Centennial Symposia Abstracts

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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

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 FLRISTIC 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 present 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 25.3% in 1932, and 29.6% by 1971. The percentage is higher in unglaciated Ohio. A total of 2077 (of 2077) species and 53 genera listed by Kellerman and Werner in their Catalog of Vascular Plants of Ohio are known in the various parts of the current 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% n native and 0.5% from Africa. With regard to stability of the flora, 11.8% were weedy, 38.2% occasionally escaped, and 29.3% thoroughly naturalized. Noteworthy among weeds then were Allaria officinalis, Lonicera xylosteum, and Lotus corniculatus, 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 44112, 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 recovery. Four taxa that had not been observed at the bog since the 1980's were recorded in 1990. When compared with the flora of three other bogs of northeast Ohio, the Camden bog showed an average similarity of 73%, which is 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 dominant mat, species found in 1990.
At least 300 species of aquatic and wetland vascular plants have been identified from western Lake Erie at 35 study localities. This floristic diversity exists primarily because of the natural changing water levels over various substrates creating varied habitats which are available for plant colonization and for continued natural and human-induced changes to which these habitats are subjected. Drastic changes have occurred in the composition of this flora during the past century. Since Pieters (1901), 52% of 630 species are no longer present. Of the total 28 native submerged species as reported by Nye (1989) for the region, 13 (46%) have disappeared. Of 28 showy, native perennial emergents reported by Nye (1989), 18 (64%) 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.

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 waterways. 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 wetlands 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 submerged 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, Bidentis connata var. angustifolia, and Hieracium reniformis. Hibiscus laevis, Hibiscus moscheutos, Ipomoea purpurea, and Salsola kali are characteristic of canal habitats. 37 species are characteristic of mesic habitats. 37 species are characteristic of wetlands. 54 species are dicots; 37, monocots; 6, pteridophytes. There is no strong pattern of colonization by native species, although some species appear to have narrowed their range and distribution, whereas others have increased their distribution. A Markovian model of species distribution in the Ohio landscape over the past 200 years is being developed to explore the relationships among such physical parameters as soils, physiography and geologic setting, as well as competition by non-native species. 95% of the species that have disappeared have narrow ecological tolerances and are northern in distribution.

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 species as it relates to Riddle’s (1834), Sullivan’s (1840), Selby & Craig’s (1890), and Selby’s (1970) treatments of the county’s vascular flora. Respectively, the percentages of non-indigenous species are 15% (84 of 543), 12% (77 of 659), 18% (172 of 974), and 16.1% (194 of 1142). The field and herbarium surveys of the county’s vascular flora (1988-1989) are discussed along with the actual progress being made to document gains and losses, as represented within the collection, to the extent, 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 post-1940 records:

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

Arranged by: Joseph R. Steiger
Hosted by: Robert L. Vettees
FRIDAY, APRIL 26, 1991
The Ohio State University
Kottman Hall Williard Auditorium
202 Coffey Road
8:45 AM
Joseph R. Steiger, Presiding

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. 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 provided for nearly every land use from waste recycling to conservation. Utilization of soil surveys has expanded with the pace of land development in Ohio. Legislation now mandates use of soil data as part of farmland appraisal, prime farmland protection, wetland protection.

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 its sustenance and well-being. There will be a strong tendency in the future to view resource-related problems more holistically. Pedologists must adapt to this holistic paradigm since genetic and environmental problems and management needs will integrate across the discipline boundaries of pedology, geology, hydrology, atmospherics 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 resource base. Pedologists will have a major role to play, but we will be left with only minor parts if we try to play it alone.
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 "clayey 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 research has exposed the presence of an amorphous aluminum silicate 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 THROUGH THE PAST CENTURY, C.L. Post, USDA-SCS (retired), Lincoln, NE 68508

Soil correlation is concerned with the definition, naming, and classifying of the larger features in a soil survey area. 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 give 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 in every category 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.


In 1935, a site near Coshocton, Ohio was selected by the U.S. Dept. of Agriculture for the study of hydrology and 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. Kohne, F.R. Drebehlis and C.R. Hall mapped the area on a physiographic base at 3:4" and printed in 1-minute quadrangle sheets with 5' contour intervals. Small watersheds were mapped at a scale of 1" = 100', with 2' or 5' contour intervals. 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 1940 by C.E. Redmond and published as a 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 in the uplands and valleys of special hydrologic studies. The station was mapped again in 1989 during the modern soil survey of Coshocton County. The extreme detail of this survey 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 productivity and soil science to predict the relative cropland value of different soils. Over the years, requests for information have driven soil scientists to interpret soils for many other uses besides land use. This has led to the development of a soil interpretation system based on a much more extensive data base than the soil survey. Soil interpretations for an increasing number of uses have been developed. Our knowledge of soil characteristics has been increased by soil scientists, increased soil surveying, and laboratory testing of soil. Observations of soils have been made to document their response to different land uses. Soil surveys have been conducted in each of Ohio's 88 counties.

11:00 CHANGES IN SOIL PARENT MATERIAL CONCEPTS IN OHIO. George H. 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 Eolian (loess), which is composed of windblown particles ranging in size from silt to fine sand, and fluvial sediments, materials deposited 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 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 colluvial deposits. Soil scientists 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 colluviation 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. Everett Jr., J.B. Ritchie, Jr., and K.L. Powell, Agronomy Department, Ohio State University, Columbus, OH 43210

Ohio's organic soils include peatlands, upland organic soils and wetland organic soils. Peatlands are found in a small percentage of Ohio's land area, but they are of great importance in providing water, wildlife habitat, and as carbon sinks. Upland organic soils are found in the northern part of the state and are important for agriculture, forestry, and wildlife habitat. Wetland organic soils are found in the southern part of the state and are important for water quality, wildlife habitat, and as carbon sinks.

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

Refinements in mapping of soils in Ohio had three distinct stages. The earliest landform surveys prior to 1930 were based on a limited scale of 1:62500 scale on the original USGS topographic maps. The sampling of soils was done on a reconnaissance basis. For the Ohio farms and fields. These surveys were completed prior to 1900. The first survey of Ohio was completed in 1932. The mapping of Ohio's soils was completed in 1907 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 >5 cm-a thickness sufficient to qualify them as Hicetosols in current terminology. By 1913 a reconnaissance soil survey of the state and at least one county soil survey had been completed in every county. 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 organic soils sampled, at least 14,000 ha. (35,000 acres) of organic soils (Hicetosols) with thicknesses greater than 40 cm remained -a reduction of 57 percent, due mainly to subsidence resulting from drying, drainage, and fill. With loss rates ranging from 0.4 to 7.5 cm a year, the life expectancy of many of the state's organic soils is indeed finite. Many areas now mapped as Hicetosols will, in time, fail to meet the 40 cm minimum thickness and will shift to Histosols.

12:10 CHANCES IN SOIL PARENT MATERIAL CONCEPTS IN OHIO. George H. Hall, Agronomy Department, The Ohio State University, 2021 Coffey Rd., Columbus, Ohio 43210

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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
2021 Coffey Road
1:30 PM
Mohan K. Wali, Presiding

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 Thomas, 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, palynology 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 60 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, saddled 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. Truax 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 beech 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 the future of our 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 synchrony of the North American and European climate change records; the ecological meaning of the documented changes through time in the palynological record.

4:10 CONTRIBUTIONS OF PAUL B. SEARS TO WILDLIFE MANAGEMENT. Thomas W. Townsend. School of Natural Resources, 210 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 sound 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
Seurs' emphasis is not so much on the natural world as it is on the demands of nature on human 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. Kolatukudy, The Ohio State Biotechnology Center, 1000 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 polymer of the cuticle. Plant components trigger the transcriptional response of the fungal cutinase gene. Transformation of Fusarium solani pisi with constructs containing hygrokinzyme resistance gene driven by a Cochliobolusmiuromycle promoter and chloramphenicol acetyl transferase driven by DNA from the 5'-flanking region of cutinase gene maintained 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 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, Tililang Deng, Christopher Harendza, Dawei Li and Kathy Osborne. 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. Crimino 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 nucleotide 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.
Thus expression of the a subunit carrying mutations which alter specific mutagenesis, the cardiac glycoside binding site on the a transgenie mouse assays, we have identified regions of the a3 subunits exist. Utilizing transfection into cultured cells and nutrients and ions into the cell. The enzyme is composed of two drives many transport processes + the function of excitable tissues such as brain and muscle and responsible for pumping Na out of the cell and K+ responsible for pumping Na into the cell. Jerry B Lingrel, James Van Huysse, Patrick Sehultheis, Bhavani Bethesda Avenue, Cincinnati, Ohio 45267-0524

The Na,K-ATPase is an integral membrane protein which is related to growth-related biological activities, the following experimental approach was used: (i) gene mutations which generates bGH analogs; (ii) in vitro expression analyses of the murine bGH gene in normal and transformed cell lines; (iii) mouse embryonic liver and hematopoietic cells expressing RNA containing sequences of wild-type and bGH analogs. In 1961, Jacob and Monod postulated that a repressor molecule in E. coli regulates expression of a set of genes including the lac genes encoding galactokinase and 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 sequence (lacO). 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 lac 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 lac 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 tumorogenesis. Supported by NIH grant ES05204.

A genetic transcriptional regulatory element designed to show the tissue tropism of the Moloney murine leukemia virus (MuLV) directing expression of RNA sequences complementary to the packaging sequences of the retrovirus MuLV was constructed and introduced into stable cell lines and transgenic mice. The anti-sense expressing cell lines when infected with native virus were unable to produce active virus but yielded empty capsids devoid of viral genomic RNA. The anti-sense expression in these mice was shown to produce the appropriate RNA complementary to the MuLV packaging sequences within their lymphocytes. When challenged with active MuLV at high dosage none of these anti-sense transgenic mice developed leukemia or demonstrated multiple signs of the development of the disease by 14 weeks of age. Blind control non-transgenic littermates infected with the leukemia virus showed a high percentage of leukemia and demonstrated multiple signs of the development of the disease in these animals not yet leukemia. 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.

In 1961, Jacob and Monod postulated that a repressor molecule in E. coli regulates expression of a set of genes including the lac genes encoding galactokinase and 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 sequence (lacO). 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 lac 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 lac 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 tumorogenesis. Supported by NIH grant ES05204.

1:30 Na,K-ATPase: STRUCTURE-FUNCTION ANALYSIS AND EXPRESSION OF THE SUBUNIT GENES

Jerry B Lingrel, James Van Huysse, Patrick Sehultheis, 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 electrochemical 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 involving the translocation of sugars 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 of cultured cells, our transgenic mouse assays, we have identified regions of the α subunit which are involved in regulation. Utilizing site-specific mutagenesis, the cardiac glycoside binding site on the α subunit has been identified. These studies were designed to test the hypothesis 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 STAVEBEZER, Craig Richmond, Hong Chen, Cuong Zheng and Glennes Colmenares, Department of Molecular Genetics, Biochemistry and Microbiology, University of Cincinnati College of Medicine, 231 Bethesda Avenue, Cincinnati, OH 45267-0524

The retroviral onconeogene, 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 and murine embryonic stem cells, and includes its activation of the muscle-regulatory genes, MyoD and myogenin. Sequence comparisons reveal 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 mutations 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 MyoD and myogenin. The role of ski in these diverse processes is likely mediated through its ability to bind two unrelated RNA 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, Dep. of Zoology, Molecular and Cellular Biology Program and Edison 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 mutations which generates bGH analogs; (ii) in vitro expression analyses of the murine bGH gene in normal and transformed cell lines; (iii) mouse embryonic liver and hematopoietic cells expressing RNA containing sequences 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 asparagine. The plasmid pBGH10A6-M8 was shown to be expressed in, and its protein produced 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-I 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-I 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 DURING RANDOMIZATION FOR 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 human mission planning during prolonged exposure. 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, nanoramic HMD system was designed for management of multiple critically ill patients by a life flight crew. DESIGN. 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. System Hageterance data from real-time, dynamic simulations revealed improved reaction time with use of the closed polygon format (Perlinger 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 Forest, 1990; Perlinger and Chrisman, 1987).

CONCLUSION. Nanometric 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. Hanksins 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 a high rate of recurrent and potentially irreversible outcomes. This disease may affect 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 neurological events primarily precede or follow intracranial pathology. Differences between the diving and aviation environments, bubble reservoirs created, and target organ pathophysiology were contrasted. Recent microscopic provocative Doppler echocardiographic data was compared to prior series of anatominical postmortal findings. Use of 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 sensors 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. Sinamand, M.D., 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: 

$$ \frac{dV}{dt} = \frac{-RT}{P} \times \left( \frac{3 + 2\gamma r - \gamma}{P + 4\gamma r} \right) $$

where: R = gas constant, T = temperature, D = diffusion coefficient, S = Solubility, r = bubble radius, P = ambient pressure, \( \gamma \) = surface tension and \( \gamma \) = dissolved nitrogen tension. P and \( \gamma \) were respectively increased and decreased to simulate hyperbaric treatment. \( \gamma \) was set to zero to simulate oxygen 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 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 AIRCRAFT 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 directed concerning the interplay between these rhythms and aircraft 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 flight. However, there is 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 use of standard sleep patterns for any change to a more common all to forms of flight, not just long haul, that is discussed by aircrews and is responsible for a large impact or potential outcome 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 aircraft. All the 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 orbit 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, maintainability, and work station into a single unit. A high pressure, “thin-sleeve” environment will greatly enhance comfort for 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 simulating posture which will be well tolerated in the zero gravity environment. A comparison is made between the current extravehicular mobility unit and the proposed enclosure with regard 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, the long term cost advantage would be expected.

4:45
HUMAN FACTORS IN THE DEVELOPMENT OF THE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM FOR SPACE STATION
Laurie Anne Aten, M.D., 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 for 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. 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 recycled or reused. Consideration of all the systems on 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 humans can and will use the facilities. The actual subsystems, interactions, and implementations, 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.
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 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.

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

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

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 analysts. This paper contains an application of the aspiration core solution to a model of redistributive regulation.
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 turn-over 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 chemist's 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 pharmacologically active range of concentrations. SCh was extracted as an ion-pair with hexanitrophenylnitramine, dioxymethyl 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 HOPING? Michael Yarchak, 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. Now 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.

3:00 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 program and changes that have been made 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 creating the opportunity to do internships between the 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. Planning for future programs 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. Frickel, Food & Drug Administration, National Forensic Chemistry Center, 1441 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. Hammerle, 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 retaining a depth of 8 inches.
Death was by exsanguination. A 1 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.

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.

For several thousand years of recorded history arsenic has been used both as a poison and for medicinal purposes. Current therapy restricts the use of arsenicals to the treatment of certain tropical parasitic diseases of man. The use of arsenic is very rarely encountered in Ohio as a drug, but more commonly from homicidal, industrial and environmental sources. The symptoms of arsenic poisoning often appear to be those of some naturally occurring disease, gastrointestinal, ocular or cardiovascular, etc. The lecture will illustrate the laboratory investigation of these 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. The basic principles of electrochemical techniques and how they are used in forensic chemistry will be presented. The basic principles of electrochemical techniques and how they are used in forensic chemistry will be presented.

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The Ohio State University
James Y. Tong, Presiding

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 REMEDY
Craig A. Suthlerman, Chief Toxicologist,
Cuyahoga County Coroner’s Office
2121 Aelder Road, Cleveland, OH 44106

Forensic toxicology has long been an area of innovation and hybrid technologies. The Blooded PrintRMDI is a novel hybrid of HPLC (preparation and analysis), fast-sampling UV detection, and a sophisticated data system. The system utilizes artificial intelligence to identify drug residues, detect impurities, and incorporate its contribution into a full service forensic toxicology laboratory. The basic principles of electrochemical techniques and how they are used in forensic chemistry will be presented.

The Ohio State University
James Y. Tong, Presiding

Forensic Chemistry Part II
Arranged by: James Y. Tong
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SATURDAY, APRIL 26, 1991
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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 spectrometry is an excellent tool for investigating the inorganic content of trace evidence. Similarly, the fourier transform infrared spectrometer 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.

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

Inductively Coupled Plasma Emission Spectroscopy (ICP) is an analytical technique which had its theoretical inception about twenty years ago. However, the first commercial instruments were introduced ten years ago, but developments in microcomputer technology have made 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 calibration specimen sizes than conventional atomic absorption spectrometry. With the aid of this technique we are now able to scan, screen and quantitate the amount of any of thirty metals which have been known to be biologically significant levels. The lecture will give a brief review of the development of ICP and an overview of the instrumentation, digests and the chemical and physical characterizations are being planned for future production.

ENVIRONMENTAL GEOLOGIC CONSULTING IN THE NEXT CENTURY
René L. Fernandez, WW Engineering & Science, 6201 Bush 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 consultant. More and more concern was now being expressed about such issues as public health and welfare. 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 involved in compliance and legal issues. He or she will advise clients of numerous and often overlapping legal requirements. Geologists, 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 much work. More sophisticated methods will be used to define geology, hydrogeology, and soil and water chemistry. Non-geologists will operate the equipment in the field and resulting data will be broadcast to specialists who will be monitoring the geologic field.

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

GEOLOGY IN THE CONSTRUCTION AGGREGATE INDUSTRY
Ken Coates, 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 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, groundwater mining activities will grow steadily into the next century.

Geology students interested in a career in this industry should develop a sense of social concern 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.

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

In recent years, the native microbiota 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, the data, 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 valleys. 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 differences 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 Ohio. Sampling and appropriate analytical methods both require development. However, the possibility exists near-term for microbiology to better serve 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 COLUMBUS, James Bauder, Independent Consultant, 3095 Bernewood Dr. NW, Canton, OH 44709

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

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 43266-0109

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D. Future program development

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

Current concern 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 receive permit applications, report on field activities at existing sites, and investigate environmental complaints. The area of complaint and contamination site investigation is often 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 correlate the resulting information. Skills in oral and written communication, negotiation, knowledge of regulatory law, and governmental processes are necessary. Geologists and hydrologists 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 relationship 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. These wells reach 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 very 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 and Liquid Crystals was established 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 A/7 and A/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.
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.

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 BPIII 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.


Soluble, rigid-rod, and segmented rigid-rod polymides have been synthesized by polymerizing 3,6-diphenylpyromellitic dihydrazide (DPPDMDA) and 3',4',4'-biphenyltetra-carboxylic dihydrazide (BHTCD) with 2,2'-bis(trifluoro-methyl)-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.

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.

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

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 Heps 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]-enkephalin, [3H]-DSTF, and [3H]-EKG. After rapid filtration using a Brandel cell harvester, followed by 3x3ml 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...
The presence of opioid receptors in human peripheral nerves was recently reported. To investigate the potential for a physiologic role of these receptors, human peripheral nerves were examined for the presence of two opioid ligands - δ endorphin and met-encephalin. The five human nerves were prepared by heating in 1 M acetic acid, followed by homogenization and then lyophilization. The extracts were reconstituted in RIA assay buffer and incubated with bovine antiseraum. For δ-endorphin, radioliodinated antibody to δ-endorphin was added, the mixture was incubated and centrifuged, and gamma counts were performed. For met-encephalin, 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.


2:15 KAPPA-OPIOID AGONISTS AND PHOSPHOINOSITIDE TURNOVER IN RAT BRAIN

Among the various brain regions examined, only hippocampus showed a decrease of 35% in the specific binding of kappa opioid receptors (p <0.05) in the hyperpyrexic pig compared to control pig. Scatchard analysis of the binding data showed that Bmax of kappa receptors decreased. In addition, the opioid receptors had less affinity for kappa ligand than the κ1 receptors increased from 0.19 ± 0.02 to 0.41 ± 0.03 nM in hyperpyrexic animals. These results suggest that a loss in the number and affinity hippocampal kappa opioid receptors in the hyperpyrexic pig would undermine the effect of dynorphin. In such animals, dynorphin would not be able to potentiate the hypothemic action produced by opiates or other agents. A loss in the function of kappa receptors makes hyperpyrexic animals susceptible for production of hyperthermia.

2:45 EFFECTS OF PMSF ON HUMAN PERIPHERAL NERVE OPIOID RECEPTORS.

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 Heps 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]-DAGO, [3H]-naloxone, [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 Heps 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 tonic channels, kappa receptors, and PMSF.

3:00 OPIOID PEPTIDES ENDOGENOUS IN HUMAN PERIPHERAL NERVES.

The presence of opioid receptors in human peripheral nerves was recently reported. To investigate the potential for a physiologic role of these receptors, human peripheral nerves were examined for the presence of two opioid ligands - δ endorphin and met-encephalin. The five human nerves were prepared by heating in 1 M acetic acid, followed by homogenization and then lyophilization. The extracts were reconstituted in RIA assay buffer and incubated with bovine antiseraum. For δ-endorphin, radioliodinated antibody to δ-endorphin was added, the mixture was incubated and centrifuged, and gamma counts were performed. For met-encephalin, 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.


3:15 HYDROMORPHONE RECEPTORS IN BRACHIAL PLEXUS ANESTHESIA.

A study of hydromorphone receptors in brachial plexus anesthesia was performed. Hydromorphone was administered via intravenous infusion with hydromorphone, with hydromorphone added to the local anesthetic solution. The hydromorphone was administered through the intravenous line and mixed with the local anesthetic solution. The hydromorphone was administered via intravenous infusion with hydromorphone, with hydromorphone added to the local anesthetic solution. The hydromorphone was administered through the intravenous line and mixed with the local anesthetic solution. The hydromorphone was administered via intravenous infusion with hydromorphone, with hydromorphone added to the local anesthetic solution. The hydromorphone was administered through the intravenous line and mixed with the local anesthetic solution. The hydromorphone was administered via intravenous infusion with hydromorphone, with hydromorphone added to the local anesthetic solution. The hydromorphone was administered through the intravenous line and mixed with the local anesthetic solution. The hydromorphone was administered via intravenous infusion with hydromorphone, with hydromorphone added to the local anesthetic solution. The hydromorphone was administered through the intravenous line and mixed with the local anesthetic solution. The hydromorphone was administered via intravenous infusion with hydromorphone, with hydromorphone added to the local anesthetic solution. The hydromorphone was administered through the intravenous line and mixed with the local anesthetic solution.
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 IN VITRO. HEATTIE, 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. CARPENTER, 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 CD4+ T cells 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 are particularly pronounced in the being with chronic and terminal illnesses, 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 hr 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. Lymphocytes were depleted 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 induced the tissue concentration of norepinephrine in lymph nodes and thymus. Studies are in progress to determine if these neuroendocrine changes are associated with stress-induced depression of the IL-2 response to influenza virus.

1:30

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


A recent report of the OSTC 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.


1:50

"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 OSTC 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 strengthening 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 discuss how the STBF entrepreneurs can perhaps reduce their difficulties in dealing with these external conditions over which they have no/little control.


2:10

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

A recent report of the OSTC 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 is a founder and president of Funk Metallurgical Corporation, an manufacturer of precision investment castings.

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 university researchers 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 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.

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 years of experience in accounting and consulting, with a focus on entrepreneurs. He arrived in Columbus in 1987.

Ohio is 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, President

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 polyamides, 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.
Microelectronic fabrication technology has been applied to and chemical and plasma etching, are proven microelectronic sensor research and development in recent years. Photo-platinum has been electrodeposited. Selectivity against ascorbate based on molecular size and (iii) immobilization of an enzyme. Between the polymer film and the analyte, (ii) restricted diffusion immobilizing glucose oxidase and lactate oxidase, respectively, in interaction (hydrophobic, hydrogen bonding, coordination) selectivity to electrochemical sensors by means of (i) a specific network 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.

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

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 politically. Labor leaders insisted that the most rational choice theory explain labor's inaction under conditions it faced during this period? Interviews with labor leaders, Democratic Party officials, and other relevant political scientists revealed that an emergent turbulent political environment called for innovative strategies. Adversities included: declining union members, new entrants into liberal-labor coalition, change 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 coalitions 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.

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.
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: MINIMIZATION OF THE LOSSES OF EDUCATIONAL RESOURCES
Kasimirz M. Słomczynski, 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 optimal 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 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 major concepts is illustrated by 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 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. Chicano, Vietnamese, and Puerto Rican groups that have not achieved substantial upward mobility while Japanese Americans, American Jews, and the Irish exemplify groups that have been socioeconomically successful. The comparison is made with skin color and language play roles in accounting for success, but they are also clearly insufficient. Clearly, factors such as social and economic standing are important, as are cultural factors such as Japanese and Jews have little in common culturally and physiologically. Japanese and Jews are not as different as they are different from other groups, and they are easily identifiable as Asian. Although other possible causal factors could be mentioned, it is safe to say that the major differences in the success of these groups are being operationalized as being socioeconomically successful. The comparison is enlightening by a systematic application of rational choice theory to the issue of how ethnic group success is formed, maintained, and used.

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**Scientific Basis of Service Delivery for Older Adults**

Arranged by: Robert Gande
Hosted by: James C. Naylor
FRIDAY, APRIL 26, 1991
The Ohio State University
Townshend Hall 250
1885 Neil Avenue Mall
1:30 PM
Robert Gande, Presiding
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 accuracy of an experiment in which 15g NaOH is partially decomposed to find the amount of 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

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-
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

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

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 travelers 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, OH 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;

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 B.S. by Barry 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, 4. 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, institues 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 unrealisic. 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 OGD
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, Hamilon and Clermont counties near Cincinnati and Franklin and Delaware counties near Columbus. Other areas have few or no ticks. This includes Gahogah, Seagage and Ash irreland 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.
Molecular Biology of Ixodid Tick Salivary Glands: Its Impact on Disease Transmission. Deborah C. Jaworski, Mark T. Muller and Glen R. Neecham. 1. Acarology Laboratory, Department of Entomology, and Department of Molecular Genetics. 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 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 ofTick Borne Pathogens as Shown by DNA Fingerprinting and Gene Sequencing. Charles Pretman, Vector-Borne Disease Unit, Ohio Department of Health, P.O.Box 2568, Columbus, 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 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. OSH/ODH/Columbus Zoo

5:00 PM OH Vector-Borne Disease Unit Laboratory Tour

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