reforest and revert in places to a more natural mix of open land and forest. This paper reports on the results of research in a portion of the Northern Virginia Military District of Ohio in which the nature and causes of specific spatial patterns of open space, successional fields and forest are examined. GIS technology combines maps of pre-settlement vegetation, historical aerial photos and field classification of vegetation to explore the relationships among such physical parameters as soils, physiography and geologic setting, and vegetative patch characteristics through time. A Markovian

transition model is used to calculate transition probabilities and to predict vegetational pattern changes in the absence of human intervention. Speculations are made concerning the effects of changing landscape pattern on wildlife and vegetational diversity, surface water and air quality, scenic beauty, and economic development potential.

4:00 **TWO CENTURIES OF CANOPY TREE RECRUITMENT IN TWO OLD-GROWTH OHIO FORESTS: RELATIONSHIPS AMONG TREE SPECIES, HUMANS, AND DISTURBANCE.** Ralph E.J. Boerner and Do-Soon Cho. Department of Plant Biology, The Ohio State University, Columbus, OH 43210 and Department of Biology, Songsim College, Puchon City, Republic of Korea.

Establishment and subsequent recruitment of trees into the canopies of Goll Woods (Fulton County) and Sears Woods (Crawford County) have varied among species during the period 1765-1980. Patterns for species typically considered relatively shade intolerant (e.g. oaks, silver maple, ashes) have been strongly episodic. Some episodes correlate well with human activities, such as the widespread drainage of mesic forests in the mid-1800's; others correlate well with quasi-natural forces, such as the onset of Dutch Elm Disease in the early 1900's. Yet others do not correlate with easily identifiable events, and may represent effects of fires, tornadoes, or windthrows. Recruitment of relatively shade tolerant or mid-tolerant species (e.g. sugar maple, beech) show no discernable periodicity. We review results of analyses of the current and historic disturbance regimes of these two forests, and relate them to the on-going "decline" of oaks and increase of sugar maple in the midwest.

4:20 **THE PHYTOPLANKTON OF LAKE ERIE ESTUARIES - AN EXTENSION OF LAKE POPULATIONS?**

David M. Klarer & David F. Millie. Old Woman Creek State Nature Preserve, O.D.N.R., 2514 Cleveland Rd. East, Huron, OH 44839 & U.S.D.A. - A.R.S., P. O. Box 19687, New Orleans, LA 70179

Phytoplankton populations in the estuaries draining into Lake Erie are not extensions of lake populations, as has once been postulated. Surface runoff and interflow from storms of irregular frequency appear to be a major factor regulating these populations in small estuarine systems, such as Old Woman Creek. The influx of storm-water acts as a "double-edged sword" in the regulation of phytoplankton periodicity; it flushes the existing populations from the estuary, but at the same time, also carries in nutrients necessary for rapid recovery by opportunistic taxa. However, when the estuary is periodically isolated from the lake by a shifting-sand barrier beach, the flushing effects of storm inflows are not readily apparent.

In large estuarine systems, such as Sandusky Bay, storm events do not appear to be a major factor regulating phytoplankton populations. Although a great similarity between Sandusky Bay and Lake Erie phytoplankton populations currently exists, historical records suggest the two are distinct.

advances in the knowledge of soils. Ohio has led the nation in the funding for soil surveys and has made significant contributions toward the national effort in soil classification and basic research in soil science. The soil inventory has provided detailed soil maps that serve as the base for transfers of new technology in resource planning and land management. Soil research has provided insights into the 1) formation of soils, 2) origin of soil materials, 3) distribution of soils based on geomorphology. Basic chemical and physical properties of soils have been systematically tested and serve to support the soil classification system. Soil interpretation started as simple estimates of farmland value, expanded to conservation oriented capability rating and more recent soil potential ratings. Rating of soil limitation and potential are now available for nearly every land use from waste recycling to recreation. Utilization of soil surveys has expanded with the pace of land development in Ohio. Legislation now mandates use of soil maps and data as part of farmland appraisal, prime farmland restoration, wetland protection.

9:00 **PEDOLOGY IN THE 21ST CENTURY: FORCES AND FACTORS FRAMING OUR FUTURE.** Fred P. Miller, Chairman. Dept. of Agronomy, 202 Kottman Hall, The Ohio State University, Columbus, OH 43210.

Our nearly century's-worth of experience in pedology will serve as the foundation for our future. Starting with the need to guide farmers in managing various soils across the then-newly opened frontier, the National Cooperative Soil Survey has expanded to address many 20th Century land use and environmental agendas. Pedology's future will continue to be driven by its mission to enable humankind to understand and utilize soil resources for his sustenance and well-being. There will be a strong tendency in this future to view our resource-related problems more holistically. Pedologists must adapt to this holistic paradigm since geotechnical and environmental problems and management needs will integrate across the discipline boundaries of pedology, geology, hydrology, geography, atmospheric sciences and other disciplines. People perceive that they have land use problems, not necessarily soil or geology or hydrology, etc. problems. We will be challenged by not only the land use and environmental agendas before us, but also by the methodologies of handling and presenting data and information. We are going to have to translate and transfer our concepts and data bases into a variety of other cognitive domains, from political science and economics to epidemiology, modelling and regional planning. Economics, population pressure, cultural attitudes and the propensity for bettering the human life will continue to pressure our land resource base. Pedologists have a major role to play, but we will be left with only minor parts if we try to play it alone.

9:20 **PEOPLE AND AGENCIES AND THEIR ROLES IN THE OHIO SOIL SURVEY**
Richard L. Christman
4259 Rowanne Road
Columbus, OH 43214

The early 20th century saw the beginning of soil survey in Ohio. The first recorded soil survey in Ohio was in Montgomery county. The survey began in 1899 by the Division of Soils, United States Department of Agriculture, and in 1900 field work was completed and a soil survey report was published the same year. Those early participants laid down basic principles of conducting a survey that are still valid today. Much of the technology has changed, particularly in the fields of classification, morphology, and soil genesis. As the surveys progressed and the years passed, other participants and agencies joined together in a common goal of a total mapping program of the state. In 1949 the Ohio legislature organized the Division of Lands and Soil within the Ohio Department of Natural Resources. Staffing of agencies and personnel became the life blood of what was to become a model program of conducting soil surveys in the United States. The field mapping accomplishments and personnel peaked in the 1970's. As the completion of mapping of the state approaches, changes in staffing and new roles for soil scientists are emerging.

9:40 **EVOLUTION OF GENETIC CONCEPTS FOR OHIO SOILS.**
Neil E. Smeck, Agronomy Dept., The Ohio State University, 2021 Coffey Rd., Columbus, OH 43210

Recognition of "Brown" soils formed under deciduous forests in a humid temperate climate as a distinct genetic group occurred in the 1920's. These soils were classified as Gray-Brown Podzolics in the 1938 classification system and as Alfisols in Soil Taxonomy published in 1975.

The most diagnostic characteristic of Alfisols is a genetic clay maximum in B horizons. Whereas early research documented the role of eluvial-illuvial processes in the formation of clayey B horizons, recent studies provide a comprehensive understanding of clay enrichment by quantifying clay illuviation, clay concentration due to carbonate

A Century of Progress in Understanding and Mapping Ohio's Soils

Arranged by: Joseph R. Steiger

Hosted by: Robert L. Vertrees

FRIDAY, APRIL 26, 1991

The Ohio State University

Kottman Hall Williard Auditorium

2021 Coffey Road

8:45 AM

Joseph R. Steiger, Presiding

8:45 **A CENTURY OF PROGRESS IN UNDERSTANDING AND MAPPING OHIO'S SOILS**

This symposium will highlight the achievements of the Ohio Cooperative Soil Survey from an historical perspective. Speakers will focus on efforts and progress in the areas of soil inventory, soil research, soil interpretation and management. The joint effort by federal, state and local government to provide detailed soil surveys for all of Ohio has been the setting for spectacular

dissolution, grain disintegration, and clay mineral weathering. Clay illuviation is sufficient in most well drained Ohio soils for classification as Alfisols.

Another diagnostic horizon common to Alfisols in eastern Ohio is the fragipan. Although the term "fragipan" was not introduced until 1951, soils containing a horizon with a "distinctly hard" consistency were reported in Wayne County as early as 1931. The earliest studies of fragipans in Ohio suggest that most fragipan characteristics are inherited, and enhanced by physical processes. More recent reports profess the presence of an amorphous aluminosilicate bonding agent and conclude that weathering discontinuities play a key role in precipitation of the bonding agent.

10:00 CLASSIFICATION AND CORRELATION OF OHIO SOILS DURING THE PAST CENTURY, G.J. Post, USDA-SCS (retired), Lincoln, NE 68508

Soil correlation is concerned with the definition, mapping, naming, and classifying of the kinds of soils in specific survey areas. Relating the soil bodies represented on maps to taxonomic classes at some level in a classification system is accomplished through soil correlation. This is important so as to insure that any one kind of soil is given the same name wherever it occurs. The earliest framework for classification and correlation was a combination of physiographic provinces, underlying rock, and soil texture. Soil series, comprising a category first introduced in 1903, were recognized and has been continued and is the lowest category in the current classification system. This system introduced in the early 1960's is comprehensive. It is a multiple category system including from the top orders, suborders, great groups, subgroups, and series. It differs from earlier ones by having more quantitative definitions. Classes at every categoric level are expressed in terms of properties that can be measured. Ohio has been a leading, active participant in the national soil survey since the earliest days. Soils and soil surveys have been classified and correlated in the national system. Ohio has been an outstanding leader in collecting and providing laboratory soil characterization data needed for the proper placement of soils in the classification system.

10:20 SOILS OF THE NORTH APPALACHIAN EXPERIMENTAL WATERSHED. W.M. Edwards and C.E. Redmond, USDA-ARS Coshocton, OH 43812 and USDA-SCS Mt. Vernon, OH 43050.

In 1935, a site near Coshocton, Ohio was selected by the US Dept. of Agriculture for the study of hydrology and of runoff and erosion control practices. A soil survey of the area had been made in 1934 by A.H. Paschall and W.B. Oliver of the Zanesville soil conservation project. In 1936, H. Kohnke, F.R. Dreifelbis and G.R. Hall mapped the area on a photo base at 3.5"/mile. These maps were refined in 1938 and printed on 1-minute quadrangle sheets with 5' contour intervals. Small watersheds were mapped at a scale of 1" = 100' with 2' or 5' contour intervals. The dominant soil in these surveys was Muskingum, and the type locations of two other series, Keene and Coshocton, were located on the research station. The earlier surveys were modernized in 1970 by G.E. Kelley and published in a special soil survey bulletin describing the watershed soils. Several new soils were recognized and Muskingum disappeared from the legend. Throughout the 1980's, C.E. Redmond performed detailed mapping and soil investigations to enhance interpretation of special hydrologic studies. The station was mapped again in 1989 during the modern soil survey of Coshocton County. The extreme detail of the surveys and special investigations has proven invaluable in transferring hydrologic research findings throughout the world and in explaining why management practices, such as no-tillage, afford better runoff and erosion control on some soils than on others.

10:40 SOIL INTERPRETATIONS THROUGH THE YEARS
J. C. Gerken, USDA-SCS, Columbus, OH 43215

During the last 100 years various forces have driven the development of soil interpretations. Early interpretations were geared toward evaluating land for use as cropland. Soil scientists used their knowledge of plant physiology and soil science to project the relative cropland value of different soils. Over the years requests for information have driven soil scientists to provide soil interpretations for an increasing number of land uses. Our knowledge of soil characteristics has increased due to increasing volumes of data. Observations of soils have also been made to document their response to different land uses as soil surveys have been conducted

in each of Ohio's 88 counties. Current techniques of development and methods of delivery of soil interpretive information are as markedly different from those of a century ago as are the types of interpretations themselves.

11:00 CHANGES IN SOIL PARENT MATERIAL CONCEPTS IN OHIO. George F. Hall, Agronomy Department, The Ohio State University, 2021 Coffey Rd., Columbus, Ohio 43210.

Identification of soil parent materials during the early inventory of Ohio's soils was largely based on the geologic separations and definitions. The two most important materials were glacial drift and residual bedrock. As the detailed soil inventory continued it became clear that the soils were developed in a much more complex array of geologic materials.

One of the most significant changes in our concept of materials was the acceptance of an aeolian component (loess) as a surficial deposit in many of the soils throughout Ohio. Combined research by pedologists and geologists identified the surface silty material found in the uplands throughout the state as loess that originated from the major glacial outwash valleys. Field studies show that loess ranges in thickness from a few centimeters to several meters.

Detailed soil mapping in the 'residual soil' area of eastern and southern Ohio has shown that the soil parent materials are a complex pattern that includes not only bedrock but also loess, glacial outwash, pre-glacial sediments, recent alluvium and colluvium. Soil mapping and deep borings in that area have shown that the colluvial material is as much as 2.5 meters thick on some of the benches and extends well up the back slopes. The identification of large quantities of colluvium raises the question of when and under what conditions did this deposition of materials take place?

11:20 OHIO'S ORGANIC SOILS: A VANISHING RESOURCE
K.R. Everett¹, A. Ritchie, Jr.², and K.L. Powell²
¹ Dept. of Agronomy, OSU, Columbus, OH 43210
² Ohio Dept. Natural Resources, Soil & Water Conservation Division

Until the mid 19th century there was relatively little interest in the use and development of Ohio's fens and bogs for agricultural purposes. Serious attempts to drain the state's two largest peatlands began in 1850 in Scioto Marsh and 1859 in New Haven Marsh. Both were completed prior to 1900. The first survey and characterization of Ohio peatlands was under taken in 1909 by Alfred Dachnowski under direction of the Geological Survey of Ohio. This survey indicated there were approximately 60,700 ha. (150,000 acres) of peatland with commercial organic accumulations >61 cm-a thickness sufficient to qualify them as Histosols in current terminology. By 1915 a reconnaissance soil survey of the state and at least one county soil survey had identified many areas of muck and peat. Beginning in 1946 with the Modern Progressive Soil Survey descriptions and systematic mapping of the state's organic soils began. In 1980, with all of the peatland counties surveyed, approximately 34,400 ha. (85,000 acres) of organic soils (Histosols) with thicknesses greater than 40 cm remained-a reduction of 57 percent, due mainly to subsidence resulting from drainage, fire and deflation. With loss rates ranging from 0.4 to 7.5 cm-yr⁻¹ the life expectancy of many of the state's organic soils is indeed finite. Many areas now mapped as Histosols will, in time, fail to meet the 40 cm minimum thickness and will shift to Histic subgroups.

11:40 REFINEMENTS IN MAPPING THE DIVERSITY OF SOILS IN OHIO. Joseph R. Steiger, USDA Soil Conservation Service, Lancaster, OH 43130

Refinements in mapping of soils in Ohio had three distinct stages. The earliest farmland surveys prior to 1930 were published at a 1:62500 scale on the original USGS topographic survey. The conservation era that focused attention on soil erosion control greatly increased the demand for detailed soil maps. Aerial photograph base maps at a scale of 1:15840 provided many clues to soil variability and are user friendly. Mapping of interpretive phases related to slope, erosion, and landuse provided the basis for land capability maps used in conservation planning for specific fields. In the 1950's rapid urban growth and new agriculture technology brought the demand for multiple use soil surveys. Ohio surveys focused on the growing metropolitan areas and the cropland of the state. The rating of soils for buildings and water management required more attention to flooding frequency, water tables, slope stability, depth to hard layers. In the 1970's mine reclamation, and reforestation required soil surveys in southeastern Ohio. Mapping of mine spoils presented a fresh challenge of a landform shaped by man. The new soil taxonomy required more attention on the properties of the subsoil. Field estimates of soil properties are supported by laboratory testing of soil. The recent demand for updating older soil surveys is again stimulated by new technology.

***A Memorial Tribute to an
Eminent Ohioan:
Paul Bigelow Sears (1891-1990)***

**Arranged by: Mohan K. Wali
Hosted by: Robert L. Vertrees
FRIDAY, APRIL 26, 1991
The Ohio State University
Kottman Hall 103
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1:30 PM
Mohan K. Wali, Presiding**

1:30 TRIBUTE TO AN EMINENT OHIOAN: PAUL BIGELOW SEARS. Mohan K. Wali, School of Natural Resources, The Ohio State University, Columbus, Ohio 43210-1085

The formative decades of the science *ecology* were fortunate to have the intellect, dedication, and enthusiasm of some noted American ecologists (Clements, Cowles, Gleason, Shelford, and Transeau, to name a few). Their work has proved both pioneering and enduring. Among these eminent ecologists was an Ohioan, Paul Bigelow Sears, who made lasting contributions in several subdisciplines of ecology. These areas include community structure, vegetation mapping, palynology, trophic dynamics, and conservation. He and Aldo Leopold were the first to grasp the true extent and magnitude of human impact on ecosystems.

Well before arriving in Ohio to make a living, I had much looked forward to the happy coincidence that both Paul B. Sears and the Ohio Academy of Science (OAS) would attain their 100th year in 1991. I had wished for him to be among us at this OAS Centennial Meeting but that was not to be. So, although we gather here without him, we do so with great admiration, appreciation and enthusiasm to celebrate his contributions.

1:40 PAUL B. SEARS AND AMERICAN ECOLOGY. Robert L. Burgess, Dept. of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry Syracuse, NY 13210

Paul Sears, perhaps more than any other person, epitomizes American ecology. In a professional career spanning almost seven decades, Sears made major contributions to vegetation mapping, paleoecology and Pleistocene history, vegetation studies, conservation, human ecology and our impact on the land, and particularly, the varied roles of scientists in modern society. In Ohio, at the universities of Chicago, Oklahoma, or Yale, or in retirement in New Mexico, Paul Sears continued to write, and his myriad papers and milestone books have had a major impact on generations of ecologists who know only his name. For over 40 years he was an active player in The Ecological Society of America, where his influence is still felt, although few realize where the ideas originated. Named EMINENT ECOLOGIST by the Ecological Society of America in 1965, the title is as appropriate today as it was 25 years ago. To honor a native Ohioan, it is most fitting that the Ohio Academy of Science uses its own Centennial to commemorate the life and work of Paul Bigelow Sears.

2:10 PAUL B. SEARS, THE TEACHER Loren D. Potter Biology Dept., Univ. of New Mexico, Albuquerque, NM 87131

Dr. Paul B. Sears had those qualities of a teacher that one would wish to emulate and for which one treasures the opportunity to have been a student under his guidance. He excelled at many things but was a master teacher, especially to those students privileged to be within the informal circle of his influence. He was humble and kind, a classicist and realist, respected and respectful, expert at "one liners" but also flowing prose, maddened by mathematical analysis for its own sake without relation to reality, perceptive and prophetic, and forever an excellent teacher because he was forever a learner.

2:40 PAUL B. SEARS AND HIS CONTRIBUTION TO NATURAL VEGETATION MAPPING IN OHIO.

Ronald L. Stuckey, Professor of Botany, The Ohio State University, 1735 Neil Avenue, Columbus 43210.

Paul B. Sears was the first to prepare a natural forest vegetation map of Ohio devised from a systematic analysis of field survey records. As a lad, with a strong curiosity about plants, Sears became especially interested in the native prairie flora south of his Bucyrus, Ohio, home. While an instructor at The Ohio State University, Professor Edgar N. Transeau expanded Sears desire to study Ohio's natural vegetation. By 1919, Sears was obtaining records of "witness trees" left by the surveyors of the Old Northwest Territory. With a set of symbols Sears devised, he plotted these tree records on an Ohio map creating the first virgin forest map of the state, published in the *Ohio Journal of Science* (1925). The various forest types shown were: oak (circles), beach (plus signs), and ash (times signs). In the same publication are maps that depict the relationships of oak and beach forest to the moraines, and the natural treeless areas of Ohio and their correlation with moraines, preglacial drainage routes, and post glacial lakes. In 1923, Sears had drawn a map of the virgin forest using horizontal, vertical, and slanting lines to show the extent of the different forest types, but not published by him until 1941. A total of nine natural vegetation maps have been identified as prepared by Paul B. Sears.

3:30 PAUL BIGELOW SEARS: CONTRIBUTIONS TO PALEOECOLOGY. Linda C.K. Shane, Limnological Research Center, U. of MN, 310 Pillsbury Drive, Minneapolis, MN 55455

Paul Bigelow Sears' research in vegetation history and paleoecology set the foundation for many of the major questions that concern these fields today. His method of using early land survey records as a near pre-European vegetation record has been pivotal in the development of modern climate analogs for fossil pollen assemblages. He was responsible for introducing palynological analysis of sedimentary sequences as a functional tool to North America. Using pollen records primarily from Ohio, he addressed a large variety of ecological issues whose understanding will be key to modeling global climate warming. Among those I will discuss are: identification of the major pollen taxa; the relative ages of glacial geomorphic features; the regional sequences of revegetation after final deglaciation; the climatic interpretation of vegetation change; the rate of vegetation change; the synchronicity of the North American and European climate change records; the ecological meaning of the documented changes though time in the palynological record.

4:10 CONTRIBUTIONS OF PAUL B. SEARS TO WILDLIFE MANAGEMENT. Thomas W. Townsend, School of Natural Resources, 210 Kottman Hall, 2021 Coffey Rd., The Ohio State University, Columbus 43210

Paul B. Sears had an eclectic interest in ecosystems, and this interest included an active concern for wildlife. His professional training was in botany and ecology, but he was one of the first to recognize and write clearly about wildlife as a resource vitally dependent on soils, plant communities and human land use. He employed his impressive scientific capabilities in active service to practical wildlife conservation as chairman of the Board of the National Audubon Society, member of the Ohio Commission on Conservation and Natural Resources, and member of The Ohio Wildlife Council. In these positions and others, he did much to further scientific wildlife management. He will probably be best remembered in wildlife management circles for his insightful insistence that wildlife problems were ecosystem problems generated, and therefore solvable, by man.

4:40 PAUL BIGELOW SEARS: CONTRIBUTIONS TO AMERICAN CONSERVATION. John F. Disinger, School of Natural Resources, The Ohio State University, Columbus, OH 43210-1085.

Much of Paul Sears' reputation, and a significant portion of his scholarship, was tied to his work as a scientific conservationist. He is particularly renowned for *Deserts on the March*, the publication of which in 1935 had extensive impact on public understanding of the forces involved in causing the American Dust Bowl of the 1930s. The book also clarified the enormity of the task of bringing

soil erosion under control through effective land management and understanding of ecological relationships. It suggested mechanisms which even today have not been effectively explored and implemented.

Sears' emphasis is not so much on the natural world as it is on the demands of nature on humans and human institutions, constraints placed on human activity by ecological realities. His enduring contribution is a sharpened focus on the meaning and necessity of an ecological perspective on the human role in the natural environment.

A Sampling of Molecular Biology in Ohio

Arranged by: John J. Kopchick

Hosted by: Paul L. Fuerst

FRIDAY, APRIL 26, 1991

The Ohio State University

Upham Hall N012

473 West 12th Avenue

8:45 AM

John J. Kopchick, Presiding

9:00 **MUTUAL TRIGGERING OF GENE EXPRESSION IN PLANT-FUNGUS INTERACTION.** P.E. Kolattukudy, The Ohio State Biotechnology Center, 1060 Carmack Road, Columbus, OH, 43210

Fungal interactions with plants have major consequences. Fungal diseases cause the most damage to crops. Plant-fungus interactions that ultimately result in disease development or resistance involve mutual triggering of gene expression. Penetration of pathogenic fungi into the plant through the cuticle is achieved by the production of cutinase, an enzyme that catalyzes the hydrolysis of cutin, the structural polyester of the cuticle. Plant components trigger the transcription of fungal cutinase gene. Transformation of *Fusarium solani pisi* with constructs containing hygromycin resistance gene driven by a *Cochliobolus* promoter and chloramphenicol acetyl transferase driven by DNA from the 5'-flanking region of cutinase gene demonstrated inducible promoter activity for the 5'-flanking region of *Fusarium* cutinase gene. Deletion analysis defined the cutinase promoter activity to a specific 135 bp region. The same region of the 5'-flanking region showed binding to the protein factor required for cutinase transcription activation in isolated fungal nuclei. Experimental evidence suggests that the plant component enhances phosphorylation of a transcription factor that binds to promoter only when phosphorylated and thus promotes cutinase gene transcription. After penetrating the cuticle, the fungus must penetrate through carbohydrate barriers to invade the plant. The molecular mechanisms involved in this process will be discussed. Fungal invasion triggers expression of many plant genes including those involved in reinforcing the host cell walls by making them resistant to the fungal hydrolytic enzymes. To achieve this the cell walls are suberized. A highly anionic peroxidase plays a crucial role in this process. The expression of the host gene coding for this enzyme is triggered by the fungal signals in the host that is resistant to the fungal attack but not in the susceptible host. The studies on the wound-inducible and constitutive expression of this peroxidase gene in transgenic plants will be discussed.

9:30 **COMPLEX REGULATORY SIGNALS OF THE MOUSE THYMIDYLATE SYNTHASE (TS) GENE.** Lee F. Johnson, Yue Li, Keith Jolliff, Tiliang Deng, Christopher Harendza, Dawei Li and Kathy Osborn. Departments of Molecular Genetics and Biochemistry, The Ohio State University, Columbus, Ohio 43210.

The TS gene is a housekeeping gene that is expressed at much higher levels in proliferating cells than in quiescent cells. We have identified a variety of unusual features of the gene and have been studying the sequences and trans-acting factors that are required for expression and proper regulation of this gene in growth-stimulated cells. Chimeric minigenes with different promoters and downstream regions were constructed and transfected into cells. We found that all of the sequences required for efficient transcription were located within 20 nucleotides upstream of the first transcriptional initiation site, and that at least 5 proteins interact with this critical promoter region. However, proper regulation of TS gene expression required the presence of sequences that are upstream of the critical region as well as downstream of the AUG start codon. The presence of introns was required for high level expression of the gene. However, introns did not appear to be important for proper regulation. The TS polyadenylation signal is unusual in that it directs poly(A) addition at the translational termination codon. Substitution of the SV40 polyadenylation signal resulted in a significant increase in mRNA production and a partial loss in regulation. This indicates that the polyadenylation signal is inefficient and that it may play a role in proper regulation. Current studies are directed at identifying additional regulatory sequences and analyzing the factors with which they interact.

10:00 **TRANSCRIPTIONAL REGULATION OF THE YEAST ACID PHOSPHATASE GENE.** Lawrence W. Bergman, Caretha Creasy, Steven Madden and David Johnson, Program in Molecular and Cellular Biology, Department of Chemistry, Ohio University, Athens, Ohio 45701.

In *Saccharomyces cerevisiae*, the major acid phosphatase is encoded by the PHO5 gene. Transcription of the PHO5 gene is regulated in response to the level of inorganic phosphate available to the cell (i.e. PHO5 is transcribed at high levels in medium containing low amounts of Pi and transcription is repressed when cells are supplied with high amounts of Pi. Genetic analysis has indicated that there are at least five unlinked loci which affect expression, two involved in repression of PHO5 transcription (PHO80 and PHO85) and three involved in PHO5 activation (PHO2, PHO4 and PHO81). Using gene libraries to complement mutations or using the polymerase chain reaction, we have obtained DNA clones for all five of these trans-acting alleles. We have developed a vector containing a selectable marker under control of the PHO5 transcriptional control sequences. This has allowed the isolation and characterization of constitutive mutations in the PHO4, PHO80 and PHO81 genes. Additional experiments where the level of various trans-acting factors has been increased or decreased provide valuable information concerning a proposed model for the transcriptional regulation of the acid phosphatase regulation.

10:30 **ALTERNATIVE PROCESSING OF BOVINE GROWTH HORMONE mRNA.** Fritz M. Rottman, Robert K. Hampson, and David F. Ayers. Department of Molecular Biology and Microbiology, Case Western Reserve University, School of Medicine, 2109 Adelbert Rd., Cleveland, Ohio 44106

Bovine growth hormone (bGH) mRNA can undergo an alternative processing event in which the last intron is retained in a portion of the cytoplasmic mRNA where it is found on polysomes. The intron maintains an open reading frame through the intron into the fifth exon which is shifted from the normal reading frame. The 125 amino terminal amino acids of this predicted bGH-related protein are identical to wild type bGH with the protein having an alternate 108 amino acid carboxyl terminus. The composition of the alternate carboxyl terminal region differs significantly from that of wild type bGH, suggestive of a protein with other properties and/or junction than wild type bGH. Initial experiments using antibodies raised against synthetic peptides specific to the variant carboxyl terminus suggest that this bGH related polypeptide is not secreted from transfected Cos 1 cells expressing predominantly the intron containing mRNA. This alternative processing event is markedly influenced by exon sequences well removed from the intron. Deletion of a 115 bp fragment of the last exon beginning 73 bp downstream of the splice acceptor site results in retention of the intron in >95% of the cytoplasmic mRNA when transiently expressed in Cos 1 cells.

11:30 **INVOLVEMENT OF AN AMINOACYL-tRNA SYNTHETASE IN SPLICING OF GROUP I INTRONS.**

A.M. Lambowitz, Departments of Molecular Genetics and Biochemistry and the Biotechnology Center, The Ohio State University, Columbus, OH 43210.

Group I intron are of interest both as ribozymes that catalyze their own splicing and as mobile elements that propagate by insertion into other genes. The splicing of group I introns involves transesterification reactions that are catalyzed by the intron RNA, and a number of group I introns have been shown to be self-splicing *in vitro* -- i.e., they splice themselves in the absence of proteins. *In vivo*, however, the splicing of group I introns is dependent on protein factors that are presumably required to fold the intron RNA into the catalytically active conformation. We have found that an important protein required for splicing group I introns in *Neurospora* mitochondria is the mitochondrial tyrosyl-tRNA synthetase (mt tyrRS), which is encoded by nuclear gene *cyt-18*. We have expressed functional *cyt-18* protein in *E. coli* and have used *in vitro* mutagenesis to identify regions required for splicing and tyrRS activity. In other experiments, we have localized the *cyt-18* protein binding site in the intron RNA and find that it may include sequences and structures that resemble *Neurospora* mt tRNA^{tyr}. Several findings suggest that the adaptation of the *Neurospora* mt tyrRS to function in splicing is a relatively recent evolutionary development and could reflect the recent dispersal of the introns themselves. Our findings demonstrate one mechanism whereby splicing factors may evolve from pre-existing cellular RNA binding proteins.

12:00 **TRANSCRIPTION OF VESICULAR STOMATITIS VIRUS GENOME RNA.** A.K. Banerjee, Research Institute, The Cleveland Clinic Foundation, Cleveland, Ohio, USA, 44195.

The negative strand genome RNA of vesicular stomatitis virus (VSV) is transcribed *in vitro* and *in vivo* by the virion-associated RNA polymerase (241Kd) and the phosphoprotein (P, 29Kd). The L protein appears to be the RNA polymerase although without the P protein it fails to transcribe the genome RNA. The P protein, on the other hand, appears to be a regulatory protein which interacts with the L protein and the template RNA wrapped with the nucleocapsid protein (N, 50Kd) to synthesize RNA. In order to ascertain the functions of the RNA polymerase subunits in the transcription process, functionally active P

protein was synthesized *in vitro* using recombinant DNA technology. The functional domains of the P protein was mapped by deletion and site-directed mutagenesis on the gene and assaying activity of the mutant protein products by transcription reconstitution *in vitro* using purified L protein and N-protein-RNA template. Three distinct domains, such as template binding, L protein binding, and an acidic transactivating region, were identified within the P protein and their functions determined. By site-directed mutagenesis the phosphorylation sites within the acidic domain were identified, and their role in transcription studied. The role of phosphorylation in P function in transcription was also studied using P protein and its mutants expressed in bacteria. The mechanism by which the RNA polymerase subunits transcribe the VSV genome RNA will be discussed.

2:00 INHIBITION OF MOLONEY MURINE LEUKEMIA VIRUS (M-MuLV) INDUCED LEUKEMIA IN TRANSGENIC MICE EXPRESSING ANTI-SENSE RNA COMPLEMENTARY TO THE M-MuLV PACKAGING SEQUENCE. Thomas Wagner and Lei Han, Edison Animal Biotechnology Center, Ohio University, Athens, OH 45701

A genetic transcriptional regulatory element designed to show the tissue tropism of the Moloney murine leukemia virus (M-MuLV) directing expression of RNA sequences complementary to the packaging sequences (Ψ) of the retrovirus M-MuLV was constructed and introduced into stable cell lines and transgenic mice. The antisense Ψ expressing cell lines when infected with native virus were unable to produce active virus but yielded empty capsids devoid of viral genomic RNA. The antisense Ψ transgenic mice were shown to produce the appropriate RNA complementary to the M-MuLV packaging sequences within their lymphocytes. When challenged with active M-MuLV at high dosage none of these anti-sense Ψ transgenic mice developed leukemia or any signs indicative of the development of the disease by 14 weeks of age. Blind control non-transgenic littermates identically infected with the leukemia virus showed a high percentage of leukemia and demonstrated multiple signs of the development of the disease in animals not yet fully leukemic. These results are interpreted to suggest the potential value of anti-sense synthetic oligonucleotide reagents and drugs to inhibit retroviral replication in patients infected with pathogenic retroviruses such as HIV.

2:30 BACTERIAL REGULATORY ELEMENTS CAN CONTROL GENE EXPRESSION AND MODULATE PHENOTYPE IN MAMMALIAN CELLS. P.J. Stambrook¹, M.A. Lieberman² and H.S. Liu¹. Department of Anatomy¹ and Molecular Genetics², University of Cincinnati College of Medicine, Cincinnati, OH 45267.

In 1961, Jacob and Monod postulated that a repressor molecule in *E. coli* regulates expression of a set of genes including the *lacZ* gene encoding β -galactosidase. We have translocated this *lac* regulatory system into mammalian cells and demonstrated that the *lac* repressor can repress a reporter gene under control of a eukaryotic promoter containing a *lac* operator (*lacO*) sequence. The reporter genes we have used are the bacterial *lacZ* gene and a human *Ha-ras* oncogene. When the *lacI* gene, encoding repressor, and a reporter gene under *lacO* control are present in the same cell, the reporter gene is repressed, but can be induced by IPTG, a non-metabolizable lactose analog. In cells containing *lacI* and *lacZ*, β -galactosidase activity can be induced with IPTG as evidenced by histochemical detection with X-gal. Further, NIH 3T3 cells containing *lacI* and a *Ha-ras* gene remain untransformed. Administration of IPTG results in a transformed phenotype manifested by anchorage independent growth, proliferation in reduced serum and release of an angiogenic activity. The ability to selectively activate a gene without perturbing chromatin structure has broad implications in areas as diverse as developmental biology and mutagenesis. Supported by NIH grant ES05204.

3:30 Na,K-ATPase: STRUCTURE-FUNCTION ANALYSIS AND EXPRESSION OF THE SUBUNIT GENES,

Jerry B Lingrel, James Van Huysse, Patrick Schultheis, Bhavani Pathak, Department of Molecular Genetics, Biochemistry and Microbiology, University of Cincinnati College of Medicine, 231 Bethesda Avenue, Cincinnati, Ohio 45267-0524

The Na,K-ATPase is an integral membrane protein which is responsible for pumping Na⁺ out of the cell and K⁺ in. The enzyme produces an electrogenic potential which is involved in the function of excitable tissues such as brain and muscle and the chemical gradient of Na⁺ drives many transport processes including the translocation of sugars, amino acids and other nutrients and ions into the cell. The enzyme is composed of two subunits, an α and β and multiple isoforms for each of these subunits exist. Utilizing transfection into cultured cells and transgenic mouse assays, we have identified regions of the $\alpha 3$ subunit gene which are involved in regulation. Utilizing site-specific mutagenesis, the cardiac glycoside binding site on the α subunit has been identified. These studies take advantage of the finding that the human enzyme is sensitive to cardiac glycosides. Thus expression of the α subunit carrying mutations which alter the binding site for cardiac glycosides confers resistance to

sensitive cells. Site specific mutagenesis is also being used to identify sites within the enzyme which are involved in the transport process.

4:00 PROBING THE STRUCTURE AND FUNCTION OF *SKI* RELATED TO INDUCTION OF MUSCLE DIFFERENTIATION. ED STAVNEZER, Craig Richmond, Hong Chen, Guoxing Zheng, and Clemencia Colmenares. Department of Molecular Genetics, Biochemistry and Microbiology, University of Cincinnati College of Medicine, 231 Bethesda Avenue, Cincinnati, OH 45267-0524.

The retroviral oncogene, *v-ski*, encodes a nuclear protein that is a truncated version of its cellular precursor, *c-ski*. Both the viral and cellular forms of *ski*, when expressed in retroviral vectors, cause cellular transformation and induce myogenesis. The ability of *ski* to induce skeletal muscle differentiation can be demonstrated both in avian embryonic fibroblasts and murine embryonic stem cells, and includes its activation of the muscle-regulatory genes, MyoD1 and myogenin. Sequence comparisons revealed regions in *ski* related to functional motifs in proteins known to regulate cellular transcription. Mutations that alter or delete some of these regions have pronounced effects on the activity of *ski* in both transformation and muscle differentiation. Some mutants are defective in all aspects of transformation and myogenesis while others are defective in inducing transformation and terminal muscle differentiation but are fully active in inducing expression of muscle-specific genes including MyoD1 and myogenin. The role of *ski* in these diverse processes is likely mediated through its ability to bind two unrelated DNA sequences, one of which is found in the promoter region of several muscle-specific genes.

4:30 STRUCTURE/FUNCTION STUDIES OF BOVINE GROWTH HORMONE USING TRANSGENIC ANIMALS. John Kopchick and Wen Chen, Dept. of Zoology, Molecular and Cellular Biology Program and Edison Animal Biotechnology Center, Ohio University, Athens, OH 45701

To determine the importance of the third α -helix in bovine growth hormone (bGH) relative to growth-related biological activities, the following experimental approach was used: (i) gene mutagenesis which generates bGH analogs; (ii) *in vitro* expression analyses of the mutated bGH genes in cultured mouse L cells; (iii) mouse liver membrane binding studies of wild-type and bGH analogs; and (iv) expression of the mutated gene in the transgenic mice. An altered bGH gene (pBGH10A6-M8) was generated that encodes the following changes: glutamate-117 to leucine, glycine-119 to arginine, and alanine-122 to aspartate. The plasmid pBGH10A6-M8 was shown to be expressed in, and its protein product secreted, by mouse L cells. This bGH analog possessed the same binding affinity to mouse liver membrane preparations as wild-type bGH. Transgenic mice containing the mutated bGH gene, however, showed a significant growth-suppressed phenotype. The degree of suppression was directly related to serum levels of the altered bGH molecule. Also, serum IGF-1 levels were decreased while pituitary GH levels elevated in these mice. Together these data suggest that this bGH analog has uncoupled GH ligand-receptor binding from IGF-1 production and that the analog acts as a GH antagonist.

Aerospace Medicine

Arranged by: Michael Barratt

Hosted by: James S. King

FRIDAY, APRIL 26, 1991

The Ohio State University

Graves Hall 2063

333 West 10th Avenue

1:30 PM

Michael Barratt, Presiding

1:30 OVERVIEW OF AEROSPACE MEDICINE AND THE WRIGHT STATE UNIVERSITY AEROSPACE MEDICINE PROGRAM. Michael R. Barrett, Wright State University, School of Medicine, 119 West Funderburg, Fairborn OH 45324

1:45 BONE DENSITY MEASUREMENT IN BEDREST SUBJECTS IN A SIMULATION OF ZERO GRAVITY EFFECTS. W. Edward Powers, M.D.

Wright State University School of Medicine, Aerospace Medicine Residency Program, Department of Community Health P.O. Box 927, Dayton, Ohio 45401-0927

Weightlessness (zero gravity) during space flight produces biochemical changes in bone metabolism which

causes a loss in bone density. The density changes are potentially irreversible and may in fact be the limiting factor for humans during prolonged space flight. These considerations would profoundly affect a mission to explore Mars.

Bedrest studies provide information regarding the biochemical changes which occur during immobilization, the best earth based simulation of zero gravity for bone studies.

Various methods have been used to measure bone density including plain film radiography, dual photon absorptiometry, and gamma computed tomography. Many recent advances in hardware and software have increased the accuracy of these devices. It is now possible to detect the small changes in bone density which occur over only a few weeks of exposure to zero gravity or bedrest.

These studies are essential for developing countermeasures for loss of bone density during space flight.

2:15 A HELMET MOUNTED DISPLAY SYSTEM FOR ENHANCED PATIENT MONITORING. A. SOBEL, WRIGHT STATE UNIVERSITY, DEPARTMENT OF AEROSPACE MEDICINE, P.O. BOX 927, DAYTON, OH, 45401-0927.

INTRODUCTION. An integrated, panoramic HMD system was designed for management of multiple critically ill patients by a life flight crew. **DISCUSSION.** The HMD system described employs the "polar graphic" display concept, i.e. the segmented polygon, as a means of data formatting and real-time integration. Multiple clinical parameters such as systolic blood pressure, heart rate, and oxygen saturation can be simultaneously displayed as required for each patient. A review of the human factors literature provided the basis for system design and innovation. System performance data from real-time, dynamic simulations revealed improved reaction time with use of the closed polygon format (Beringer and Chrisman, 1987). In addition, there appeared to be no reliable effect due to the number of indices monitored on the detection rate with use of this format (Munson and Horst, 1986; Beringer and Chrisman, 1987). **CONCLUSIONS.** Panoramic HMD systems provide an advanced, comprehensive means of clinical data formatting, integration through use of "polar graphic" displays. This approach to patient monitoring in the aviation environment may improve real-time diagnostic and management capabilities of the life flight crew.

2:45 PATENT FORAMEN OVALE AS A RISK FACTOR FOR TYPE II DECOMPRESSION SICKNESS IN DIVERS AND AVIATORS: ENVIRONMENTAL DIFFERENCES AFFECTING TARGET ORGAN PATHOPHYSIOLOGY

Thomas C. Hankins M.D. Department of Aerospace Medicine, P.O. Box 927, Wright State University, Dayton, Ohio 45435

Type II Neurological Decompression sickness (DCS) is a disease with severe morbidity and mortality and with significant numbers of highly trained and motivated individuals at risk. Data from retrospective case control studies in divers and aviators with Type II DCS were reviewed. Neurological events in divers are highly selective to the spinal cord; in aviators cerebral pathology predominates. Differences between the diving and aviation environments, bubble reservoirs created, and target organ pathophysiology were contrasted. Recent microbubble provocative Doppler echocardiographic data was compared to prior series of anatomical postmortem findings of Patent Foramen Ovale (PFO) in divers and aviators showing PFO to be a significant risk factor for Type II DCS. Differences in head up orientation, mobility, protective equipment, and timing of valsalva and straining maneuvers were compared as possible target organ selectors during Type II DCS events. Color contrast Doppler echocardiography is suggested as a technique for a prospective, noninvasive study of the diving and aviation populations.

3:15 The Use of Intravenous Perfluorocarbon Emulsion in the Treatment of Decompression Sickness. John P. Simanonok, MD. Wright State University School of Medicine. Aerospace Medicine Program. PO Box 927. Dayton, OH 45401-0927.

Intravenous Fluosol-DA was compared with air, normobaric oxygen, and hyperbaric oxygen (HBO) using a mathematical model of bubble dissolution. The rate of dissolution is:

$$\frac{dr}{dt} = \frac{-RTDS}{r} \times \frac{(P + 2\gamma/r - \tau)}{(P + 4\gamma/r)}$$

where: R = gas constant, T = temperature, D = diffusion coefficient, S = Solubility, r = bubble radius, P = ambient pressure, γ = surface tension, and τ = dissolved nitrogen tension. P and r were respectively increased and decreased to simulate hyperbaric treatment. τ was set to zero to simulate oxygen treatment, and to 79% of P to simulate air treatment. Solubility was increased to simulate treatment with intravenous Fluosol-DA. Following each manipulation,

the equation was numerically integrated to model the respective treatment. From an initial 1 mm diameter, bubble lifetimes were 340 min for air, 73 min for normobaric oxygen, 38 min for HBO, and 34 min for normobaric oxygen with Fluosol-DA. These results predict that treatment with intravenous Fluosol-DA will be a highly effective adjunct to the current treatment protocols for decompression sickness.

3:45 CIRCADIAN RHYTHMS AND AIRCREW PERFORMANCE Robin Dodge M.D., Division of Aerospace Medicine, Wright State University, P.O. Box 927, Dayton, Ohio 45401-0927

The scientific literature has devoted considerable space to the issue of circadian rhythms, a subset of which is directly concerned with the interplay between these rhythms and aircrew performance. It should be no surprise to find altered circadian rhythms in terms of their relationship to different phases of the light/dark cycle, especially in long haul crews. However, a definite relationship between the flight performance and these altered rhythms is questionable. It is generally agreed that the prime time for a performance effect to appear would be the period immediately following the first full rest period in relationship to a new light/dark cycle (time zone). This easily lends itself to the idea that altered or affected sleep patterns are primarily responsible for any changes. Also the factor most common to all forms of flight, not just long haul, that is discussed by aircrews and is responsible for a large impact or potential impact on performance of all workers, especially shift workers, is that of disturbed sleep habits leading to fatigue. Fatigue is the major concern of this author in considering the implied role of circadian rhythms and aircrew. All these issues will be briefly reviewed and discussed in this presentation.

4:15 RIGID ENCLOSURES FOR ORBITAL EXTRA-VEHICULAR ACTIVITY: ADVANTAGES AND HUMAN FACTORS CONSIDERATIONS Michael R. Barratt, M.D. Department of Aerospace Medicine, P.O. Box 927, Wright State University, Dayton, Ohio 45435

Projected space station and other orbital operations call for a substantial requirement of manned extravehicular activity (EVA) for construction, maintenance, and servicing tasks. It is questionable whether space suits currently in use can meet acceptable levels of reliability, maintainability, and safety. A rigid enclosure is proposed which will incorporate life support system, maneuverability, and work station into a single unit. A high pressure, "shirt-sleeve" environment will greatly enhance comfort of the EVA astronaut while reducing EVA overhead time. Arm-length dextrous gloves and tool station will be mounted on a forward hatch, allowing access for interchange when docked at space station. Remote grappling arms will enable optimal work envelope positioning and provide a stable base from which to exert a force. The occupant will assume a kneeling posture, which should be well tolerated in the zero gravity environment. A comparison is made between the current extravehicular mobility unit and the proposed enclosure with regards to primary protective functions, servicing and maintainability, task oriented attributes, and cost. Substantial benefits in overall EVA productivity and safety could be realized with such an enclosure. While initial development costs and cost-to-orbit would be relatively high, over the long term a cost advantage would be expected.

4:45 HUMAN FACTORS IN THE DEVELOPEMENT OF THE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM FOR SPACE STATION. Laurie Anne Aten, MD. Wright State University, Aerospace Medicine, Box 927, Dayton, Ohio 45401.

Humans require a minimum of 0.8 liters of water per day to survive and water is second only to oxygen as a nutrient essential to human life. On space station, water will also be necessary for personal and environmental hygiene as well as supporting plants and animals for experiments and possibly even food supplementation. Since water is both a bulky and heavy commodity its transportation could use up to half of a supply vessel's cargo ability. This paper discusses the various problems which must be considered with humans "in the loop" in a life support system in which the water is reclaimed or recycled. Consideration of all the sources of water on space station including urine, shower hygiene, laundry and atmospheric moisture condensate and the different contaminants from each is required. A water system is thus necessary which can remove solids and volatiles, control the microflora and still produce water which is safe for humans to use. The system has to be engineered to work in microgravity, yet still have enough similarity to ground based systems so that astronauts can and will use the facilities. The actual subsystems, interfaces, and end use equipment will have to be designed so that crew without technical, mechanical or engineering skills can build, use the equipment comfortably and perform the maintenance necessary to keep the system functioning for 30 years.

David F. Ward, M.D., Wright State University School of Medicine,
Dept. of Community Health, P.O.Box 927, Dayton, OH 45401-0927.

A computer program, HUMAN (Coleman, 1980), uses sophisticated algorithms to approach human physiology in a systems analysis manner. HUMAN allows over 450 variables and parameters to be manipulated and calculated for physiologic systems including circulatory dynamics, electrolytes and cell water, and red cells and blood viscosity. By negating the normal hydrostatic gradient of body fluids in the system analysis, the computer program allows modeling of the circulatory physiology and control mechanisms of body fluid during microgravity conditions. Twenty-one parameters of the circulatory and body fluid systems analysis were monitored during a 100 day microgravity simulation. Calculations of the parameters were monitored at hourly intervals for days one through nine of the simulation, six hour intervals for days 10 through 30, and daily intervals for days 31 through 100. Comparisons of the parameters calculated were made to inflight data obtained from Skylab 2, 3, and 4 measurements to assess the model. Analysis of data using the HUMAN model verifies that this simulation of physiologic adaptation in spaceflight is a valid method to predict regulatory parameters, including highly invasive, previously unmeasured or currently impractical in human subjects.

Collaborative Aerospace Research through

The Ohio Aerospace Institute

Arranged by: Theo G. Keith
Hosted by: James L. Marshall
FRIDAY, APRIL 26, 1991
The Ohio State University
Agricultural Engineering 0142
590 Woody Hayes Drive
9:00 AM
Theo G. Keith, Presiding

9:00 COLLABORATIVE AEROSPACE RESEARCH THROUGH THE OHIO
AEROSPACE INSTITUTE. Theo G. Keith, Jr., Ohio
Aerospace Institute, 2001 Aerospace Parkway, Brook Park, OH
44142

The Ohio Aerospace Institute (OAI) is a newly formed consortium consisting of 9 universities (University of Akron, Case Western Reserve University, University of Cincinnati, Cleveland State University, University of Dayton, The Ohio State University, Ohio University, University of Toledo and Wright State University), two Federal laboratories (NASA Lewis Research Center and Wright Laboratory) and numerous companies. OAI was created in order to satisfy a number of educational and research objectives. OAI is developing various collaborative research activities involving the three sectors of universities, government, and industry. Seventeen focus groups have been established in order to accomplish this objective. These groups represent interdisciplinary research thrusts and act as catalysts to promote collaboration. During the first year of the Institute over 600 individuals have participated in a variety of focus group activities. The purpose of this symposium will be to describe some of the experiences of the focus groups and to describe areas in which aerospace research efforts will be directed. The discussion will come from some of the focus group chairmen who will also provide a presentation of the state of the art for their area. A round table discussion will follow these presentations in which lessons learned and new directions will be described.

Computers as Educational Tools: Computer Tutors

Arranged by: Philip J. Smith
Hosted by: Michael H. Klapper
SATURDAY, APRIL 27, 1991
The Parke University Hotel
3025 Olentangy River Rd.
8am-6pm
Philip J. Smith, Presiding

8:30 INTELLIGENT COMPUTER-AIDED INSTRUCTION. William
Clancey, Institute for Research on Learning,
Palo Alto, CA.

This presentation on the use of knowledge-based systems technology to build tutoring systems will draw on examples from research on the design of systems such as NEOMYCIN. One emphasis is the need to guide system design with psychological models of problem solving. A second is the value of identifying and explicitly representing domain-independent problem-solving strategies to support the teaching process.

9:30 INTERACTIVE EDUCATION INVOLVES MUCH MORE THAN THE
COMPUTER: TEACHING BIOLOGICAL SCIENCES. Susanne
Stensaas, Director of the Center for Medical Education,
Cornell University, New York, NY 10021

Multimedia courseware is useful for the design of interactive learning environments. This talk will illustrate the integration of existing texts, syllabi, visuals and sound into a teaching tool based on computer and videodisc technology. Practical concerns in making such technology widely accessible, with an emphasis on the value of shared resources, will also be discussed. This presentation will outline approaches to collaborative efforts based on experience in the "Slice of Life" videodisc project, a collaborative effort to develop and provide access to videodisc images for use in teaching the biological sciences.

Contemporary Economic Issues

Arranged by: Edward J. Ray
Hosted by: Edward J. Ray
FRIDAY, APRIL 26, 1991
The Ohio State University
Robinson Laboratory 2027
206 West 18th Ave.
1:00 PM
Edward J. Ray, Presiding

1:00 A MODEL OF COMPETITION AMONG POLITICAL INTEREST
GROUPS. W.W. Sharkey, Bellcore, 435 South St.,
Morristown, NJ 07960

This paper presents a new solution concept, known as the aspiration core, for cooperative games without side payments generally, and for spatial political models in particular. In a spatial political model the aspiration core is closely related to the competitive solution, due to McKelvey, Ordeshook, and Winer, and the set of bargaining aspirations, due to Bennett and Zame. While the aspiration core is not a universal political solution concept, it is argued that it is an appropriate extension of the concept of competitive equilibrium to general political analysis. This paper contains an application of the aspiration core solution to a model of redistributive regulation.

Karl Brunner's contribution to the development of monetary economics during the last thirty years was of the first order of importance. This paper sketches the nature of the economic understanding revealed by Karl Brunner's published work, particularly in monetary economics. This retrospective is undertaken in the hope not only of providing future historians of economic thought with a starting point for the study of his overall contribution, but also, and more immediately, in the hope that currently active researchers will find it a useful foundation for their own endeavors. Karl Brunner's work contained far more than its fair share of good ideas, and it is worth a considerable effort to ensure that they survive him and continue to influence the development of monetary economics.

Forensic Chemistry Part I

Arranged by: James Y. Tong

Hosted by: Carolyn Carter

FRIDAY, APRIL 26, 1991

Stouffer's Dublin Hotel

Stouffer Dublin Hotel Ballroom

600 Metro Place North, Dublin, OH

1:30 PM

James Y. Tong, Presiding

1:30 IMPACT OF AUTOMATION ON CRIME LABORATORIES

MOHAMED M. GOHAR, State Of Ohio, Arson Crime Lab, 8895 East Main Street, Reynoldsburg, Ohio 43068.

As a result of recent progress in the field of microprocessors, the power of main frame computers has become affordable to many small to medium sized crime laboratories. This paper will discuss the availability of various systems, their applications in the field of forensic laboratories, and benefits of implementing a comprehensive laboratory information management system with real-time data acquisition and processing.

Issues of system access security, memory size, integrity of hardware and software, and unattended 24 hour-a-day instrumental operation will be addressed. To satisfy legitimate legal questions, emphasis will be placed on the strict quality assurance and security measures required in the daily operation.

Finally, this paper will describe specific benefits of automation within the Ohio Arson Crime Laboratory. The most significant benefit has been a 400% improvement in turnover time. Other benefits include the ease of: data management and interpretation, sample history tracking and consequent analytical steps, results entry, statistical studies, certifying or approving forensic chemists' findings, and report generation.

2:00 POISONING IN DISGUISE, FORENSIC TOXICOLOGY IN A MURDER CASE. Robert B. Forney, Jr., Ph.D., DABFT., Medical College of Ohio, 3000 Arlington Ave., Toledo, OH 43699

A newly wedded, 25 year old woman's death was due to a fall from a horse according to the husband. The discovery of inconsistencies in his background and \$330,000 in accidental life insurance led to a disinterment and autopsy 33 days after death. Analysis revealed the muscle relaxant, succinylcholine (Sch) in embalmed tissues and an apparent injection site. Difficulties arose due to the bis-quaternary ammonium structure of Sch and its low pharmacologically active range of concentrations. Sch was extracted as an ion-pair with hexanitrodiphenylamine, demethylated with sodium benzene-thiolate and identified and quantitated by GC/MS. Finding Sch *post mortem* appeared inconsistent with its rapid enzymatic hydrolysis by

pseudocholinesterase. However, studies in surgical patients and animals confirmed its persistence in tissues beyond the time required for plasma disappearance. Based upon this work, the failure to find an anatomical cause of death, and other evidence, the husband was convicted of the murder of his wife by lethal injection of Sch.

2:30 FORENSIC SCIENCE EDUCATION - WHERE ARE WE HEADING? Michael Yarchak, Attorney General's Office, Ohio Bureau of Criminal Identification and Investigation, P.O. Box 365, London, Ohio 43140

After receiving a degree in a generalized scientific major, the crime lab analyst usually is trained in a crime lab in a specific area of forensics expertise. The nature and rate of scientific progress is significantly diminishing the role of the crime lab as primary educator. Chemical fingerprint development techniques, lasers, DNA, new drug variations, chemical instrumentation, accreditation and legal challenges make necessary even greater specialization by the scientist working in the crime lab. New attitudes must develop on the part of forensic analysts, crime lab managers and educators and their efforts should be more complementary.

Suggested for discussion are ideas such as extended degree programs, a forensics "institute", new courses, modified attitudes by crime lab management, and the establishment of a commitment to excellence.

Some of these ideas will be discussed in relation to recommendations of other professional entities such as the National Science Foundation task force for math and science education, ASCLD, etc.

2:50 FORENSIC CHEMISTRY EDUCATION IN OHIO. James Y. Tong, Chemistry Department, Ohio University, Athens, OH 45701.

The development of B.S. in Forensic Chemistry program at Ohio University is briefly outlined. The progress and changes in the program since its inception and a survey of the careers chosen by the graduates in the last 15 years are summarized and evaluated. The importance of the forensic laboratories in Ohio and elsewhere in giving the students opportunities to do internships between their junior and senior years is acknowledged. The program has several unique features: (1) it has a ratio of female to male graduates of 3 to 1, (2) very few graduates are not working in forensic chemistry or related scientific fields, and (3) the program has prepared others for advanced studies in law, medicine, environmental science, biochemistry, as well as analytical chemistry. Planned changes such as training in DNA fingerprinting to enhance the program and to meet changing needs of the field are described.

3:20 DEVELOPMENT OF ANALYTICAL TECHNIQUES FOR FDA INVESTIGATION OF TAMPERING INCIDENTS AND OTHER CRIMINAL ACTIVITIES. Fred L. Fricke, Food & Drug Administration, National Forensic Chemistry Center, 1141 Central Avenue, Cincinnati, Ohio 45202.

The FDA has been involved in investigating product tampering incidents for a number of years. The Tylenol incidents in 1982 and 1986 resulted in the death of several innocent citizens. Tampering thus became a weapon for either random killings or targeted homicides. Until recently, the tampering episodes under FDA jurisdiction were mainly confined to the U.S. and in a majority of the cases, each problem was localized to a particular metropolitan area. The Chilean fruit incident has now demonstrated that tampering can be used as an international weapon with far-reaching effects on U.S. citizens. In addition to tampering, the FDA conducts investigations of counterfeit drugs, generic drug fraud, product contamination, etc.

The FDA has decided to be pro-active in dealing with these activities and has established a National Forensic Chemistry Center (NFCC).

My presentation will describe the functions of the NFCC and the analytical techniques that are currently being used. Specific examples of the use of Inductively Coupled Plasma-Optical Emission and Inductively Coupled Plasma-Mass Spectrometry for determining trace elements in various matrices will be given.

3:50 TOOL MARK IDENTIFICATION IN HUMAN BONE. Carl H. Haemmerle, Miami Valley Regional Crime Laboratory, 361 W. Third St, Dayton, OH 45402

On October 22, 1990, a W/M 23 died of an apparent knife wound to the chest as a result of a domestic dispute. An autopsy at the Montgomery County Coroner's Office revealed that the victim had two knife wounds, one in the right thigh and one in the upper left chest. The blade entered the third intercostal space, nicked the fourth rib and several major vessels while attaining a depth of 8½ inches.

Death was by exsanguination. A 1½ inch section of rib containing the nick was recovered at autopsy and forwarded to the Miami Valley Regional Crime Laboratory for analysis and tool mark comparison with the murder weapon. The bone was cleaned, sectioned, stained, and microscopically compared with test cuts produced by the questioned knife. The knife was positively identified as the murder weapon due to the microscopic comparison of striations on both the bone and test media.

4:10 TIRE IMPRESSION IDENTIFICATION ON HUMAN TISSUE
Kenneth M. Betz, Miami Valley Regional Crime Laboratory, 361 W. Third St, Dayton OH 45402

The ability to accurately determine the time of death, cause, and subject responsible for the event is of medical and legal importance. Numerous disciplines within the forensic science community must be utilized in the search of truth. This study involved a rural area fatal pedestrian accident in which the driver left the scene and reported the accident to the local authorities. Examination of blood spatters on the roadway and other physical evidence recovered at the scene were found to be inconsistent with the statement given by the driver. The autopsy examination revealed a series of tire impressions on the victim's torso. Reactivity in the tissue was present to indicate the subject was alive at the time the impressions were made. The impressions were later identified as not originating from the driver's vehicle. Subsequent investigations by the authorities resulted in the arrest of a driver of a second vehicle who was charged with hit and run.

4:30 ARSENIC POISONING; Ancient Poisons in Modern Ohio Context. James L. Ferguson, Chief Toxicologist, Franklin County Coroner's Office, 520 King Avenue, Columbus, Ohio 43201.

For several thousand years of recorded history arsenic has been used both as a medicine and a poison. Current therapy restricts the use of arsenicals to the treatment of certain tropical parasitic diseases. Consequently arsenic is very rarely encountered in Ohio as a drug, but more commonly from homicidal, industrial and environmental sources. The symptoms of arsenic poisoning most often appear to be those of some naturally occurring disease, gastrointestinal, cardiac or hematologic in origin. The lecture will illustrate the laboratory investigation of three recent cases of arsenic poisoning. Blood and tissue levels of arsenic may be low even in acute exposure because of the rapid redistribution to liver, kidney and heart. Because of the high sulfhydryl content of hair and nails, arsenic is deposited into the growing roots at high concentration. It is possible for such arsenic to remain fixed in the hair at the point of time relative to its deposition for as long as the hair grows. Since hair grows at a rate of 0.3mm per day, a few millimeter's growth can correspond to a few weeks exposure. Hair analysis for heavy metals has proved to be particularly useful in establishing the difference between chronic and acute poisoning in these cases.

Forensic Chemistry Part II

Arranged by: James Y. Tong

Hosted by: Carolyn Carter

SATURDAY, APRIL 26, 1991

The Ohio State University

Evans Hall Conference Room

520 King Avenue

1:30 PM

James Y. Tong, Presiding

1:30 FORENSIC ANALYSIS UTILIZING THE BIO-RAD REMEDI
Craig A. Sutherland, Chief Toxicologist,
Cuyahoga County Coroner's Office,
2121 Adelbert Road, Cleveland, OH 44106

Forensic toxicology has long been an area of innovation and hybrid technologies. The Bio-Rad REMEDI is a novel hybrid of HPLC (preparation and analysis), fast-scanning UV detection, and a sophisticated data system. The system utilized artificial intelligence to qualitatively identify unknown analyte in various preparations (biological or pharmaceutical) and subsequently quantitates these analytes based upon multiple internal standard calculations. REMEDI has multiple uses in forensic toxicology and its incorporation into a full service forensic toxicology laboratory will be the topic of this presentation.

1:55 ANALYTICAL SURVEY OF CURRENCY FOR COCAINE RESIDUE, Robert E. Budgake and Jay D. Spencer, Canton-Stark County Crime Laboratory, 3530 Central Avenue, S.E., Canton, Ohio, 44707.

At the request of the law enforcement agencies in Stark County, Ohio, the Canton-Stark County Crime Laboratory was asked to evaluate the analysis of currency for cocaine residue, for the purpose of aiding in the seizure of currency involved in drug trafficking. To determine if a correlation could be made between possessing cocaine tainted currency and the drug trafficking trade, a survey was conducted of twelve financial institution's local deposits to ascertain the degree of cocaine contamination of the general money supply. Six thousand eight hundred (6,800) bills, totaling \$306,000, were analyzed utilizing a petroleum ether wash, followed by evaporation and GCMSD analysis. Cocaine was detected on 0.36% of the currency analyzed. This is in sharp contrast to the 47.8% positive rate being detected on currency seized from individuals suspected of being drug traffickers.

2:15 REFLECTIONS ON COCAINE-RELATED DEATHS IN THE 1980s; A Central Ohio Perspective. Sonja L. Rawn, Associate Toxicologist, Franklin County Coroner's Office, 520 King Avenue, Columbus, Ohio 43201.

Episodes of stimulant drug abuse have been a part of American history for over a hundred years. These episodes are cyclic, occurring about every twenty years, employing cocaine, amphetamines or both. The recent experience with cocaine abuse in the Central Ohio area continues to bear out that tendency. Since the latter 1970s, all questioned deaths in Franklin County have been subjected to toxicology testing. From the early eighties evidence of cocaine usage doubled yearly until 1985, and then plateaued out reaching a maximum in 1989. The early incidences of cocaine positives corresponded to accidental drug overdoses by insufflation and intravenous administration. The peak occurrence of accidental ODS occurred in 1987. The number of cocaine positive cases has remained fairly steady, but the manner of death has shifted to gunshot wound, stabbing and other drug related violence. The demographics of the drug using population has shifted in other ways as well, reflecting a continuing shift toward younger black males. We hesitate to attribute any particular enforcement or treatment strategy to this moderation in incidence and average blood levels for cocaine. For whatever reasons history has shown us that this particular drug-craze will also pass, but forensic toxicologists must remain vigilant and prepare for the next wave, the next drug of abuse.

2:35 ELECTROCHEMICAL ANALYSIS IN FORENSIC CHEMISTRY.
Howard D. Dewald, Department of Chemistry, Ohio University, Athens, OH 45701-2979

The basic principles of electrochemical techniques and how they are used in forensic chemistry will be presented. Detailed theory will not be given, rather examples will be used to illustrate the scope and possibilities of electroanalysis in the forensic laboratory. Among the examples will be the application of polarography in the analysis of Tylenol samples for adulteration with cyanide that occurred in October 1982. Another electrochemical application is the use of anodic stripping voltammetry (ASV) in the detection of firearm discharge residues by the determination of antimony and lead on the hand swabs of suspected firers. Similar ASV procedures have been developed for measuring lead in blood, paint chips, and pottery. Also, liquid chromatography with electrochemical detection (LCEC) is a suitable technique for analysis of narcotic alkaloids and for the detection of nitro-aromatic and nitrate esters in explosives.

3:20 NOVEL METHODS OF FORENSIC IDENTIFICATION BY CHEMICAL FINGERPRINTS. Peter de B. Harrington, Department of Chemistry, Clipping Laboratories, Ohio University, Athens, OH 45701-2979.

Analytical spectroscopy is a useful tool for forensic analysis, because many important properties of complex samples may be characterized by their spectra. Spectra may be used as a chemical fingerprint for detection of criminal evidence. Rule-building expert systems are programs that may learn distinctive patterns from training sets of spectra. Once trained, these systems may automatically and rapidly identify unknown samples.

A novel fuzzy multivariate rule-building expert system (FuRES) has been devised which extracts information from training sets of data. This system uses fuzziness within its rule construction. Fuzzy rules allow the system to make reliable inferences when clear cut decisions are inappropriate. FuRES is a robust classification method which also furnishes qualitative information regarding its inference mechanism. A myriad of potential applications exist for FuRES in the modern forensic laboratory.

3:45 CHARACTERIZATION OF TRACE EVIDENCE BY INSTRUMENTAL MICROANALYSIS. William L. Dean, Hamilton County Coroner's Laboratory, 3159 Eden Avenue, Cincinnati, Ohio 45219.

One of the primary functions of the trace evidence examiner in a crime lab is to compare material from a suspect to material from a crime scene. If these materials correspond in chemical or physical characteristics, they could establish a link between the suspect and the crime. Such forensic examinations often involve trace amounts of material necessitating microanalytical techniques. Our laboratory has found that the scanning electron microscope-energy dispersive x-ray spectrometer is an excellent tool for investigating the inorganic content of trace evidence. Similarly, the fourier transform infrared microspectrometer is used to analyze the organic composition. Evidence such as paint from hit-and-run cases is routinely characterized by the combination of these two techniques. This presentation will provide other examples of instrumental techniques applied to the analysis of criminal evidence.

4:10 A REVIEW OF THE 1990 ETHANOL STATISTICS FROM THE OHIO HIGHWAY PATROL. Sgt. John R. Allard, Ohio State Highway Patrol Crime Laboratory, 660 East Main Street, Columbus, OH 43205

The author reviewed breath, blood, and urine alcohol results collected from individuals tested by the Ohio State Patrol during the year 1990. Mean ethanol levels were determined for individuals arrested for driving while under the influence as well as for individuals involved in fatal traffic crashes. These findings indicate a need for targeting certain groups for deterrent effect campaigns against drinking and driving.

4:30 FORENSIC APPLICATION OF ICP SPECTROSCOPY; A New Analytical Tool For Heavy Metal Poisoning Cases. James L. Ferguson, Chief Toxicologist, Franklin County Coroner's Office, 520 King Avenue, Columbus, Ohio 43201

Inductively Coupled Plasma Emission Spectroscopy (ICP) is an analytical technique which had its theoretical inception about twenty years ago. The first commercial instruments were introduced ten years ago, but developments in microcomputer technology have placed these instruments within the affordability and general use only in the last few years. The technique of ICP offers greater overall sensitivity, ease of sample preparation and smaller total specimen sizes than conventional atomic adsorption spectroscopy. With the aid of this technique we are now able to scan, screen and quantitate the amount of any of thirty metals which are known to be toxic to man at biologically significant levels. The lecture will give a brief review of the development of ICP and an overview of sample handling techniques as applied to forensic specimens of blood, urine, tissue and hair for the analysis of the classical heavy metals from current poisoning cases.

Geology in the Twenty-First Century

Arranged by: Michael P. Angle

Hosted by: Garry D. McKenzie

FRIDAY, APRIL 26, 1991

The Ohio State University

Orton Hall 110

155 South Oval Mall

2:00 PM

Michael P. Angle, Presiding

2:00 PM RECEPTION HOSTED BY WW ENGINEERING & SCIENCE, INC. AND GEOLOGICAL SCIENCES ORTON HALL MUSEUM

3:00 PM OPENING REMARKS
Michael P. Angle, ODNR

3:05 GEOLOGIC MAPPING AT THE OHIO GEOLOGICAL SURVEY: PAST, PRESENT, AND FUTURE. Dennis N. Hull, ODNR, Division of Geological Survey, 4383 Fountain Sq. Dr., Columbus, Ohio 43224-1362.

For more than 150 years, the Ohio Geological Survey has mapped the geology of Ohio. Through the years, Survey mapping has evolved in response to changing societal needs and expanding knowledge of Ohio geology. Between 1879 and 1920, numerous small-scale county geologic maps and five official state geologic maps were published. From 1920

through the 1980s, most mapping by the Survey was in the form of coal-resource maps and 1:62,500-scale county bedrock, glacial, bedrock-topography, and drift-thickness maps. Beginning in the 1980s, geologic maps were prepared at 1:24,000 scale for open-file release and 1:62,500 scale for publication. In 1990, the Survey began a four-year program in cooperation with USGS-COGEOMAP to map the bedrock geology of the entire state in reconnaissance fashion on 7½-minute quadrangles to be released as open-file maps and digitally compiled at 1:100,000, 1:250,000, and 1:500,000 scale for publication as full-color maps. A new state Quaternary geology map in preparation is also scheduled for publication in 1992. Compilation sheets for the new Quaternary map will be released as open-file 1° x 2° quadrangle maps in 1991. Upon completion of the new state maps, the Survey will resume detailed, 7½-minute quadrangle mapping. Geologic hazards maps and stacked-unit maps for characterization of solid-waste disposal suitability are being planned for future production.

3:20 ENVIRONMENTAL GEOLOGIC CONSULTING IN THE NEXT CENTURY. René L. Fernandez, WW Engineering & Science, 6620 Busch Boulevard, Columbus, OH 43229

Social concern for our environment has created a need for the environmental consultant. A trend over the last 30 years saw environmental issues become a public concern. This concern resulted in legislation that created a need for the environmental geologist. New and existing environmental issues will determine what the environmental geologist will be doing in the 21st century. Global political change will open the world to the environmental consultant.

In the next century, environmental geologists will be versed in compliance and legal issues. He or she will advise clients of numerous and often overlapping legal requirements and liabilities. Mitigation and, unfortunately, litigation will become an essential part of geologic consulting. Although a classical geology background will remain important, environmental consultants will need additional background in law and compliance.

High-tech instruments will speed up investigations, reduce costs, and end most field work. More sophisticated and reliable instruments will accurately define geology, hydrogeology, and soil and water chemistry. Non-geologists will operate the equipment in the field and resulting data will be broadcast to satellites where it will be monitored by the project geologist.

The demands of society will continue to create jobs for geologists. World events and global concerns will provide international opportunity for the forward looking consultant. Flexibility, a sound geologic background, and a sense of social concern will determine the success of the consulting geologist in the next century.

3:35 GEOLOGY IN THE CONSTRUCTION AGGREGATE INDUSTRY
Ken Coats, American Aggregates Corporation
6450 Sand Lake Road, Dayton, Ohio 45414

The mining industry is a continued source of employment for geologists worldwide. The aggregate business is an often overlooked part of the mining industry, which provides "sized" aggregates for nearly all forms of construction. Aggregate companies are located extensively across North America and provide employment for geologists nationwide. The industry is facing new problems and challenges following the recent increased public awareness of environmental issues. Geologists will play an important role in meeting these challenges.

The aggregate mining geologist will continue to be involved with exploration for new reserves, quality analyses, mine planning and permitting, reclamation, land use planning, zoning, and environmental permitting. As permitting for new surface mining operations becomes more and more difficult, underground mining activities will grow steadily into the next century.

Geology students interested in a career in this industry should develop a background with field experience and a good general "rock knowledge." Other courses that may be of value include hydrology, surveying, environmental law, land use planning, and business economics.

3:50 INTEGRATION OF ENVIRONMENTAL MICROBIAL INVESTIGATIONS INTO ROUTINE GROUNDWATER QUALITY AND REMEDIATION STUDIES IN OHIO. SMITH, Stuart A., CGWP, Ground water scientist, P.O. Box 88, Ada, Ohio 45810

In recent years, the native microflora of aquifers have increasingly been recognized as key influences on groundwater quality, the fate of introduced chemicals, and the operation of water and monitoring wells. However, to date, for a variety of reasons, microbiological studies have not yet become part of the routine of hydrogeological studies.

In work by numerous research groups, microbiological methods have been adapted for studies of porous-matrix lithologies, with important information gathered and an advanced state of art. These are appropriate for Ohio alluvial and outwash valley studies. Locally, in a series of studies, we have worked to develop methodologies for sampling/analysis of microorganisms in carbonate aquifers, which have different sampling requirements due to fracture/channel permeability.

Evidence indicates that microbial influences strongly affect groundwater quality in both the northwest Ohio carbonate aquifer, and valley sands/gravels. More routine and

appropriate microbiological studies would aid in interpretation of hydrogeochemistry in these aquifers. Sampling and appropriate analytical methods both require development. However, the possibility exists near-term for microbiology to better used in "routine" hydrogeology.

4:15 IMPLEMENTATION OF A WELL LOG COMPUTERIZATION SYSTEM FOR THE STATE OF OHIO. Rebecca Petty, Division of Water, Ohio Dept. Natural Resources, 1939 Fountain Square Dr., Columbus, Ohio 43224

The Division of Water maintains a large portion of Ohio's ground water data in the form of over 700,000 well logs. Each record is a legal document filed with the Division and stored as paper files by county, township, and location, with approximately half of the records located on topographic maps. These records are used extensively for ground water research, development, protection, and remediation efforts with over 7000 inquiries received annually by the Division. A well log computerization system using optical disk storage and retrieval technology combined with database management has been developed to facilitate storage and retrieval of records and enable other software applications including flow modeling and GIS. Well logs can be retrieved by searching key fields and database information can be downloaded in an ASCII format for further processing. Future system development will include connection to the state data network and access through fax gateways from remote terminals. Data entry has been limited due to availability of funds. Demonstration projects are planned for 1991 to identify networking applications and data entry needs.

4:30 THE MULTIDISCIPLINE ANALYSIS AND PROJECTION FOR A DEVELOPMENT SITE SOUTH OF KENT, OHIO. James Bauder, Independent Consultant, 3095 Bernewood Dr. NW, Canton, OH 44709

4:45 OHIO EPA - DIVISION OF GROUND WATER PROGRAM
Thomas M. Allen-Assistant Chief-Ohio EPA-DGW

Ohio EPA
1800 WaterMark Drive
P.O. Box 1049
Columbus, Ohio 43266-0149

- A. Discussion of the Ohio Ground Water Protection and Management Strategy;
- B. Division of Ground Water responsibilities identified;
- C. Relationship of DGW responsibilities and Hydrogeology discipline; and
- D. Future program development

5:00 REGULATORY GEOLOGY - A RAPIDLY EXPANDING AREA OF GEOLOGIC CAREERS, Clark E. Scheerens, Ohio Department of Natural Resources, Division of Oil and Gas, 4435 Fountain Square, Columbus, Ohio 43224

Current concerns with the quality of the environment have created a career niche which did not exist forty years ago. The geologist or hydrologist now has a rapidly expanding career area of environmental regulation. Regulatory geologists and hydrologists review permit applications, report on field activities at existing sites, and investigate environmental complaints. The area of complaint and contamination site investigation is perhaps the most confusing, and requires a diverse range of skills. Scientists in such positions use several aspects of geology and hydrology, with significant amounts of time required for field investigations. The variety of scientific disciplines needed include knowledge of local stratigraphy, structural geology, geochemistry, hydrology concepts and local processes, geophysical techniques, rock and mineral characteristics, and the ability to collate the resulting information. Skills in oral and written communication, negotiation, knowledge of regulatory law, and governmental processes are also necessary. Major concerns in the course of investigations include limited background data, small budgets and short time frames for on-site investigation work, and somewhat limited time to reach conclusions.

5:15 NEW TECHNOLOGIES FOR OLD PROBLEMS: TRADING ALLADIN'S LAMP FOR A NEW ONE. J. Michael Clinch, Dept. of Geology, University of Dayton, 300 College Park Ave., Dayton, oh 45469-2364

Often, as new technologies are discovered and applied to geology, they open up new fields of study, and help to define the new questions whose answers will carry us into the next century and beyond. At the same time, there are old questions left that still have no final answer. It is sometimes useful to apply new technologies to these old problems. One of the most hotly debated old problems in Ohio is the drainage history of the Miami River drainage

and its relation to the Teays. Geomorphologists and glacial geologists have long applied traditional methods to this problem, with contradictory results. Others began to find a solution to the problem by compiling bedrock topography maps, a time-consuming, thankless task that had to be started from scratch when new data were available. This problem is now being addressed using computer techniques. Available published and unpublished well log data have been digitized and stored in a spatial database. Those wells reaching bedrock or deep enough to define the buried valleys have been selected, and are used to construct bedrock topography maps by a computer contouring program. These maps give new insights, presented elsewhere, into the drainage history of southwest Ohio. However, their chief advantage is that they can be updated constantly, making this particular old problem best solvable using new methods, instead of the old ones.

Liquid Crystals: A Tribute to Glenn H. Brown

Arranged by: Mary E. Neubert

Hosted by: James L. Marshall

FRIDAY, APRIL 26, 1991

The Ohio State University

Agricultural Engineering 142

590 Woody Hayes Drive

1:15 PM

Mary E. Neubert, Presiding

1:15 PROFESSOR GLENN H. BROWN AND THE LIQUID CRYSTAL INSTITUTE. Mary E. Neubert. Liquid Crystal Institute, Kent State University, Kent, OH 44242

In 1965, Glenn H. Brown founded and became the first director of the Liquid Crystal Institute (LCI) at Kent State University. Under Brown's direction, the LCI obtained outside funding for a wide variety of research projects. Significant contributions to the liquid crystal area include development of the twisted nematic display, discovery of the smectic C and H (now called G) phases and discovery of the biaxial N phase in lyotropic systems. An organic synthesis group was formed to provide high-quality liquid crystals for researchers. The International Liquid Crystal Conferences were initiated and continue biannually. The journal *Molecular Crystals* was expanded to include liquid crystals with Glenn Brown serving as one of its three editors. Later, he became editor of the Letters section and also "Advances in Liquid Crystals." Today, LCI continues to grow under the direction of J.W. Doane with its major expansion being in the applications area with the development of the PDLC display.

1:30 POLYMER-DISPERSED LIQUID CRYSTAL FILMS FOR SOLAR ENERGY CONTROL

G. Paul Montgomery, Jr.

Physics Department

General Motors Research Laboratories

Warren, MI 48090-9055

Polymer-dispersed liquid crystal (PDLC) films can be used for electrical control of the solar influx into buildings and automobiles because they can be switched from a cloudy, light-scattering off-state to a transparent on-state. Optimum PDLC performance in solar control applications requires maximizing the backscattering of incoming solar radiation in the off-state. We have theoretically and experimentally studied the effects of droplet size and concentration on backscattering. Rayleigh-Gans calculations predict that, at wavelength λ , maximum backscattering occurs for droplet radii between $\lambda/7$ and $\lambda/5$, depending on the liquid crystal concentration. These results are consistent with hemispherical transmittance and reflectance measurement on PDLC films with controlled droplet sizes. These measurements indicate that solar attenuation by PDLC films will be maximized by choosing droplet size to maximize backscattering of visible radiation. This choice also increases solar attenuation by absorption of scattered radiation trapped inside a PDLC film by total internal reflection.

2:00 FINGERS, DENDRITES AND FILAMENTS:
PATTERN FORMATION IN LIQUID CRYSTALS

PETER PALFFY-MUHORAY

Liquid Crystal Institute Kent State University, Kent, OH 44242

Interfacial instabilities give rise to the formation of complex patterns in a wide variety of nonequilibrium systems. Although the responsible physical mechanisms may be different, the underlying mathematical structure is often similar. Since anisotropy plays an essential role in the interfacial dynamics, the inherent anisotropy of liquid crystalline systems make them ideally suited for the study of pattern formation.

In viscous fingering experiments using liquid crystals, the anisotropy may be varied by changing the temperature. Pattern selection mechanisms in these experiments will be discussed. Mesophase growth in liquid crystals will be reviewed, where nonequilibrium 'solidification' gives rise to a variety of patterns. These include dense branching and dendritic structures, as well as metastable filaments with unusual dynamic behaviour.

2:30 THE CHOLESTERIC BLUE PHASES: THE IMPORTANCE OF FLUCTUATIONS.
KEYES/ Paul H., Dept. of Physics & Astronomy,
Wayne State University, Detroit, MI 48202.

Two of the blue phases (BPI and BPII) are cubic lattices of orientational order. A simple theoretical argument, based on dimensional analysis, shows that these structures are unstable in the limit of high chirality and this instability provides a natural explanation for the formation of BPIII, the disordered blue phase. Measurements of the Debye-Waller factors of a cubic lattice of BPII are shown to be in agreement with this "melting" mechanism. Light scattering measurements of BPIII show it to be dominated by divergent director fluctuations, similar to what has been calculated for two dimensional nematic liquid crystals, including a singular behavior for the autocorrelation function at zero time.

3:00 GEL/SOL AND LIQUID-CRYSTALLINE TRANSITIONS IN SOLUTIONS OF RIGID-ROD POLYIMIDES. F.W. Harris,
S.K. Lee, S.L. Hsu, S.Z.D. Cheng, Institute of
Polymer Science, The University of Akron, Akron, OH 44325.

Soluble, rigid-rod, and segmented rigid-rod polyimides have been synthesized by polymerizing 3,6-diphenylpyromellitic dianhydride (DPPDMA) and 3,3',4,4'-biphenyltetracarboxylic dianhydride (BPDA) with 2,2'-bis(trifluoromethyl)-4,4'-diaminobiphenyl (PFMB). Hot, isotropic solutions of the polymers in m-cresol undergo two major transitions during cooling. Mechanical sol/gel transitions occur first, possibly through a nucleation-free, liquid-liquid phase separation. These are followed by the development of lyotropic liquid crystalline states through nucleation and growth mechanisms. Both processes are thermally reversible. The latter process is endothermic, typical of an order/disorder transition. Structure formation kinetics of these processes and their morphologies will be discussed.

3:30 POLYMER DISPERSED LIQUID CRYSTALS:
NEW DEVELOPMENTS

John L. West
Liquid Crystal Institute, Kent State University
Kent, Ohio 44242

Polymer dispersed liquid crystals (PDLC) are composites consisting of low molecular weight liquid crystals dispersed as droplets in a polymer binder. Application of an electric field across a PDLC film switches it from a scattering to transparent state.

Current PDLC research focuses on several new areas: incorporation of liquid crystal polymer binders offering haze-free and reverse-mode shutters, development of materials for IR modulation, and incorporation of dichroic dyes for colored shutters. Haze-free and reverse-mode shutters are formed by matching the optical anisotropy of a side chain liquid crystal polymer and the low molecular weight liquid crystal droplets. Efficient IR modulation requires polymers and liquid crystals with low IR absorption, droplet size on the order of the IR wavelength to be modulated, and matched refractive indices. Colored PDLCs have been formed using dichroic dyes. The absorption of the dye in the field ON non-scattering state can be used to determine the distribution of the dichroic dye. These new PDLCs will be used for a variety of applications including color projection TV, color computer monitors, shutters for infrared video and night vision, and haze-free and reverse-mode windows.

4:00 NONLINEAR OPTICS OF LIQUID CRYSTALS. Michael
A. Lee. Liquid Crystal Institute, Kent State
University, Kent, OH 44242

With the recognition in recent years that liquid crystals can have large optical nonlinearities, there has followed a sudden increase in theoretical and experimental investigations of these materials. We will present our results on theoretical investigations of molecular origin of both large second and third order nonlinearity. We will discuss the manner in which the structure of a variety of bulk liquid crystal phases serves to manifest and enhance the molecular origins of the nonlinearity. Results of recent experiments to determine the nonlinear susceptibility of liquid crystals will be presented.

4:30 BIAxIAL NEMATICS

A. SAUPE and J. LIU. Liquid Crystal Institute and Department
of Physics, Kent State University, Kent Ohio, 44240.

Biaxial nematics are rare and at present only micellar biaxial nematics have been investigated extensively. Studies of phase transitions showed that there is little change in micellar structures at nematic-nematic transitions. The uniaxial-biaxial transitions are second order and have the critical properties of the three dimensional xy-model. The direct identification of a nematics as biaxial by textures is difficult. The Schlieren textures of all nematics are similar but uniaxial-biaxial transitions are well recognizable by transient irregular patterns. However, the structures of defects differs qualitatively. Point defects and disclination lines observed in capillaries and change characteristically at the transitions between the different nematic phases. Acknowledgement: This research was supported by the NSF under Grants DMR85-12253 and DMR89-03453. We thank S. Sabol-Keast and M.E. Neubert for preparation and purification of surfactants under NSF Grant DMR88-18561.

Narcotic Receptors in Animals and Humans

Arranged by: **Juliana H. J. Brooks**

Hosted by: **James S. King**

FRIDAY, APRIL 26, 1991

The Ohio State University

Arthur James Cancer Hospital 518

300 West 10th Avenue

1:30 PM

Juliana H. J. Brooks, Presiding

1:30 EFFECTS OF TEMPERATURE AND DTT ON HUMAN PERIPHERAL NERVE OPIOID RECEPTORS.
JHJ Brooks, MD, B Gupta, MD, G Tejwani, PhD,
AK Rattan, PhD, Dept of Anesthesiology, N429
Doan Hall, 410 West Tenth Ave, Columbus, OH 43210

The presence of opioid receptors in human peripheral nerves was recently reported. This report noted that receptor density changed dramatically over a period of time. The effects of temperature and dithiothreitol (DTT) on human peripheral nerve opioid receptors were studied, in order to refine the membrane preparation technique and provide greater stability of the opioid receptors. Live human sciatic nerves were studied. After homogenization in Hepes buffer, the nerves were treated as follows: (1) maintained at 4°C; (2) maintained at 4°C with DTT 10 mM; (3) 37°C incubation; and (4) 37°C incubation with DTT 10 mM. The resultant membrane suspension was incubated with [³H]-naloxone, [³H]-DAGO, [³H] DSTLE, and [³H]-EKG. After rapid filtration using a Brandel cell harvester, followed by 3x3 ml Hepes washes, liquid scintillation cocktail was added and radioactivity was counted with a Beckman counter. The assay process was repeated one week later. Opioid, mu, delta, and kappa receptors were identified in

all groups, however, neither alterations of temperature or the presence of DTT conferred greater stability on human opioid receptors.

1:45 **DECREASE IN THE HIPPOCAMPAL KAPPA OPIOID RECEPTORS IN MALIGNANT HYPERTENSIVE PIG.** A.K. Rattan, M. Kolattukudy, J.S. McDonald, and G.A. Tejwani. Depts of Anesthesiol. & Pharmacol. The Ohio State University, Columbus, OH 43210

The objectives of the present study were to determine the number and affinity of kappa receptors in various brain regions of normal and malignant hypertensive pigs.

Among the various brain regions examined, only hippocampus showed a decrease of 35% in the specific binding of kappa receptors ($p < 0.05$) in the hypertensive pig compared to control pig. Scatchard analysis of the binding data showed that B_{max} of kappa receptors also decreased by 34%. In addition, the opioid receptors had less affinity for kappa ligand as the K_D of receptors increased from 0.19 ± 0.02 to 0.41 ± 0.03 nM in hypertensive animals. These results suggest that a loss in the number and affinity hippocampal kappa opioid receptors in the hypertensive pig would undermine the effect of dynorphin. In such animals, dynorphin would not be able to potentiate the hypothermic action produced by opiates or other agents. A loss in the function of kappa receptors makes hypertensive animals susceptible for production of hyperthermia.

2:15 **KAPPA-OPIOID AGONISTS AND PHOSPHOINOSITIDE TURNOVER IN RAT BRAIN**
Sumudra Periyasamy, Wayne Hoss and William S. Messer, Jr., Department of Medicinal and Biological Chemistry, University of Toledo, Toledo, OH 43606

Dynorphins represent one class of opioid peptides derived from a unique precursor (pro-enkephalin-B) and exert their physiological effects through kappa opioid receptors (κ -receptors). Although κ -receptors have been identified by binding studies, their biochemical responses are largely unexplored. In this report multiple effects of κ -opioid agonists on the PI turnover response were investigated in the rat brain. Kappa-agonists, including U-50,488H, ketocyclazocine and D[Ala]²-dynorphin-A (1-13) amide stimulated the PI turnover response in rat brain slices. The magnitude of response varied among regions of the brain which are in general agreement with the distribution of κ -receptors in the brain. The PI turnover response elicited by U-50,488H was partially antagonized by naloxone and more completely by the κ -selective antagonists norbinaltorphimine and MR2266. These data indicate that U-50,488H stimulated PI turnover by acting through κ -opioid receptors. In addition to the stimulation of the PI turnover response in rat brain, U-50,488H inhibited carbachol-stimulated PI turnover in a non-competitive manner. However, the inhibitory effect of U-50,488H was not blocked by norbinaltorphimine or MR2266, indicating that this inhibitory effect was not mediated by κ -receptors. Further, κ -agonists inhibited PI turnover stimulated by non-hydrolyzable analogs of GTP in a non-competitive manner in both hippocampal and cortical membranes. These data suggest that the inhibitory effect of U-50,488H on carbachol-stimulated PI turnover was mediated through the interaction with the G-proteins. Supported by HEW grants DA04068 and DA06258.

2:45 **EFFECTS OF PMSF ON HUMAN PERIPHERAL NERVE OPIOID RECEPTORS.**
JHJ Brooks, MD, B Gupta, MD, G Tejwani, PhD, AK Rattan, PhD, Dept of Anesthesiology, N429
Doan Hall, 410 West Tenth Ave, Columbus, OH 43210

The presence of opioid receptors in human peripheral nerves was reported. This report noted that receptor density changed dramatically over time. Subsequent experiments on the effects of temperature and dithiothreitol (DTT) failed to stabilize the human nerve membrane preparation. Phenyl methyl sulfonyl fluoride (PMSF) was studied for its potential stabilizing effect in the membrane preparation. Live human sciatic nerves were homogenized in either Hepes buffer or Tris-HCl buffer. The homogenate was then either maintained at 4°C, or incubated at 37°C in a water bath, and PMSF 50- mM was added. A membrane pellet was obtained by centrifugation and the preparation was reconstituted in the original buffer. The assay was performed by incubating the suspension with [³H]-naloxone, [³H]-DAGO, [³H] DSTLE, and [³H]-EKG. After rapid filtration with a Brandel cell harvester and 3x3 ml buffer washes, liquid scintillation cocktail was added and radioactivity was counted using a Beckman counter. PMSF did not confer greater stability on the human peripheral nerve opioid receptors in Hepes buffer. PMSF did confer greater stability on the kappa receptors when prepared in Tris-HCl and incubated at 37°C. This is consistent with other reports on ionic channels, kappa receptors, and PMSF.

3:00 **OPIOID PEPTIDES ENDOGENOUS IN HUMAN PERIPHERAL NERVES.**
JHJ Brooks, MD, B Gupta, MD, G Tejwani, PhD, AK Rattan, PhD, Dept. of Anesthesia, N429
Doan Hall, 410 W. 10th Avenue., Columbus, Ohio 43210

The presence of opioid receptors in human peripheral nerves was recently reported.¹ To investigate the potential for a physiologic role of these receptors, human peripheral nerves were examined for the presence of two opioid ligands - β endorphin and met-enkephalin. The live human nerves were prepared by heating in 1M acetic acid, followed by homogenization and then lyophilization. The extracts were reconstituted in RIA assay buffer and incubated with bovine antiserum. For β -endorphin, radioiodinated antibody to β -endorphin was added, the mixture was incubated and centrifuged, and gamma counts were performed. For met-enkephalin, bound antigen was separated using polyethylene glycol, and the precipitate was counted in a gamma counter. Human peripheral nerves contain endogenous opioid ligands, as well as opioid receptors.

1. Gupta B, Brooks JHJ, Tejwani G, Rattan A: Narcotic Receptors in Human Peripheral Nerves. *Anesthesiology* 1989, 71(3A).

3:15 **HYDROMORPHONE RECEPTORS IN BRACHIAL PLEXUS ANESTHESIA.**
Juliana H.J. Brooks, M.D., Bhagwandas Gupta, M.D., Dept. of Anesthesia, N429
Doan Hall, 410 W. 10th Ave., Columbus, Ohio 43210

Four cases are reported wherein patients undergoing arteriovenous shunt insertion for renal dialysis received brachial plexus anesthesia, with hydromorphone in the local anesthetic solution. Patients undergoing this surgery normally require postoperative analgesics for 2-3 days; however, in the reported cases, none of the patients required analgesics. Possible mechanisms of action for opioids in brachial plexus anesthesia include nociceptive blockade via opioid receptors in the brachial plexus, centripetal neuroaxonal transport of the narcotic to the substantia gelatinosa of the spinal cord, diffusion of opioids from the brachial plexus sheath to the epidural or subarachnoid space, and slow release of the opioid from the brachial plexus sheath into the systemic circulation.

Neurosciences

Arranged by: James S. King

Hosted by: James S. King

FRIDAY, APRIL 26, 1991

The Ohio State University

Graves Hall 2063

333 West 10th Avenue

8:45 AM

James S. King, Presiding

9:00 **NEUROSCIENCE: AN INTERDISCIPLINARY EFFORT.**
Dr. James S. King, Chairperson, Ohio State University Department of Cell Biology, Neurobiology & Anatomy, 333 W. 10th Ave., Columbus, OH 43210

9:15 **NEURAL TRANSPLANTS: FRONTIERS FOR THE 1990's.** Bradford T. Stokes. The Ohio State University, Department of Physiology, 333 West Tenth Avenue, Columbus, Ohio 43201.

The use of neural transplants for the potential restoration of lost or altered function is quickly becoming an issue of interest to the neuroscience community and the bioethicist. I will address the general issues of how one could use such approaches to effect improvements in a number of human neurological disorders. In particular, I will consider some of the general features of neural grafting, its application to several neurological problems (neurodegenerative disorders, traumatic injury) and one specific example of how behavioral recovery is altered by transplants after experimentally induced spinal cord injury.

Finally, I will consider the current problems with these techniques and the potential solutions that the scientific community offers in the future.

9:45 **SPINAL CORD REGENERATION IN *XENOPUS LAEVIS* FROGS IN VIVO AND IN VITRO.**
BEATTIE, Michael S., NORRIS, David L., and BRESNAHAN, Jacqueline C. Depts. of Surgery and of Cell Biology, Neurobiology, and Anatomy. The Ohio State University, 333 W. 10th Ave., Columbus, OH 43210.

Some non-mammalian vertebrates exhibit the ability to regenerate axonal connections in the central nervous system (CNS), an ability which is severely retarded in mammals. The African clawed frog, *Xenopus* can regenerate visual pathways even as an adult. Spinal cord regeneration, however, occurs only prior to metamorphosis, although some reorganization of neural connections after lesions, comparable to that seen in some mammalian systems, seems to occur. This presentation will discuss the use of *Xenopus* as a model for the study of mechanisms of growth and regeneration in the CNS, and the possible role of thyroid hormone in metamorphosis and CNS growth and cell death. Data from intact animals will be compared to data from studies of CNS explant cultures in defined medium. (Supported by NS-10165 and OSU Dept. of Surgery MRDF)

10:15 **AN EXPERIMENTAL APPROACH TO MULTIPLE SCLEROSIS THERAPY.** Caroline C. Whitacre.
Department of Medical Microbiology and Immunology, The Ohio State University, 5072 Graves Hall, 333 West Tenth Avenue, Columbus, OH 43210.

Experimental autoimmune encephalomyelitis (EAE) is a T cell-mediated autoimmune disease of the central nervous system (CNS), which is used as a model system for study of the human disease, multiple sclerosis (MS). A single injection of myelin basic protein (MBP) and adjuvant in Lewis rats results in a monophasic disease in which CD4+ T cells directed against MBP cause clinical paralytic signs and CNS perivascular infiltrates. We have recently reported that the oral administration of MBP to Lewis rats prior to EAE induction results in suppression of clinical neurologic signs, decreased CNS histopathologic changes, suppression of the antigen-specific lymphocyte proliferative response, and suppression of serum antibody levels. We have focused on the mechanism of disease suppression following the oral introduction of MBP. Since the orally induced tolerance is not transferrable with lymphoid cells, not abrogated by cyclophosphamide treatment, and not demonstrable in cell mixing studies, we have ruled out the participation of suppressor T cells. Thus three possibilities remain: clonal deletion of MBP-reactive lymphocytes, clonal anergy, or altered migration patterns. Because mRNA levels for the MBP-specific T cell receptor are reduced in tolerized rats and tolerance at the B cell level can be reversed by T cell-derived lymphokines, we favor a clonal anergy mechanism. Establishment of a long-term anergic state or deletion of destructive myelin-reactive lymphocytes in multiple sclerosis would be more desirable than currently used broad spectrum immunosuppressive drugs. (Supported by USPHS grants NS 23561 and MH 44660)

11:00 **NEUROIMMUNE REGULATION DURING VIRAL INFECTION.** John F. Sheridan, Departments of Oral Biology, Medical Microbiology and Immunology, The Ohio State University, Columbus, Ohio 43210.

Stress has been shown to affect a variety of immunological parameters in both animal models and man. However, the health consequences of stress, particularly those pertaining to infectious diseases, are still unclear. The purpose of this study was to assess the effect of restraint-induced stress on the cellular immune response during an experimental viral infection. C57/BL6 mice were infected intranasally with influenza A/PR8 virus, and restrained daily for 16 hr from 1 d before infection to 14 d post infection (p.i.). Mice restrained for 8 cycles showed a markedly reduced pattern of cellular infiltration and consolidation in the lung when compared to the non-stressed, infected group. However, mortality due to viral infection was not significantly different between the groups. The effect of restraint on the immune response (IL-2) to PR8 virus was measured 14 d p.i. Responses were depressed when lymphocytes from restrained mice were stimulated in vitro with PR8 virus. Depression of the response correlated with the number of restraint cycles. Although the inflammatory response was reduced during stress, the titer of infectious virus in the lungs was similar to non-restrained controls. The restraint protocol used in this study produced prolonged, elevated levels of plasma corticosterone and increased the tissue concentration of norepinephrine in lymph nodes and thymus. Studies are in progress to determine if these neuroendocrine changes are associated with stressed-induced depression of the IL-2 response to influenza virus.

Nurturing a Vital Economic

Resource:

The Ohio Science Entrepreneur

Arranged by: Gene A. Nelson

Hosted by: Henry L. Hunker

FRIDAY, APRIL 26, 1991

The Ohio State University

Hagerty Hall 160

1775 College Road

1:30 PM

Gene A. Nelson, Presiding

1:30 *Biophysics Company: A Case Study. Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.* Dr. Gene A. Nelson, Symposium Organizer and President, Biophysics Company, 7374 Brookside Parkway, Cleveland, OH 44130-5468

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio.

New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Dr. Nelson will make a short presentation on the challenges that his High-Technology Service Startup (HTSS) is undergoing. Biophysics Company is applying a new class of portable computer that can "read" a user's hand printing on *electronic forms* for data input to existing computer systems. The firm's present focus is on health care data collection.

Dr. Nelson will also function as moderator during the presentations by the three other successful Ohio high-technology firms and by three organizations that assist Ohio scientific entrepreneurs. Question and answer periods are planned for both the panelists and audience.

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

1:50 *"Cause for Concern" Report Summary: Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.* Dr. Herb S. Kleiman, President, Kleiman Associates Inc., 21975 Westchester Road, Shaker Heights, OH 44122

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio. New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Dr. Kleiman, president of Kleiman Associates, has over 25 years of experience in a range of technology-related and industrial activities. He will be reporting on a survey and analysis that his firm prepared on the role of small technology-based firms (STBFs) in Cleveland's industrial reemergence. His report examined if existing conditions in the Greater Cleveland area are supportive to the creation and continuing vigor of STBFs. (No, there are several causes for concern.) Where are the gaps, and how have conditions changed since the report was prepared almost 2 1/2 years ago? (The situation is tougher now.) Dr. Kleiman will also suggest how the STBF entrepreneur can perhaps reduce their difficulties in dealing with these external conditions over which they have no/little control.

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

2:10 *The Success Story of Danninger Medical: Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.* Dr. Edward R. Funk, President, Danninger Medical Technology, Inc., 1145 Chesapeake Avenue, Columbus, OH 43212-1443

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio.

New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Dr. Funk will be discussing success factors involved in several of his enterprises, the first one being founded in 1954. He was awarded a ScD in Metallurgy from Massachusetts Institute of Technology in 1951. He was also an associate professor at OSU in welding engineering for 13 years. He holds several patents. Danninger Medical Technology manufactures post - orthopedic surgery Passive Motion Machines and manufactures surgical implants. He is also founder and president of Funk Metallurgical Corporation, an manufacturer of precision investment castings.

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

2:30 *A Strategic Plan for Ohio. Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.*
Dr. Richard W. Janson, Kent State University, Kent OH, 44242-0001

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio.

New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Dr. Janson is the author of *A Strategic Plan for Ohio*, which is one of the objectives of the OSTC report. The plan is designed to build on existing Ohio Edison programs, which have resulted in the creation of eight research centers. Centers were chosen to augment the comparative advantage of each subregion of Ohio. Research in core technologies of most significance to the firms and universities located near to each center is favored. The Ohio Edison board requires a reasonable chance for world class status. The network includes substantial participation by foreign firms and by universities far from the eight research centers. The strategic development plan should support rapid growth firms and industries of Ohio that are likely to benefit from the R&D in the core technologies defined in the mission statement of each Edison center.

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

3:00 *Steris - A Successful Seed Venture Startup: Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.* Bill R. Sanford, President, Steris Corporation, 72 Corwin Drive, Painesville, OH 44077

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio.

New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Mr. Sanford will be discussing Steris, an Ohio venture capital funded corporation. As an entrepreneur with twenty five years of health care industry experience, Mr. Sanford has been instrumental in starting four businesses prior to his involvement with Steris Corporation. Under his leadership, Steris has progressed in four years from an idea to a fully operational developer, manufacturer, and marketer of sterile processing and infection prevention systems with sales in excess of \$10 million. Steris has been the recipient of two seed development grants from the state of Ohio Edison Program to partially fund research at CWRU and LCCC. Mr. Sanford is a member of the commercialization committee of the Edison BioTechnology Center (EBTC).

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

3:20 *Foster Technology Corporation - A Success Story: Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.* George Foster, President, Foster Technology Corporation, 7700 Rivers Edge Drive, Columbus, OH 43235

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio.

New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Mr. Foster will be presenting a historical view of the dozen or so enterprises that he either founded or assisted in founding over his forty plus year professional career. He will be highlighting lessons from both the successful and not so successful ventures. Trained as an electrical engineer, he also has a hard earned education in economics, finance, and operations. The talk will focus on basic principles such as modes of financing and growth rates. In 1984, he was the SBA Technology Applications Entrepreneur of the Year, receiving the award from President Reagan. In 1985, he received the Albert Sperry Medal from the Instrument Society of America.

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

3:40 *Entrepreneurial Services Division of Ernst & Young: Nurturing a Valuable Economic Resource, the Ohio Scientific Entrepreneur.* G. Michael Horn, Partner and Director of Entrepreneurial Services, Ernst & Young, 10 West Broad Street, 24th Floor, Columbus, OH 43215

A recent report of the OSTC¹ highlights the need for improving the availability of seed venture capital in Ohio.

New high-technology enterprises need multiple seed capital sources from both the public and private sectors. Ohio has derived substantial economic benefits from high-technology. Throughout Ohio, large sums are being spent to create and strengthen high-technology. The Thomas Edison Program is a major contributor toward this end.

Mr. Horn helped to establish the original Entrepreneurial Services Division for Arthur Young in Chicago. Mr. Horn started the "Entrepreneur of the Year" program in Columbus in 1988. He brings over twenty two years of experience in accounting and consulting, with a focus on entrepreneurs. He arrived in Columbus in 1987.

1. *Ohio's Third Century, Meeting the Economic Challenge through Science and Technology* (1990). A report of the Ohio Science and Technology Commission.

4:00 PM PANEL DISCUSSION

Ohio at the Forefront of Materials Research

Arranged by: **Sheikh A.Akbar**

Hosted by: **James L. Marshall**

FRIDAY, APRIL 26, 1991

The Ohio State University

Fontana Laboratory 145

116 W. 19th Avenue

1:15 PM

Sheikh A.Akbar, Presiding

1:30 PM INTRODUCTORY REMARKS

George R. St. Pierre, OSU

1:35

CONDUCTING POLYMERS. Arthur J. Epstein, Department of Physics, Department of Chemistry and Center for Materials Research, The Ohio State University, 4108 Smith Laboratory, 174 W. 18th Avenue, Columbus, Ohio 43210-1106

Polymers have made important advances in replacement of other materials for structural usage. Commercial polymers, however, do not conduct electricity. In the past decade we and others have developed new classes of polymers that have both high strength and are able also to conduct electricity, in some cases nearly as well as copper.

These new types of polymers, especially the polyanilines, will be introduced. A variety of their properties and chemical control will be discussed. Potential commodity and high tech applications, including electrostatic elimination, electrochromics and batteries, sensors, welding of plastics, and optical information storage will be reviewed. The scientific and commercial trends will be discussed.

This research is supported in part by Defense Advanced Research Projects Agency through a contract monitored by the Office of Naval Research.

1:55 CERAMIC COMPOSITES RESEARCH AT NASA LEWIS.
Stanley R. Levine, NASA Lewis Research
Center, Cleveland, OH 44135.

Fiber reinforced ceramic matrix composites are a potentially enabling technology for the next generation of engines for a high speed civil transport aircraft and for more efficient and durable rocket engines. Ceramics research at NASA Lewis is primarily directed toward identification and development of the fibers, interphases, and matrices capable of making the potential real. Fibers research primarily addresses SiC and advanced oxide single crystals. Interphase research is directed toward understanding of interphase requirements and the identification of interphase structures that meet these requirements from the mechanical, thermodynamic, and environmental durability standpoints. Matrix research is aimed at incorporating fiber/interphase systems into composites. Properties such as environmental durability, strength and toughness are maximized within the constraints of fiber durability to the processing environment.

2:15 HIGH-TEMPERATURE STRUCTURAL MATERIALS. Dr. Hamish L. Fraser, Department of Material Science and Engineering, Ohio State University, 143 Fontana Labs, 116 W. 19th Ave., Columbus, OH 43210

2:35 ISSUES IN THE DEVELOPMENT OF STRUCTURAL CERAMIC COMPOSITES. Ronald J. Kerans. The Air Force Materials Laboratory, WRDC/MLLM, Wright-Patterson AFB, OH 45433-6533

The properties of ceramic composites which make them attractive materials for structural applications at high temperatures will be summarized. The key issues which must be addressed by the research and development communities will be discussed with particular attention given to the role of the fiber-matrix interface. Recent work on the measurement and importance of various parameters such as bonding, surface roughness and abrasion will be discussed.

2:55 - 3:20 PM Coffee Break

3:20 CHEMICAL SYNTHESIS OF ELECTRONIC CERAMICS. Patrick K. Gallagher. The Ohio State University, Departments of Chemistry and Materials Science & Engineering, 120 W. 18th Avenue, Columbus, Ohio 43210-1173.

Ceramic technology is changing due to the infusion of chemical approaches to the synthesis of ceramic powders. This is particularly true when new materials and products are being developed. The initial successes have been in the area of electronic ceramics where materials are constantly changing and the improved properties can justify the added developmental costs.

Various approaches to the preparation of ceramic materials starting from solution or metalorganic precursors are summarized. Aspects of both the precursor formation and its conversion to the desired ceramic are described.

3:40 ELECTROCHEMICAL BIOSENSORS. William R. Heineman, Kiamars Hajizadeh, and Louis A. Coury, Jr., Edison Sensor Technology Center, Department of Chemistry, University of Cincinnati, Cincinnati, Ohio 45221-0172.

Water-soluble polymers have been immobilized on graphite electrodes by exposure to gamma radiation. These polymer networks have been investigated as a means of imparting selectivity to electrochemical sensors by means of (i) a specific interaction (hydrophobic, hydrogen bonding, coordination) between the polymer film and the analyte, (ii) restricted diffusion based on molecular size and (iii) immobilization of an enzyme. Sensors for neurotransmitters are based on selective extraction into a poly(N-vinylpyrrolidone) film on graphite electrodes. Sensors for glucose and lactate have been prepared by immobilizing glucose oxidase and lactate oxidase, respectively, in poly(vinylalcohol) on graphite electrodes onto which a layer of platinum has been electrodeposited. Selectivity against ascorbate interference is achieved by electrostatic repulsion with a thin layer of Nafion adjacent to the electrode.

4:00 MICROELECTRONIC FABRICATION IN SENSOR TECHNOLOGY. Chung-Chiun Liu, Electronics Design Center, Case Western Reserve University Cleveland, Ohio 44106.

Microelectronic fabrication technology has been applied to sensor research and development in recent years. Photolithographic reduction, thick and thin film metallization, and chemical and plasma etching, are proven microelectronic

fabrication techniques that can be utilized in the formation of physical, chemical and biological sensors. These technologies can produce an array of identical or different sensors on a relatively small substrate. Sensor elements produced by these techniques are also highly uniform and geometrically well-defined. These sensor element characteristics are very desirable. Furthermore, the sensor elements produced by this approach can lead to the introduction of new sensing principles, and higher degrees of sensitivity and reliability of the device. The technology also has the potential to produce sensors at modest cost.

Microelectronic fabrication technology as well as the material aspects involved will be discussed. Various types of sensors developed by these technologies will be used as examples for discussion.

Rationality Guided by the Invisible Hand: How it works, if it does

Arranged by: Krishnan Namboodiri

Hosted by: Krishnan Namboodiri

FRIDAY, APRIL 26, 1991

The Ohio State University

Bricker Hall 385

190 North Oval Mall

9:00 AM

Krishnan Namboodiri, Presiding

9:00 THE PROBLEM OF NO CHOICE IN RATIONAL CHOICE THEORY: ORGANIZED LABOR AND THE DEMOCRATIC PARTY William Form, Department of Sociology, 300 Bricker Hall, 190 N. Oval Mall, Columbus, Ohio 43210

Despite being the main supporter of the Democratic Party since 1947, organized labor was unable to get Congress to pass key labor legislation even when the Party controlled both the Presidency and Congress. Yet, Labor remained loyal to the Party throughout and did not innovate political strategies. Labor leaders insisted that the most rational choice was not to choose. Can rational choice theory explain Labor's inaction under conditions it faced during this period? Interviews with labor leaders, Democratic Party officials, and other relevant politicals revealed that an emergent turbulent political environment called for innovative strategies. Adversities included: declining union members, new entrants into the liberal-labor coalition, changes in voter mobilization techniques, conservative drift in the major parties, and decline of urban political machines. Although AFL-CIO leaders considered alternative strategies, none were adopted because they would not increase labor's leverage in the Party. Barrier to innovation included: separate political machines of major unions, inability to match Republican innovations in mass-media electioneering, inability to build quid-pro-quo relationships with liberal single-interest lobbies, and unwillingness to risk historic gains in the Democratic party. Apparently, the strategy of minimizing losses can be permanent even in the face of declining rewards and exchanges.

9:20 SOCIAL CAPITAL, HUMAN CAPITAL, AND THE PRODUCTION OF CHILDREN: INSIGHTS FROM THE CHILDREN OF THE NLSY Toby L. Parcel, Dept. of Sociology, 300 Bricker Hall, 190 N. Oval Mall, Columbus, Ohio 43210

James Coleman argues that the social capital embodied in the interaction between parents and children and between the community and children provides an important form of investment that will yield returns in the social and cognitive development of children as they mature. This paper discusses the relationship between the concept of social capital, and the more researched concept of human capital, with particular reference to economists' literature on the production of children. I then describe an ongoing research program studying the effects of parental working conditions and child care arrangements on cognitive and social child outcomes of 3-6 year old children. This program uses data from the National Longitudinal Surveys of Youth (NLSY) derived in 1986 when the children of the NLSY mothers were given a battery of age appropriate developmental assessments. This data resource enables us to combine the advantages of detailed longitudinal maternal data including investments in human capital, on a large

nationally representative sample, with direct child assessments. Findings from this research program will be interpreted within the frameworks suggested by Coleman and human capital economics, and the success of such compared with insights derived from other sociological frameworks. Implications for future research will be derived.

9:40 OPTIMAL ALLOCATION OF PERSONS TO JOBS: MINIMIZING THE LOSS OF EDUCATIONAL RESOURCES
Kazimierz M. Slomczynski, Dept. of Sociology,
300 Bricker Hall, 190 N. Oval Mall, Columbus, Ohio 43210

Human capital theory treats the education of the actual and potential labor force as an investment whose cost burdens individuals and society as a whole. This paper investigates the extent to which such an investment is used efficiently in so far as persons with given amounts of education are matched to jobs with appropriate educational requirements. The purposes of the paper are: (1) to investigate the optimal matching of persons with given educational attainment to jobs with given educational requirements; (2) to derive the formal properties of optimal matching, under distributional constraints; (3) to determine the relationship between the efficiency of the utilization of educational resources and educational inequality among occupational groups. The main theoretical and methodological issues of this paper are considered within the framework of linear programming and other optimization techniques. In order to illustrate the introduced concepts and procedures the data on the U.S. labor force for 1957, '67, '77, and '87 are used. The substantive content of the paper consists of various comparisons of the observed and optimal matching of educational attainments of persons to the educational requirements of their jobs. The main result is that any reallocation from the observed to the optimal matching necessarily increases educational inequality among occupational groups.

10:00 MAKING IT IN AMERICA: ACCOUNTING FOR ETHNIC GROUP SUCCESS Robert M. Jiobu, Dept. of Sociology, 300 Bricker Hall, 190 N. Oval Mall, Columbus, Ohio 43210

It is a truism that some ethnic groups have done better than others, and that the prospects for future success seem dim or bright depending on the group in question. Chicanos, Vietnamese, and Puerto Ricans exemplify groups that have not achieved substantial upward mobility while Japanese Americans, American Jews, and the Irish exemplify groups that have been relatively successful (the term success is being operationalized as achieving socioeconomic standing comparable to the white majority). Clearly, factors such as skin color and language play roles in accounting for success, but they are also clearly insufficient. Japanese and Jews have little in common culturally and physiologically, Japanese are easily identifiable as Asian. Although other possible causal factors could be mentioned, it is safe to say that no comprehensive theory of ethnic group success has yet been offered. The present paper attempts to explore one facet of how ethnic success might be achieved. It compares the cases of Japanese and Jewish Americans--two groups that are widely recognized as having been socioeconomically successful. The comparison is enlightened by a systematic application of rational choice theory to the issue of how ethnic group trust is formed, maintained, and used.

Scientific Basis of Service Delivery for Older Adults

Arranged by: Robert Gandee

Hosted by: James C. Naylor

FRIDAY, APRIL 26, 1991

The Ohio State University

Townshend Hall 250

1885 Neil Avenue Mall

1:30 PM

Robert Gandee, Presiding

1:30 SCIENCE IN THE SERVICE OF OLDER ADULTS: BRIDGING THE GAP: Robert Deitchman, Department of Social Work, University of Akron, Akron, Ohio 44325.

Successful solutions to many of the problems facing the older adult population centers around the ability to use the scientific information currently available in a variety of areas. Currently, there are many, disciplines involved in studying the problems related to neighborhoods, consumer product liability, housing needs, employment, assessment and diagnosis of potential client problems, discrimination and race relations, cultural effects, public matters of assistance. Scientific data is also available concerning the best way to establish formal and informal networks to most effectively deal with these concerns. In addition there is a need to deal with stress related "data shock". "Data shock" occurring when the seniors try to assimilate relevant scientific information available. This paper is concerned with the need to bridge the gap between the availability of the information, its possible use by the seniors in understanding their environment and learning how to deal with the resultant post traumatic related illness related to "data shock".

2:00 SOLVING OLDER ADULTS' MEDIGAP INSURANCE PROBLEMS THROUGH SKILLED MATRIX TRAINING

Sandra Caramela-Miller, Dept. of Psychology and Dr. Ralph F. Darr, Dept. of Educational Foundations, The University of Akron, Akron, Ohio 44325

A critical problem occurs when older adults purchase Medigap supplemental insurance to cover Medicare's gaps, since the elderly generally fail to understand the basics of these gaps. If consumers are better informed, they may be able to better evaluate and choose an adequate policy fitting their individual needs. Further, if older adults can be taught strategies through guided training, to help them deal with the enormous amounts of information in the policies, and, if this information can be presented in an organized form, such as a matrix, their processing of the information may be facilitated. This should lead to more intelligent problem solving behavior. An applied cognitive aging training approach will be discussed in an information processing framework, with particular emphasis on expert-novice differences, and transfer of training. The field environment selected for this study is a demonstration counseling project in Summit County, Ohio, that has been operational since May of 1990. This project was borne out of the cooperative efforts of the Ohio Attorney General's Office, an appointed Insurance Advisory Committee, composed of the area's major hospitals and senior citizen centers, and the Institute for Life-Span Development and Gerontology at The University of Akron.

2:15 FUNCTIONAL MOTOR SKILL MEASUREMENTS IN OLDER ADULTS: IMPLICATIONS FOR HOME CARE SERVICE DELIVERY. R. Gandee, H. Knierim and D. Fox, Slippery Rock University, Slippery Rock, PA 16057.

The acquisition and maintenance of Motor Skills are critical to the preservation of independent living of 60+ years old. The motor skills of 219 older adults attending elder hostels (EH) at Slippery Rock University and Senior Centers (SC) in Butler County Pennsylvania were compared. Means and standard deviations for the selected motor skills of the respective EH and SC are: Abdominal strength (AS), $1.72 \pm .72$, 1.5 ± 0.87 ; Grip strength (GS) 31.26 ± 12.88 , 21.86 ± 10.87 Kg.*; Penny pick up (PP) 16.2 ± 3.89 , 93 ± 3.17 pennies*; Card sort (CS) 28.98 ± 6.59 , 27.48 ± 7.16 cards; Flexibility (FX) 24.36 ± 5.06 , 23.64 ± 4.53 inches; Agility (AG) 11.25 ± 2.06 , 13.34 ± 3.61 sec.*; Arm curl (AC) 28.56 ± 6.03 , 20.61 ± 8.05 reps*; Distance walk (DW) $33.84.17 \pm 2269.37$, 4454.68 ± 1625.38 sec.*. Except for CS, AS, FX, all comparisons between EH and SC were significantly different. These data have implications for therapist and administrators conducting home care programs for aging adults. *Alpha level = .05.

2:30 THE NEED FOR OUTCOME RATHER THAN PROCESS EVALUATIONS. Isadore Newman, NEUCCOM and College of Education, University of Akron, and Carole Newman, College of Education University of Akron, Akron, Ohio 44325.

The purpose of this presentation is to discuss the value and need for evaluation of programs for the elderly that emphasize outcome rather than process. Most accreditation associations, such as the Joint Committee on the Accreditation of Health Care

Organizations (JCAHO), tend to emphasize process evaluations. It is the position of this paper that a change is needed which would place the emphasis on outcome rather than process. The authors will identify how outcome evaluations can be developed. We will take into consideration need assessment procedures and multiple stake-holder concerns into the design of the evaluation. Also included will be a discussion of the value of considering evaluation design from the perspective of a learning and motivational approach rather than one that is punitive and judgemental.

Social Psychology Lecture

Arranged by: James C. Naylor

Hosted by: James C. Naylor

FRIDAY, APRIL 26, 1991

The Ohio State University

University Hall 014

230 North Oval Mall

3:30 PM

James C. Naylor, Presiding

3:30 SOCIAL PSYCHOLOGY LECTURE. Dr. Stanley Schachter, Columbia University

Teaching Problem Solving in Science

Arranged by: Clifford L. Schrader

Hosted by: Victor J. Mayer

SATURDAY, APRIL 27, 1991

The Ohio State University

University Hall 043

230 North Oval Mall

2:30 PM

Clifford L. Schrader, Presiding

2:30 PRODUCING POWERFUL PROBLEM SOLVING IN CHEMISTRY

Tom Adkins, Ph.D.
1165 Broadview Rd.
Tallmadge, Oh. 44278

Problem solving in chemistry can be very demanding for the teacher of many students. An Apple IIe computer program, written in Apple Soft Basic, is used by the student to check the analysis of an experiment in which Epsom salts is partially decomposed to find the amount of the water of hydration in the crystal.

The use of the computer aids the student to successfully complete the data analysis, and then the print out provided is attached to the laboratory write-up sheet. The program saves countless hours for the teacher, freeing the instructor to use this time more wisely. The experimental results include the empirical formula for the hydrate used, and both experimental and percentage error for the exercise.

3:00 USING SIMULATION GAMES FOR BIOTECHNOLOGY ISSUES. Toni L. Miller, Springfield High School, 2966 Sanitarium Rd., Akron Ohio 44312

Simulations are role-playing exercises in which students represent a group of decision-makers who are to give recommendations in the area of genetic engineering, cloning, breeding and other biotechnologies. The simulation consists of two stages: 1) fact-finding in which students do re-

search pertinent to their role and 2) group-decision-making, in which group members participate in debates over which course of action to recommend. Simulations accomplish many goals of STS education: 1) group work, 2) information processing, 3) values processing, 4) exposure to biotechnology issues, 5) problem-solving and decision-making experience. It also provides in-depth focus on a particular body of knowledge as well as active rather than passive learning. Both of these techniques are proven to maximize retention and understanding. Samples of simulations will be shown and distributed to session participants.

3:30 COMMUNITY AND CITIZEN PROBLEM SOLVING. Ed Escudero, Summit Country Day School 2161 Grandin Rd., Cincinnati, OH 45208

4:00 PROBLEM SOLVING USING RESEARCH INVESTIGATIONS
Connie S. Hubbard
Minerva High School
501 Ameda Ave.
Minerva, OH 44657

When a student begins an experimental research investigation, he or she must solve several problems during the process such as selecting a suitable area to investigate, developing a hypothesis, designing an experimental situation that will adequately test the hypothesis, obtaining acceptable data from the experiments and, finally, analyzing and interpreting the information obtained as it pertains to the hypothesis in question.

The greatest obstacle to this type of work is the lack of confidence on the part of the student who feels uneasy about this type of endeavor. For the teacher the biggest problem is one of time management. Done effectively, experimental research investigations offer a tremendous opportunity for learning for both the teacher and student.

The Rising Caspian Sea: Observations During a 1990 EARTHWATCH Expedition

Arranged by: David M. Weaner

Hosted by: Victor J. Mayer

SATURDAY, APRIL 27, 1991

The Ohio State University

University Hall 038

230 North Oval Mall

2:00 PM

David M. Weaner, Presiding

2:00 THE RISING CASPIAN SEA: OBSERVATIONS DURING A 1990 EARTHWATCH EXPEDITION. David M. Weaner, Westerville North HS, 950 County Line Road, Westerville, OH 43081.

The objective of this project was to document coastal geomorphic and sedimentologic response to rapid rates of sea-level rise on the Caspian Sea in order to better define corrective and mitigating action on the part of society should sea-level rise accelerate on a global scale. During the first field season, August 12-Sept. 5, 1990, the team conducted a reconnaissance survey of three north and west basin islands in the Caspian Sea to evaluate the current geomorphic, sedimentologic, and shallow stratigraphic framework. This involved two principal efforts: establishing an initial survey grid and reference system, tied into the local leveling datum (benchmarks) for return surveys in future years; and classifying the 1990 coastal sedimentary environments through sampling, aerial reconnaissance, shallow coring, and geomorphic analysis. Surveying entailed three groups, two onshore groups conducting transect surveys across the salient coastal environments to the open coast, and an offshore group with a fathometer onboard a shallow craft extending the survey transects to water depths of between 5m to 10m. The onshore party completed as many parallel transects as possible each day, all the while sampling the surficial sediments and classifying environments. Various levels of equipment intensive activities were possible, including gouge auger coring of littoral environments, subbottom acoustic profiling of offshore regions, and water column sampling for suspended sediment. Funded in part by a grant from TRW Inc.

Use of Animals in Education and Student Research

Arranged by: J. Fredrick Cornhill

Hosted by: Victor J. Mayer

FRIDAY, APRIL 26, 1991

The Ohio State University

Dreese Hall 771

2015 Neil Avenue

9:00 AM

J. Fredrick Cornhill, Presiding

9:00 ANIMALS IN THE PRE-COLLEGE CLASSROOM: CONVERSATIONS BETWEEN SCIENTISTS AND SCIENCE EDUCATORS. J. F. Cornhill, M. D. Snyder, N. K. Hinton, Biomedical Engineering, 270 Bevis Hall, 1080 Carmack, Ohio State Univ., Columbus, OH 43210; V. J. Mayer, College of Education, 1945 N. High St., Ohio State Univ., Columbus, OH 43210; Richard Benz, Wickliffe High School, 204 Water St., Chardon, OH 44024.

While the use of animals in education and student research is considered by many to be appropriate and effective pedagogy, such use is increasingly under scrutiny. This symposium will describe an intensive program conducted in Ohio for pre- and inservice teachers (K-12) on the humane care and effective use of animals in education and student research. Dr. Cornhill will provide the rationale behind the Animals in the Classroom program. Dr. Mayer will review the relationship between societal concerns about the use of animals in education and recent developments in science curricula. The teacher's perspective on how these issues impact daily instruction will be presented by Mr. Benz. The content of the Animals in the Classroom project will be summarized by Dr. Snyder, and Dr. Hinton will report on the project's impact on 564 participants. Presenters will describe how the scientific community and science educators can work together to provide humane, educationally sound, and scientifically responsible instruction in life science.

Vector-borne Diseases in Ohio

Arranged by: Charles I. Pretzman

Hosted by: James S. King

FRIDAY, APRIL 26, 1991

The Ohio State University

Murray Hall Conference Room

1571 Perry St.

1:30 PM

Charles I. Pretzman, Presiding

1:30 TICK BORNE DISEASE IN OHIO
Charles Pretzman, Vector Borne Disease Unit,
Ohio Department of Health, POB 2568, Col. Ohio
43216-2568.

Rocky Mountain Spotted Fever is a tick borne disease of significant public health concern in Ohio. It is a disease characterized by sudden onset of fever and headache following the bite of an infected tick. Although treatable by antibiotics, the fatality rate often approaches 4%. The etiologic agent is a small intracellular gram negative bacteria, *Rickettsia rickettsii*. The tick vector in Ohio is the dog tick, *Dermacentor variabilis*. The infection rate in Ohio dog ticks is low, less than 1%, but at least two dozen cases of spotted fever are reported each year in Ohio.

Lyme disease, transmitted by the deer tick, *Ixodes dammini*, is presently not a problem in Ohio due to the absence of established populations of the tick vector. A spirochete, *Borrelia burgdorferi*, is the etiologic agent. Unlike spotted fever, the symptoms of Lyme disease are vague, and laboratory tests provide little useful information to the physician. The number of reported cases of Lyme disease in Ohio has been on the rise in the past five years with about 100 cases reported in 1990. Confirmed cases of Lyme disease in Ohio are from travellers to Lyme endemic areas of the country.

2:15 EPIDEMIOLOGY OF MOSQUITO-BORNE ENCEPHALITIS IN OHIO. Richard L. Berry, Ph.D., Vector-borne Disease Unit, Ohio Department of Health, P.O.Box 2568, Columbus, Ohio 43216-2568.

The major mosquito-borne encephalitides occurring in Ohio are La Crosse encephalitis and St. Louis encephalitis. The following topics will be discussed:

1) The basic epidemiology of these arboviral zoonoses, with special reference to Ohio;

and

2) The mission and program of the Ohio Department of Health in surveillance, prevention, and control of these diseases.

2:45 VETERINARY DISEASES, SPOTTED FEVER. Joseph J. Kowalski DVM, Veterinarian Clinic Sciences, 48 Veterinarian Hospital, 1935 Coffey Rd., Columbus, OH 43210.

3:15 TICK AND MOSQUITO SURVEILLANCE AND CONTROL AT THE LOCAL LEVEL R.S. By Harry D. Ballinger R.S. Director of Environmental Health, Newark City Health Department, 40 W. Main St., Newark, OH, 43055-5596.

In cooperation with the Ohio Department of Health, Vector-Borne Disease Unit, the Newark City Health Dept. conducts a mosquito and tick control program. The mosquito program consists of: 1. Public education 2. Physical elimination 3. Chemical control of breeding sites through growth inhibitors and larvicides 5. Adulticiding. Tick control, Rocky Mountain Spotted Fever and Lyme Disease information is supplied to residents of the Newark City Health District through public information (i.e. public seminars, media and schools). In addition, the department makes available kits for tick submissions, to the Vector Borne Disease Unit, recovered from the general public. The Newark City Health Dept., through the nuisance abatement program, institutes physical control of potential tick breeding sites based on our records of tick submissions.

Elimination of the vectors of mosquito borne diseases (LaCrosse and St. Louis encephalitis) and tick borne (Rocky Mountain Spotted Fever) diseases is ideal though unrealistic. Therefore our goal is to survey and evaluate existing situations and to minimize the conditions necessary for the spread of disease vectors. Although the program is conducted by the Newark City Health District, in times of emergency or natural disaster, other agencies assist.

3:30 THE DISTRIBUTION OF TICKS OF PUBLIC HEALTH IMPORTANCE IN THE STATE OF OHIO
By Nancy Daugherty, Microbiologist
Ohio Department of Health, Vector Borne Disease Unit, POB 2568, Col., OH 43216-2568

The Ohio Department of Health has a tick send in program. The counties with the greatest number of ticks that are commonly encountered by people is known. The American dog tick *Dermacentor variabilis*, the vector of Rocky Mountain Spotted Fever (RMSF), is the tick most commonly encountered by people and accounts for over 97% of ticks received at the ODH.

Areas with the greatest number of ticks include Lucas Co. near Toledo, Hamilton and Clermont counties near Cincinnati, and Franklin and Delaware counties near Columbus. Other areas have few or no ticks. This includes Cuyahoga, Geauga and Ashtabula counties near Cleveland.

Knowledge of tick distribution is useful in defining the risk of tickborne disease and has helped in surveys for ticks other than the American dog tick. The deer tick, *Ixodes dammini* is the vector of Lyme disease. Only three deer ticks have ever been found in Ohio. These deer ticks were found in areas that had large numbers of dog ticks. There is evidence that certain areas are more likely to become established with deer ticks.

3:45 MOLECULAR BIOLOGY OF IXODID TICK SALIVARY GLANDS: ITS IMPACT ON DISEASE TRANSMISSION. Deborah C. Jaworski¹, Mark T. Muller² and Glen R. Needham¹. ¹Acarology Laboratory, Department of Entomology, and Department of Molecular Genetics². The Ohio State University, 484 West 12th Avenue, Columbus, OH 43210.

Ixodid ticks feed on their hosts for days and even weeks providing the opportunity for transmission of tick typhus and even Lyme disease. During this interval, gene expression in tick salivary glands is greatly increased and proteins are secreted to maintain the feeding lesion. Some of these proteins stimulate host immunity to tick feeding. In this study, we report the cloning and sequencing (ExoMeth sequencing system) of a cDNA that corresponds to one of these salivary gland antigens. Homologies to existing sequence data will be presented. Additionally, New Zealand White rabbits injected with the corresponding fusion protein exhibited intriguing immune responses upon tick challenge. The potential of immunizing hosts with such tick salivary gland proteins to disrupt disease transmission during feeding will be discussed.

4:00 GENETIC RELATEDNESS OF TICK BORNE PATHOGENS AS SHOWN BY DNA FINGERPRINTING AND GENE SEQUENCING
Charles Pretzman, Vector-Borne Disease Unit
Ohio Department of Health, P.O.Box 2568, Col., OH 43216

Application of the Polymerase Chain Reaction to the detection and identification of tick borne pathogens by DNA sequence homologies in the 16s ribosomal RNA gene has revealed a spotted fever group rickettsia, *R.montana*, in the deer tick, *Ixodes dammini*. This finding raises the possibility of the deer tick transmitting spotted fever as well as Lyme disease. Phylogenetic relationships among the rickettsia as determined by 16s rRNA sequences indicate that *R.montana* has only recently diverged from the pathogen, *R.rickettsii*. Analysis of a 16s rRNA sequence from a spirochete in deer ticks collected in New York has revealed a new spirochete most closely related to the members of the genus *Oceanospirillum*. Characteristics such as pathogenicity for this new spirochete have not been defined and its importance remains to be determined. DNA fingerprinting by anonymous primer PCR of various geographical isolates of the Lyme disease spirochete, *Borrelia burgdorferi* has revealed distinct intraspecies variation which may be useful epidemiologically.

4:45 PM Film: TICK-TALK
Various Authors
OSU/ODH/Columbus Zoo

5:00 PM ODH VECTOR-BORNE DISEASE UNIT LABORATORY TOUR

8:30 EFFECTS OF A CAREER AWARENESS PROGRAM FOR WOMEN.
Maureen B. Gonzalez, Program Director, Women in Engineering, The University of Dayton, 300 College Park Dayton, OH 45469-0219

Since 1974 The University of Dayton has offered a career-awareness, summer program for high school women entitled Women in Engineering. This presentation examines the results of a 15-year follow-up study on the more than 1000 women who participated. This study shows the positive impact a high school program has had on women's decisions to enter engineering and how this intervention program influenced their future plans and specific majors. This research study indicates that 70% of past participants have become engineers; 23% have pursued a master's degree in engineering or science; and 3% have pursued a Ph.D. in science or engineering. To attract women, engineering must be perceived as a career that produces both personal and professional rewards. We found that women who attended this career-awareness program are very pleased with their personal and professional accomplishments.

9:00 THE VOICE OF YOUNG WOMEN PURSUING ENGINEERING.
Judith W. McDonald, Director, Women in Engineering, 2070 Neil Ave., Columbus, OH 43210-1275

Women who choose to study engineering almost always have been exceptional high school students - rarely have they been average. They choose to study engineering because they are good at math and science. Seldom do they have knowledge of what practicing engineers actually do on a daily basis. Once in engineering school, many become discouraged and see themselves as failures if they are unable to maintain the same level of academic success as they did in high school. Presented in this session will be examples and anecdotal stories of how undergraduate women studying engineering feel and what high school women who are about to enter the world of engineering say.

9:30 WOMEN IN ENGINEERING: PAST, PRESENT, FUTURE.
William LeBold, Ph.D., Director of Education Research and Information Systems, Department of Freshman Engineering, Engineering Administration Building, Purdue University, West Lafayette, IN 47907

Past engineering and development studies performed at Purdue University compare the role women had 30 years ago with today's women and her role in the technological world. This presentation will (1) examine National Studies of Women in Engineering, (2) discuss the newly developed WEPAN, Women in Engineering Program Advocates Network, and (3) forecast for the future, considering growth of women in science and engineering.

10:30 AM PANEL OF WOMEN SCIENTISTS AND ENGINEERS
Moderated by Dr. Lois A. Cook
Chairperson of WISEMCO - The Women in Science, Engineering and Mathematics Consortium of Ohio (The Ohio Academy of Science); and Assistant Dean Emeritus of Science and Engineering, Wright State University.

Panelists will include women scientists and engineers working in various companies in Ohio.

Women in Science & Engineering

Arranged by: Maureen Gonzalez

Hosted by: Judith W. McDonald

FRIDAY, APRIL 26, 1991

The Ohio State University

Battelle Memorial Institute

Conference Room G

505 King Avenue

8:30 AM

Maureen Gonzalez, Presiding
