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AGRICULTURAL/SOIL SCIENCE

Saturday, April 27 11:00 a.m. - noon

Learning Center 106W

11:00 AN AUTOMATED PROCEDURE FOR EXTRACTION OF METOLACHLOR FROM SOIL

Theresa H. Lemme, Alan Olness, and W. B. Voorhees, USDA-Agricultural Research Service, North Central Soil Conservation Research Laboratory, 803 Iowa Avenue, Morris, MN 56267.

Current methods for extraction of metolachlor (2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide) from soil are tedious and time consuming. A procedure was developed to provide a quick and reliable automated multi-step method of metolachlor extraction from soil. A robotic system was modified and serialized. Programs were developed to split 40-position tube racks into 20-position racks, each with individual command codes and identifiers. The cannula sipping station was programmed to sip hexane from the upper liquid layer over a methanol-hexane meniscus. An extraction station was developed to remove water from the hexane extract. A dilution station was programmed to use hexane in addition to methanol and water solvents. The robot performs multiple methanol extractions of soil followed by multiple hexane extractions of the methanol. Combined hexane extracts are filtered through a water extraction station, evaporated to dryness, the residue re-dissolved in solvent and transferred to a chromatograph vial which is then sealed. Analysis was performed with a N/P detector. Evaporation under nitrogen gas increased recovery efficiency by about 14%. Recovery of metolachlor was unaffected by soil pH. The robotic procedure increased extraction efficiency (samples hr⁻¹) by about 267%.

11:20 A BAR CODE CLASSIFICATION FOR COMPARATIVE MULTIPLE ELEMENT AVAILABILITY IN SOIL

Jana Rinke and Alan Olness, USDA-Agricultural Research Service, North Central Soil Conservation Research Laboratory, 803 Iowa Avenue, Morris, MN 56267.

Soils differ in their organic and extractable mineral composition. By displaying nutrient concentrations in a bar code format, differences in nutrient availability among soils can be compared. Two varieties of soybean (*Glycine max* L.) were grown on a 1 ha field having 4 soils. The field was divided into 330 plots. The area contained 4 soils: a Buse loam (fine loamy, mixed Udorthentic Haploboroll), Hamerly clay (fine loamy, mixed Aeric Calciaquoll), Parnell (fine, montmorillonitic, frigid Typic Argiaquoll), and Barnes loam (fine loamy, mixed Udic Haploboroll). Extractable chemical composition was determined using resin extraction and ICP analysis for surface samples (0 to 15 cm) of selected soil cores. Determinations were made with a LECO furnace for C and N and with an electrode for pH. Tests of significance ($p = .05$) based on soil classification for each element were conducted using an analysis of variance. Extractable amounts of Ca, Co, K, Mg, P, S, Zn, V, and Li differed between soils. Detectable amounts of Fe, Mn, Ti and Ni were extracted. Soil pH and contents of organic-C and total N also differed between soils. Extractable chemical composition for each soil was formatted as a bar code in which the width of the bar was proportional to extracted concentration. A standardized bar code is proposed which can be extended to include soil physical and biological characteristics.

11:40 CROPPING EFFECTS ON SOIL PHYSICAL PROPERTIES

Alan R. Wilts and Robert A. Young, North Central Soil Conservation Research Laboratory, 803 Iowa Avenue, Morris, MN 56267

Soybean cropping increases soil erosion potential during the following year. Recent increases in soybean (*Glycine max* L.) cropping area have further increased the potential for soil erosion. Soil structure often becomes loose and granular following the growth of soybean. Experiments investigated the effect of soybean and corn (*Zea mays* L.) on erosion potential near Morris, MN. Soybean-corn and corn-soybean rotations were implemented on 16 plots for five years. Rainfall simulator experiments were run to determine the relative differences in soil loss and water runoff. Soil temperature, soil water content, residue cover, canopy cover and soil aggregate stability were monitored. During the time of plant development, soil loss and water runoff amounts were greatest from plot areas that were planted to soybean during the preceding growing season. Within 30 days after planting, soil loss from corn plots following soybean averaged 22 percent greater than that from soybean following corn. For the same time period, water runoff was approximately 24 percent greater from corn following soybean compared to soybean following corn. Differences in erosion potential were evident up to 30 days after planting. Root structure and residue cover of the previous crop may explain differences in erosiveness during the seedling stage of plant development.

BIOLOGY

Saturday, April 27 9:00 a.m. - noon

Learning Center 106W

9:00 SIMIAN IMMUNODEFICIENCY VIRUS BURDENS DURING LATENCY AND AIDS IN RHESUS MACAQUES

Todd A. Reinbart, Michael J. Rogant*, Dianne Rausch**, Lee Eiden** and Ashley T. Haaset*, *Department of Microbiology, University of Minnesota Medical School, Minneapolis, MN 5545; **National Institute of Mental Health, Laboratory of Cell Biology, Bethesda, MD 20892*

Simian immunodeficiency virus (SIV) is a lentivirus that is highly related to human immunodeficiency virus type-1 (HIV-1), the etiologic agent of acquired immune deficiency syndrome (AIDS). The disease manifestations of infection by SIV in rhesus macaques (*Macaca mulatta*) are similar to AIDS in humans and include chronic lymphadenopathy, immune depletion, wasting, intractable diarrhea, and neurologic dysfunction. We have examined fundamental virus-host relationships through an extensive in situ hybridization analysis of the replication of the SIVdeltaB670 isolate during clinical latency and end-stage disease in rhesus macaques. The probes for these analyses were radioactively-labeled antisense oligonucleotide probes specific for either unspliced or spliced portions of SIV RNAs. Through standard autoradiographic and computer-assisted image analysis methodologies, lymphoid tissue viral burdens were quantitated by determining the numbers of productively infected cells, SIV RNA expression levels in individual cells were determined by counting silver grains over cells, and the amounts of viral RNA trapped in germinal centers (GC) in lymphoid tissues were determined by counting silver grains over GC. These analyses indicated that tissue viral burdens were directly proportional to plasma antigenemia levels and inversely proportional to immune status. These data indicated that during clinical latency in macaques infected with the SIVdeltaB670 isolate, lymphoid tissues are the only reservoir of productively infected cells, during the process of immune deterioration

productive infections are established throughout the entire animal, and plasma viral burdens are concordant with tissue viral burdens.

9:20 GFP AS A MARKER FOR MELANOMA METASTASIS

William H. Heidcamp, Gustavus Adolphus College, Department of Biology, 800 W. College Ave., St. Peter, MN 56082

Highly pigmented tumors derived from B16-F1 mouse melanoma cells can be found as early as ten days after tail vein injection, although three to six weeks is a more likely period for detection. Previous attempts to label the cells prior to injection utilized radioactive tracers, fluorochromes and genetic markers (LacZ). The cells can be labeled with a variety of cytoplasmic fluorochromes carried within dextrin, or via lipid incorporation in the membranes (PKH2-GL). We have also attempted labeling the cells with fluorescent beads. All of these markers reduce or eliminate metastasis or the marker becomes diluted with each cell division. By 36 hours after injection, marked cells can no longer be found. When tumors do appear, the cells have lost all detectable marker. To overcome this obstacle, we are exploring the use of green fluorescent protein (GFP) as a genetic cell marker. Plasmids containing cDNA for GFP have been inserted into B 16 cells by electroporation. Selected clones are currently being screened for fluorescence and metastasis. Our goal is to trace the cells from the time of injection through adhesion in the lung and subsequent growth into a tumor.

9:40 EFFECTS OF REGENERATING MUSCLE ON A WOUND REPAIR MODEL

Raymond E. Sicard, Linh Nguyen, Tamara Mendez, Wendy Mand, and Ronald Jacobs, Center for Wound Healing and Reparative Medicine, Department of Surgery, Box 120 UMHC, University of Minnesota, Minneapolis, MN 55455

Regeneration and repair are alternative adaptive responses to injury. In the course of studies using a polyvinyl alcohol (PVA) sponge model for repair and a minced skeletal muscle model for regeneration we observed interactions among components of these models. Granulation tissue accumulates progressively within PVA sponges implanted onto the backs of Fisher rats reaching a plateau approximately 10 days postimplantation. Minced skeletal muscle undergoes regeneration when placed within similarly implanted PVA sponges. However, PVA sponges containing regenerating, but not inactivated, skeletal muscle accumulated more granulation tissue (mean wet weight: 350 vs 175 mg/sponge at 10 days postimplantation; $p < 0.05$). In addition, interstitial fluids collected from these sponges were mitogenic for both fibroblasts and myoblasts as measured by $[^3H]$ -thymidine uptake. Moreover, the mitogenic effect on fibroblasts, but not myoblasts, of fluids conditioned by regenerating muscle was increased ($p < 0.05$) in proportion to the quantity of regenerating muscle present. These observations demonstrate that regenerating skeletal muscles produce and release factors that promote formation of granulation tissue. In addition, these results suggest potential reciprocal interactions among inflammatory cells and effector cells at the site of injury. Further studies are required to characterize these interactions and determine their relevance to regeneration and repair. [This work was supported by a grant from the National Institutes of Health (GM 50882).]

10:00 CONSERVATION OF BUTTERNUT, A THREATENED TREE IN EASTERN FORESTS

Paula M. Pijut and Michael E. Ostry, USDA Forest Service, North Central Forest Experiment Station, 1992 Folwell Avenue, St. Paul, Minnesota 55108

Butternut (*Juglans cinerea* L.), a species native to North America from New Brunswick to Georgia, and west to Minnesota and Arkansas is valued for its wood and edible

nuts. Throughout most of its native range butternut is not common or abundant, but grows in several forest types with many other tree species. Its presence significantly contributes to the biodiversity of forest stands. Butternut canker, caused by the fungus *Sirococcus clavigignenti-juglandacearum*, has caused widespread tree mortality and threatens butternut as a viable species. The fungus causes multiple branch and stem cankers that eventually girdle infected trees of all ages. Recent forest surveys have shown a dramatic decrease in the number of butternut throughout its range. It is evident that a means to conserve and regenerate butternut is urgently needed. Healthy trees that may have resistance to this disease have been found growing among severely diseased trees. Propagation of these trees will allow for the retention of these potentially valuable butternut genotypes. Development of tissue culture techniques that generate and multiply trees with increased resistance to butternut canker will allow for the conservation and restoration of this species.

10:20 - 10:40 BREAK

10:40 INTOXICATED MOTHS AND BUTTERFLIES: HOW IS THEIR FITNESS AFFECTED, AND WHY DO THEY TIPPLE?

William E. Miller, Entomology Department, University of Minnesota, St. Paul, Minnesota 55108

Lepidopterans imbibing fluids at fallen, rotting fruits sometimes show signs of intoxication. The juices of fallen fruits and woody-plant sap-flows undergo natural fermentation, which may result in frothy brews containing up to 3% ethanol. Many lepidopterans are attracted to fermentation products, but studies of actual consumption appear to be nonexistent. Reported signs of intoxication in the yellow-bellied sapsucker, *Sphyrapicus v. varius* (L.), indicates that sap in its feeding holes undergoes fermentation. This bird eats insects that visit the holes, and *Choristoneura fumiferana* (Clemens) moths are among those consumed. In the laboratory, *C. fumiferana* were neither attracted to nor repelled by diets containing 1% ethanol. When fed diets up to 1% ethanol, the moths were unimpaired in six of seven fitness factors. But at 0.5% ethanol, their fertility began to decline. Two hypotheses are articulated to explain lepidopteran intoxication in nature.

BUSINESS

*Saturday, April 27 9:00 - 11:40 a.m.
Learning Center 245W*

9:00 A PERCEPTUAL MAPPING OF MINNESOTA COLLEGES

Richard Sauter and Lorman Lundsten, University of St. Thomas, Mail #MCN6043, 2115 Summit Ave., St. Paul, MN 55105

The authors identified 12 dimensions where colleges and universities attempt to communicate differences to prospective students. In a survey, 81 high school seniors in the western suburbs of Minneapolis were asked their perceptions and attitudes regarding eleven completing colleges and universities in the Twin Cities area on these 12 dimensions. The data were subjected to multivariate analysis which produced highly simplified maps of the students' perceptions of the schools.

Most of the differences in the student perceptions can be captured in two dimensions which are heavily related to the size and reputation or prestige of the institutions.

Size was related to survey items dealing with class size, size of school, number of majors, and breadth of class

offerings. Prestige seemed to be related to survey items probing the challenge of the school, ease of being admitted, and reputation of the school. The challenge for administrators will be to decide which dimensions are possible to change in the minds of the students, and which are not. Many of these are fixed, and much differentiation occurs on variables, such as extracurricular offerings and campus ambiance, which seem to the authors to be of little import to the students in this study.

9:20 VARIANCE DECOMPOSITION OF THE CONDITIONAL VOLATILITY OF EMERGING EQUITY MARKETS

Thadavillil Jithendranathan, University of St. Thomas, MCN 6057, Summit Ave., St. Paul, MN 55105

This paper uses variance decomposition to analyze the sources of changes in the conditional volatility of emerging equity markets in Asia and Latin America. Changes in the volatility of stock market returns can be attributed to changes in dividend expectations and expected future returns. A log linear asset pricing framework is used to decompose the real unexpected stock returns in each country into changes in the expectations in the future dividends and rational expectations of the future real returns. A vector autoregressive model in real stock returns and other information variables that help forecast returns are used to estimate the revisions in long horizon expectation that define the news components. Initial results indicate that the conditional volatility across various emerging markets show considerable variation.

9:40 TEACHING MEDIA, METHODS, AND MODES

Daniel E. McNamara, University of St. Thomas, Department of Management, MCN #6064, 2115 Summit Avenue, St. Paul, MN. 55105

This paper provides an overview of the impact of various types of informational media on educational methodology and learning modes. It focuses on the significance of interactive and experiential media for enhancing teaching and learning. In particular, it examines the following educational media and methods: 1. The oral medium and lecture methods (The Sage on the Stage); 2. The print medium and analytical methods (The Star without Par); 3. Modern information media and audio-visual methods (The Source of Resource); 4. The experiential media and interactive methods (The Guide by the Side)

Each of these educational media and methods are analyzed as to their: 1. Content; 2. The role of the students; 3. The role of the teacher; 4. The effects of the media and methods on the students' intellectual, creative, and emotional development; 5. The type of learning mode (s) that is appropriate for the media and for the method; 6. Inferences as to the value of the medium in the learning context

In addition, diagrammatic views of the media and methods are provided.

10:00 MINNESOTA BOOK PUBLISHERS: NONPROFIT VERSUS FOR-PROFIT

Mary Bochnak, Hamline University, Mail Station #1670, 1536 Hewitt Avenue, St. Paul, MN 55104-1284

This empirical study tested whether differences between nonprofit and for profit publishers existed within the book publishing industry in Minnesota (a major center for independent presses) in 1993. Valid written surveys, mailed to all Minnesota publishers thought to have at least one book title for sale in print in July 1993, were returned by 223 publishers, 34% of the 650 maximum possible population; 74% of the respondents were for profit and 26% nonprofit-government. Research in other industries has shown nonprofits may provide higher quality, more costly and labor intensive services. A Priori expectations of significant differences in the material published (media, category/subject, and project selection criteria), nonprofit-government

production characteristics (smaller print run length and higher cost structure), and channels of distribution were confirmed. Unlike previous studies, respondents did not view nonprofit-government staff as more experienced and educated, nor less well paid. Organization size and inventory policy were not significantly different in the two sectors. These differences in the type or quality of book produced by the nonprofit-government sector may justify the tax exemptions provided nonprofits through public policy.

10:20 - 10:40 BREAK

10:40 GENDER, PERSONALITY TRAITS AND ADVANCEMENT: PERCEPTIONS ABOUT THE INFLUENCE ON CPA'S SUCCESS

Frank Coglitore and Janice Raffield, Department of Accounting, University of St. Thomas, Mail #MCN6010, 2115 Summit Avenue, St. Paul, MN 55105

Abstract: This study adapted the Bem Sex-Role Inventory to obtain accounting majors' perceptions about the extent of influence of selected stereotypical personality traits on the advancement of men and women in Big-Six CPA firms. The findings indicate that masculine traits are considered more beneficial than feminine traits, and that often the same personality trait is rated differently for a man compared to a woman. The ratings of male participants varied more than the ratings of female participants. A very interesting and surprising finding is that, for nine of thirty personality traits, men expect the influence on advancement to be significantly different for men compared to women. Women's ratings indicated that they expect the influence of personality traits on advancement to be consistent for both men and women.

11:00 ICONS AND ICONOCLASM: THE CLASSROOM METAPHOR

Richard J. Rexeisen, University of St. Thomas, Department of Marketing, 2115 Summit Ave, St. Paul, Minnesota 55105

One of the inherent values and challenges of education is to cause students to reflect on and to critically evaluate their current understanding of self and their relationship to the world in which they live. The classroom, as such, becomes the crucible in which prior beliefs and attitudes are mixed with new information for the purposes of rendering an expanded and presumably more accurate view of reality. Given that this process inevitably invites the potential for change, educators are well advised to be mindful of the student's competing needs to maintain cognitive consistency and the resulting selective perception response that operates to preserve and protect prior attitudes. One technique that can be useful in "unfreezing" students is the thoughtful application of iconoclastic teaching methods that require students to think about the relevancy and implications of new materials. The unexpected, when couched in a materially relevant framework, can also facilitate the retention and integration of new information.

11:20 PATTERNS OF ETHICAL COMPLIANCE IN U. S. FIRMS

Jack Militello and Lorman Lundsten, University of St. Thomas, Mail #MCN6043, 2115 Summit Avenue, St. Paul, MN 55105

A survey was sponsored by the U.S. Sentencing Commission to discover the mechanisms used by a broad cross section of American firms to comply with the Federal Sentencing Guidelines for Organizations. This law requires certain practices to prevent and detect violations of the law.

A sample was drawn of American firms, stratified by size and industry group. Telephone interviews were completed with representatives of 361 firms. The authors discovered a high level of compliance with the Sentencing Guidelines legislation and a feeling that the legislation was having an effect in the firms.

However, the study raised questions about the motivation for compliance, and the effectiveness some of the particular modes of compliance in reducing instances of illegal behavior. In general, larger firms used more sophisticated techniques, while the smaller firms relied more on urging good behavior and hoping for good results.

IMPACT OF HEALTH ON HOUSEHOLD PRODUCTION

Fabima Aziz, Department of Management and Economics, Hamline University, 1536 Hewitt Avenue, St. Paul, MN 55104
See description under POSTER SESSIONS.

GEOGRAPHY

Saturday, April 27 10:40 a.m. - noon
Learning Center 108W

10:40 MACEDONIA: A U.S. BANANA REPUBLIC

Branko Colakovic, Department of Geography, Mankato State University, Mankato, MN 56002-8400

This paper will address some topics related to the former Yugoslav Republic of Macedonia (FYROM). After a brief historical survey, a geographic assessment will cover locational considerations, natural and human resources, and the existing economic assets. Since FYROM is mainly composed of two ethnic groups, the Macedonians and the Albanians, the attentions will be given to ethnic issues. Further, relations with the neighboring countries will be analyzed, with particular attention to Greece.

A view will be presented regarding the United Nations and the United States' decision to "protect" Macedonia. It is interesting to note that the Macedonian government had never invited any foreign troops to protect its borders, nor gave any formal approval to the U.N. and U.S. "deployment" in Macedonia. An argument could be forwarded that this foreign intervention in Macedonia differs little from the old European (and American) colonial "protectorate" excuses. Hence, it is possible to suggest that Macedonia is treated as a U.S. banana republic in the Balkans.

11:00 SCALAR, DIRECTIONAL, AND VECTOR STATISTICS APPLIED TO SURFACE WINDS

Katherine Klink, Department of Geography, University of Minnesota-Twin Cities, Minneapolis, MN 55455

Wind fields are studied for a variety of purposes. Wind speed is used to evaluate wind power potential; wind direction is a factor in bird and insect migration; and wind velocity (the wind vector) is important for determining pollutant transport and dispersion. A climatology of wind speed, direction, and velocity would be helpful for these and other wind-based studies. Scalar (wind speed) analyses are quite common, but directional and vector-based wind analyses are rarely reported in the geographic and climatological literature. I present an example of scalar, directional, and vector-based analyses using the mean (1961-1990) January surface wind field over the coterminous United States. I also examine wind steadiness (the speed of the mean wind vector compared to the mean scalar wind speed) and the deviation between mean wind direction and the direction of the mean wind vector. These comparisons highlight the similarities and differences between scalar, directional, and vector-based analyses.

11:20 A GEOGRAPHER LOOKS AT "INDIAN COUNTRY" IN MINNESOTA

Roderick H. Squires, Department of Geography, University of Minnesota-Twin Cities, Minneapolis, MN 55455

Decisions by federal district courts in the eighth circuit have furthered our understanding of American Indian history, especially regarding the complex relationship between the federal government and particular bands. At the same time, however, each case has created ambiguities and paradoxes for historical scholarship because American Indian history and law are often considered as separate from other threads of history and law.

11:40 IT WAS THE BEST OF TIMES, IT WAS THE WORST OF TIMES: ANALYSIS OF A QUESTIONNAIRE SURVEY FROM A SMALL TOWN

Graham A. Tobin, Department of Geography, University of Minnesota-Duluth, Duluth, MN 55812

The city of Two Harbors, Minnesota, has experienced considerable change in recent years, especially growth in the service sector, and concomitantly, a decline in traditional industries. These changes have had a major spatial impact on the structure of the town. New businesses have expanded along the main highway, thus revitalizing the local economy and at the same time contributing to increased traffic congestion, while correspondingly the old downtown district has experienced economic decay. With this in mind, the city of Two Harbors initiated an extensive questionnaire survey of the opinions of local residents. This survey had inherent weaknesses in terms of its format and distribution that had to be addressed. Nevertheless, the results indicated particular trends within the community and revealed some interesting opinions regarding satisfaction with the city's infrastructure, buildings, and other attributes. Further analysis demonstrated that employed persons, students, and retirees, and those from different parts of the city, often had significantly different perspectives on the community. Like most other small communities, therefore, Two Harbors cannot be described as homogeneous; it is sociologically diverse, and consequently planning strategies must account for the needs of these different constituencies.

SUBARCTIC VEGETATION ASSESSMENT - A NEW CHALLENGE FOR SATELLITE REMOTE SENSING

Donald E. Petzold, Department of Geography, University of Wisconsin-River Falls, River Falls, WI 54022

See description under POSTER SESSIONS.

PHYSICAL SCIENCE/MATH

Saturday, April 27 9:00 - 11:40 a.m.
Learning Center 141S

9:00 TESTING CUSTER - AN INTERDISCIPLINARY APPROACH

Terrence F. Flower, Department of Physics, College of St. Catherine, 2004 Randolph Avenue, St. Paul, MN 55105

The outcome of the Battle of the Little Big Horn is well known, but the sequence of events on that day are neither well documented nor are they in any way known with certainty. Almost every book written about this historical battle paints a slightly different scenario. An interdisciplinary team of historian, physicist, geographer, and military law experts explored the battle and subsequent court of inquiry.

This paper focuses on a sound study of the gunshots heard at Reno Hill and possible origins. An 1873 Springfield

45 calibre carbine was fired with blackpowder loads duplicating those used in the battle. Sounds were recorded and analyzed. Both rms intensity values and FFT of the sound waves were used to understand propagation of the sound waves. A computerized model of single shots and volleys accounting for both divergence and absorption in atmospheric conditions described by survivors suggests that the sounds heard and reported at Reno Hill originated at a position closer than Last Stand Hill.

9:20 DEVICE FOR ULTRASONIC TREATMENT OF WOUNDS

Eilaz Babaev, Areopag USA, Suite 500, 701 Fourth Avenue South, Minneapolis, Minnesota 55415

The ultrasonic device is designed for the purposes of applying liquid-type medicinal preparations of physician's choice to open wound surfaces and infected skin areas.

It has been created and developed on the basis of comprehensive experimental and clinical research in former Soviet Union. Operation of the device is based on the biological properties of the low frequency ultrasound. Ultrasound waves have been proved to beneficially affect biological tissue and significantly suppress infectious bacteria. Babaev ultrasonic device began in 1972 in Moscow higher technical school for Bauman, continued later in Baku (Azerbaijan), and has been taking place in Minneapolis (USA) as AREOPAG since 1993. American made Babaev devices has been tested in independent research center "VIROMED LAB, Inc.," in Minneapolis in 1994.

Non-contact ultrasonic treatment of purulent wounds in combination with antibiotics can be considered an effective and complete treatment for infected wounds. It also leads to a significant reduction of bacterial population, destructive bacterial cells, and thus improves the process of wound healing.

The treatment of infectious wounds with pure (distilled/boiled) water proved to be extremely helpful in treating patients with serious allergies to antibiotics. The Babaev ultrasonic device for treatment of purulent-infected wounds significantly reduces the hospitalization time of patients.

9:40 ASSISTING CHILD MALTREATMENT DETERMINATION: AN EXPERT SYSTEM

Rob Faux, Master of Sciences Degree Candidate, Computer and Information Sciences Department, Mankato State University, Mankato, MN 56001

Family Services Child Protection Workers must make determinations of the possible existence of child maltreatment in the family unit. If the worker suspects maltreatment, the needs of the child may indicate that services are needed. A complex set of procedures exist for conducting the investigation and reporting the results. A Child Protection Worker must assess both tangible and intangible items in the process of determining the type, severity, or existence of abuse. Often, a worker would like the aid of an additional expert to verify results and to help insure that procedures have been followed. The intent of this project is to provide an expert system which would aid trained professionals in performing these duties.

A rule-based expert system entitled CADEA (Child Abuse Detection and Evaluation Assistant) is being developed utilizing the CLIPS expert system shell and development language. This system will emulate the decision making processes a professional social worker would follow in order to determine if maltreatment of a child has occurred. This project focuses on the development of the knowledge base, which requires the translation of human actions and reactions into a format the inference engine is able to utilize.

10:20 - 10:40 BREAK

10:40 ESTIMATING LOCATION PARAMETER OF BIVARIATE DISTRIBUTION VIA CIRCUMCIRCLE

Arkady E. Shemyakin, University of St. Thomas/Independent Siberian University, 2115 Summit Avenue, Mail #5046, St. Paul MN 55105

Some simple geometric reasoning might serve to improve certain practical procedures of statistical inference. One can use geometric ideas in order to fill in some gaps in statistics of multivariate irregular distributions.

Consider a problem of parametric estimation: based on a sample from the distribution concentrated inside a circle, estimate the location of its center.

Two classes of estimators are considered. One of them is the class of maximum likelihood estimates (not unique MLE!), based on the minimal sufficient statistic introduced by Ermakov (1980). The other is based on construction of the circumcircle of the sample.

Asymptotic distributions for these estimators and bounds for their risk are derived. With the use of the conditional distribution of estimation error obtained in Shemyakin (1991), Bayesian estimators are constructed. For the case of bivariate uniform distribution, the estimates obtained are compared in terms of relative efficiency and numerical complexity. Numerical results provided by Morozov (1995) demonstrate properties of the procedures considered.

11:00 ENERGY TRANSFER MAPPING OF GLUTAMATE DEHYDROGENASE

Ellis Bell, Biochemistry Program, Gustavus Adolphus College, 800 W College Avenue, St. Peter, MN 56082

Eukaryotic Glutamate dehydrogenase catalyzes the oxidative deamination of L-Glutamic acid utilizing either NAD⁺ or NADP⁺ and has two NAD⁺ sites [the active site which binds NAD(P)⁺ and a regulatory site] together with regulatory sites for purine nucleotides, leucine, zinc, malate and steroids per subunit. The aim of this work was to characterize the proximity of the active and purine sites. Chemical modification using AMP-PLP incorporated a single molecule per subunit and blocked the effects of ADP and GTP, introducing the pyridoxal fluorophore. Peptide mapping demonstrated a single labeled peptide corresponding to residues 440-458, with K446 the site of modification. The pyridoxal group absorbs at 325nm and fluoresces at 400nm. The thio-nicotinamide analog of NADP⁺ [s-NADP⁺] competes at the active site and upon reduction during catalysis creates a chromophore forming a resonance energy transfer couple with the incorporated pyridoxal group. The critical distance for energy transfer was calculated to be 17.2Å. Resonance energy transfer resulting from sNADPH binding to the modified enzyme allowed a distance of 15.7Å to be calculated between the active site and the regulatory purine site.

11:20 INTERACTION OF METAL IONS WITH GLUTAMATE DEHYDROGENASE

Ellis Bell, Biochemistry Program, Gustavus Adolphus College, 800 W College Avenue, St. Peter, MN 56082

Eukaryotic glutamate dehydrogenases are strongly inhibited by zinc ions however the nature of the interaction of zinc with this hexameric enzyme has not been well defined. To define the nature of the interaction of zinc with this enzyme, the effects of a variety of metal ions on the activity and structure of the enzyme have been investigated. Several lanthanides bind to the zinc site, some [Gadolinium, Terbium and Holmium] displacing zinc and relieving the inhibition while Lanthanum itself produces mild inhibition. The potency of zinc inhibition is found to be dependent on the concentration of the amino acid substrate glutamate, diminishing at low glutamate concentrations. Zinc shows no inhibition when the monocarboxylic amino acid norvaline is

used as substrate suggesting a pivotal role of subunit interactions in the ability of zinc to inhibit. This is substantiated by the finding that zinc weakens trimer-trimer interactions and produces a conformational change which exposes a single sulfhydryl group to modification by DTNB. Zinc appears to inhibit glutamate dehydrogenase by interfering with trimer-trimer interactions which are essential to the efficient oxidative deamination of L-glutamate.

ACTIVITY AND REVERSIBLE FOLDING OF CHICKEN CYSTATIN AND CORE FRAGMENTS

Ellis Bell and Jessica Bell, Biochemistry Program, Gustavus Adolphus College, St Peter, MN 56082 and U. of Minnesota, Minneapolis, MN 55455

See description under POSTER SESSIONS.

SDE/WOMEN IN SCIENCE

Saturday, April 27 9:00 a.m. - 10:20

Learning Center 108W

9:00 THE UNIVERSITY OF MINNESOTA BIOCATALYSIS/ BIODEGRADATION DATABASE

Eva Young, **Lynda B.M. Ellis, Ph.D., *Lawrence P. Wackett, Ph.D., *MS Candidate Department of Chemistry, **Department of Lab Medicine and Pathology, University of Minnesota, Minneapolis, MN 55455, ***Department of Biochemistry, University of Minnesota, St. Paul, MN 55108*

The University of Minnesota Biocatalysis/Biodegradation Database (UM-BBD; <http://dragon.labmed.umn.edu/~lynda/index.html>) is being developed on the World Wide Web to contain information on biocatalytic reactions of, and biodegradation pathways for, many, primarily xenobiotic, organic chemical compounds. The goal of the UM-BBD is to provide information on microbial enzyme-catalyzed reactions that are important for biotechnology. The reactions covered are studied for basic understanding of nature, biocatalysis leading to specialty chemical manufacture, and biodegradation of environmental pollutants. Individual reactions and metabolic pathways are presented and linked to information on the starting and intermediate chemical substances, the organisms that transform the compounds, the enzymes used in the transformations, and their genes. As the database grows, the need for facile information retrieval increases. Users of the UM-BBD currently can search for enzyme and compound names. Searches on chemical formulas, synonyms, and CAS registry numbers will soon be available. Search options and other future enhancements will be described.

9:20 A DAY IN THE LIFE

Nancy Nelson and Jill Peterman, Lake Superior Chapter, Association for Women in Science, College of Science and Engineering, University of Minnesota - Duluth, Duluth, MN 55812

The Lake Superior Chapter of the Association for Women in Science (AWIS) recently began a project to assemble a collection of personal essays written by AWIS members. The Chapter is composed of a multidisciplinary group of women scientists in government, academia, and the private sector; each essay represents a typical "Day in the Life" of the author, whether that day is dominated by laboratory research, teaching, corporate management, or family life.

The essays are currently being published in our chapter newsletter, and one goal of the project is to collect essays from members representing a wide variety of lifestyles and fields of study. By sharing the details of a typical day, AWIS members, who are spread out over a wide geographic area, are able to learn more about fellow members and share the joys and challenges that are part of all of our lives as women in science.

When completed, the collection will be made available to schools and science clubs as a way to help nurture young girls who may be interested in pursuing careers in science. It is our intent that the essays will illustrate the contributions made by women in many science and science-related fields and will also illustrate the diverse ways in which women are able to balance family life with a career.

9:40 RESOURCES FOR LEARNING AND TEACHING ABOUT WOMEN SCIENTISTS AND MATHEMATICIANS

Kimerly J. Wilcox, General College, University of Minnesota, 128 Pleasant St. S.E., Minneapolis, MN 55455-0434

It has been well documented that many children, and especially girls, lose interest in science and math by the time they reach junior high school. The importance of role models in determining career choices is suggested by several researchers (e.g., Hackett & Betz, 1981); however, until recently, few print and other materials on role models have been available for girls who have interests in science, mathematics, and other non-traditional careers.

Currently, a number of biographies and reference works can provide information for students and teachers looking for examples of women scientists and mathematicians. The ever-widening availability of the World Wide Web makes accessing information about female role models even easier. This presentation will offer a bibliography of such resources and examples of several of them.

Hackett, G. & Betz, N.E. (1981). A self-efficacy approach to the career development of women, *Journal of Vocational Behavior*, 18:326-339.

10:00 WRITING ABOUT SCIENCE

Joy L. Frestedt, President Elect, Graduate Women in Science, Inc 5727 W 42nd St., St Louis Park, MN 55416-3101

Scientist volunteers spend many hours judging science fair projects and papers for the Minnesota Academy of Science and other scientific organizations. An obvious need for additional guidance was observed especially for the youngest entrants about how to put together a science paper and how to do research. A group of scientists from the Graduate Women in Science (GWIS) decided to produce a pair of booklets to address the needs of science fair entrants and science students in general. The first booklet entitled "Writing about Science" received exciting reviews from teachers and students. One school even implemented a course assignment with collaboration between the English and Science classrooms using our booklet as a guide for scientific research. The second booklet entitled "How to do Science" is in draft form. This presentation will continue a discussion about how to develop cooperation among the many groups represented in the MAS membership (including the support of the local GWIS organization) to promote science education.

Graduate Women in Science, Inc. is a 75 year old organization in support of women in science with membership of degreed women scientists and affiliate teachers and undergraduates. For more information, please contact Joy Frestedt by phone at (612)922-2371 or e-mail <frest001@maroon.tc.umn.edu>.

POSTER SESSIONS

ACTIVITY AND REVERSIBLE FOLDING OF CHICKEN CYSTATIN AND CORE FRAGMENTS

Ellis Bell and Jessica Bell, Biochemistry Program, Gustavus Adolphus College, St Peter, MN 56082 and U. of Minnesota, Minneapolis, MN 55455

Chicken Cystatin is the most characterized thiol protease inhibitor consisting of a β - α - β - τ - β - α - β - τ - β motif, established by crystallography. This work studied the stability and folding of the protein and various fragments representing the first α helix and the first β - τ - β submotif. C.D studies, using guanidine hydrochloride indicated an increase in helix at concentrations up to 1M, followed by a reversible unfolding at concentrations above 2M. Fluorescence, uv and CD studies of peptides corresponding to the first helix showed the anticipated structure could be induced by solvent. Similar CD studies of the first β - τ - β submotif also indicated solvent induced structure. In aqueous buffers however, neither peptide contained significant amounts of native structure. When mixed in equimolar ratios, CD indicated increased native structure. The peptides of the putative binding site loop, the β - τ - β submotif, showed inhibition against papain which increased as the length of the β strands increased. With the longer β strand containing β - τ - β submotif inhibition was potentiated by the first helix, suggesting formation of a folding core with interactions governing the activity of the molecule. Supported by NIH Grant DE 09537

SUBARCTIC VEGETATION ASSESSMENT – A NEW CHALLENGE FOR SATELLITE REMOTE SENSING

Donald E. Petzold, Department of Geography, University of Wisconsin-River Falls, River Falls, WI 54022

Throughout the circumpolar subarctic, pale yellow and gray lichens comprise a large proportion of the vegetation cover and provide sharp visual contrast to common green plants. These lichens utilize solar radiation in a unique manner. They are more highly reflective in visible wavelengths, they lack a green reflectance peak, and they have a stepped reflectance pattern with high reflectance in red and near-infrared wavelengths. The commonly used normalized difference vegetation index (NDVI) employs red and near-infrared reflectance data to study characteristics of vegetation cover. The unique reflectance pattern of lichens confuses the meaning of NDVI values for partially vegetated surfaces common in high latitude environments, because reflectance spectra of lichens and soils are similar. Thus, we defined a new spectral vegetation index (the Lichen Index) which also incorporates reflectance data from blue wavelengths. While no current satellite sensors have appropriate blue and red wavelength spectral sensitivity, there are plans to launch the Moderate Resolution Imaging Spectrometer (MODIS) and the Sea-Viewing Wide Field of View Sensors (SeaWiFS) in the near future. Deployment of these sensors will facilitate exploration of the value of the Lichen Index and accurate mapping of all high latitude cover types.

IMPACT OF HEALTH ON HOUSEHOLD PRODUCTION

Fabima Aziz, Department of Management and Economics, Hamline University, 1536 Hewitt Avenue, St. Paul, MN 55104

The objective of this study was to examine the effect of health on labor productivity for women and men workers on subsistence farm households. This study used an anthropometric measure of health and other production inputs in the productivity analysis

The conceptual model was based on an economic model of household behavior developed by Gary Becker. Through optimization it was shown that production decisions were not separable from health. The relevant step was to estimate an inherently non-linear production function for the household. The empirical model used a data set consisted of a sample of forty households from six villages in India, covering three broad agroclimatic zones. Output value of production, several inputs into the production including the anthropometric measures of health were available in the data set, enabling the study to use all this information in the estimation of labor productivity.

The empirical results showed that health, as measured by weight-for-height, of the female workers was not significant but for male workers, their health, as measured by weight for-height, significantly added to the value of output. Hired workers, cultivated area, input of fertilizer, bullock labor positively affected the value of farm output. Health, as measured herein, can be viewed as a function of past calories and in that context increasing the present caloric consumption of the households would improve health and productivity of the workers in the future.