

1997

Winchell Posters

Follow this and additional works at: <https://digitalcommons.morris.umn.edu/jmas>



Part of the [Life Sciences Commons](#), [Physical Sciences and Mathematics Commons](#), and the [Social and Behavioral Sciences Commons](#)

Recommended Citation

(1997). Winchell Posters. *Journal of the Minnesota Academy of Science*, Vol. 61 No.1, 27-35.
Retrieved from <https://digitalcommons.morris.umn.edu/jmas/vol61/iss1/5>

This Article is brought to you for free and open access by the Journals at University of Minnesota Morris Digital Well. It has been accepted for inclusion in Journal of the Minnesota Academy of Science by an authorized editor of University of Minnesota Morris Digital Well. For more information, please contact skulann@morris.umn.edu.

BOARD A: PHOSPHOROUS FIXATION IN THE FISH WASTE COMPOST PROCESS

Robert Kreye, Bemidji State University, 1500 Birchmont Drive NE, Bemidji, MN 56601

This study was conducted to evaluate the quality of compost for agricultural and horticultural uses based upon plants need for phosphorous. Two types of compost piles were set up, Type I consisted of fish wastes mixed with wood fiber and type II consisted of household solid wastes mixed with wood fiber. Four sets of samples were taken through out the experiment and analyzed for the following properties: temperature and pile height, pH, moisture content, carbon, nitrogen, and phosphorous. Available phosphorous was evaluated in this study. All phosphorous analyses were conducted according to standard procedures. The levels of phosphorous and the carbon:nitrogen:phosphorous ratio increased through the first two sampling periods, decreased during the third sampling period, and increased again through the fourth sampling period. Since no phosphorous fertilizer was added during the creation of the compost piles and the microbial activity utilized the phosphorous and again transformed from organic phosphorous to inorganic phosphorous. This increases the levels of nitrogen and phosphorous making the compost valuable for agricultural and horticultural uses.

BOARD B: PLOIDY LEVELS OF HARDY *ACTINIDIA* IN THE UNITED STATES DETERMINED BY ROW CYTOMETRY

Mary Ann Start, University of Minnesota, St. Paul, MN 55108

Attempts at breeding in *Actinidia* have been complicated by the existence of intraspecific as well as interspecific variation in ploidy. The haploid chromosome number in *Actinidia* is 29, and diploid ($2n=2x=58$), tetraploid ($2n=4x=116$), and hexaploid ($2n=6x=174$) levels have been identified. Because of the problems encountered when crossing parents differing in ploidy, it is necessary to identify ploidy levels of all plants to be used in breeding. Our objective was to determine the ploidy levels of 61 *Actinidia* accessions currently available in the United States. The accessions were screened for ploidy level using flow cytometry and one plant from each ploidy level was examined microscopically to confirm the flow cytometry estimate. There were 17 diploids, 40 tetraploids, and four hexaploids. There was no intraspecific variation in ploidy in the species *arguta*, *callosa*, *deliciosa*, *kolomikta*, *melanandra*, *polygama* or *purpurea*. All *A. kolomikta* and *A. polygama* accessions were diploid. Tetraploid species included *arguta*, *callosa*, *melanandra*, and *purpurea*. *Actinidia deliciosa* was hexaploid. *Actinidia chinensis* had two hexaploid accessions, NGPR 0021.14 and NGPR 0021.3, and one tetraploid, Orange BOR 0919. The *A. arguta* x *A. polygama* cross, 'Issai', was hexaploid and the *A. melanandra* x *A. arguta* crosses, 'Ken's Red' and 'Red Princess', were tetraploid.

BOARD C: BIOASSAY OF FISH WASTE COMPOST FOR JUBILLE SWEET CORN AND MARIGOLDS

Brandy Toft, Bemidji State University, 1500 Birchmont Drive NE, Bemidji, MN 56601

Two types of fish waste compost were used in this experiment. One was fish waste (FW) mixed with wood fiber (WF) as a bulking agent. Another was a mixture of FW, WF, and household solid waste (SW). Some composts piles were inoculated with preselected mixed culture. Growth media were prepared by mixing compost samples with soil in ratios of 16.7%:83.3% and 33.3%:66.7%. Jubille sweet corn and marigolds were used to test the quality of the biotech-amended compost with soil. Amended soil mixtures of cow or sheep manure, at the same ratios as the fish waste compost, and soil alone were used as references. The resulting compost-soil mixes proved to be significantly better

than the references. High nitrogen content was found in corn grown in 33.3% FW/WF treated with inoculum. The growth medium produced the highest corn biomass (21.45 gm average) was 33.3% SW/FW with inoculum. There were no significant differences in nitrogen content of marigolds. Biomass of marigolds were high (13.55 gm and 11.27 gm) in 16.7% and 33.3% WF/FW treated with inoculum. Early and more blooms were found on marigolds grown in 33.3% WF/FW and 33.3% SW/FW treated with inocula.

BOARD D: THE USE OF OVERLAP EXPRESSION BY POLYMERASE CHAIN REACTION IN MAKING PLASMA MEMBRANE Ca^{2+} ATPASE MUTANTS

Sara Smith and Aderonke Adebayo, Bemidji State University, Chemistry Department, Bemidji, MN 56601-2699

Overlap expression by polymerase chain reaction (PCR) was used to introduce unique restriction sites in order to make cassette construct. The unique restriction sites introduced were S₁PEI and HPAI. The making of the construct allowed us to alter potential Ca^{2+} ligands

Vol⁴⁰⁹, Ala⁴¹⁰, Val⁴¹¹, Pro⁴¹², Glu⁴¹³, Gly⁴¹⁴, Leu⁴¹⁵, Pro⁴¹⁶, Leu⁴¹⁷, Ala⁴¹⁸

and in transmembrane domain four of the human plasma membrane Ca^{2+} ATPase (hPMCA). All mutations were done starting with hPMCAct120, a truncated pump which lacks the calmodulin-binding domain at the carboxyl-terminus. The use of ct120 allows us to study the activity of the mutants without interference by calmodulin. Oligonucleotides about 30 mers long were synthesized, annealed and ligated to wild type ct120 using T₄ DNA ligase. The mutant DNAs were prepared and the mutations were checked by sequencing.

BOARD E: MOLECULAR DISSECTION OF MAIZE RECOMBINANT C_4 -PYRUVATE, P_i DIKINASE REGULATION

Mary E. Lee and Molly A. Moorman, Department of Biology, Moorhead State University, Moorhead, MN, 56563

A key enzyme of the C_4 -photosynthetic pathway in higher plants is pyruvate, orthophosphate dikinase (PPDK). As a pivotal enzyme in the C_4 pathway, it undergoes diurnal light-dark regulation of activity which is mediated by a single bifunctional regulatory protein (RP). RP specifically inactivates PPDK in the dark by an ADP-dependent phosphorylation of an active-site Thr residue (Thr-456 in maize). Conversely, RP activates inactive PPDK in the light by phosphorolytic dephosphorylation of this same Thr-P residue. In order to further explore C_4 PPDK regulation by RP via site-directed mutagenesis, we have cloned the maize C_4 -PPDK gene into an expression vector for producing recombinant PPDK in *E. coli*. We have employed a His-tagged construct of this recombinant form for site-directed mutagenesis studies of the active-site regulatory Thr residue. Preliminary analysis of several of these mutants (T456V, T456S, T456D) has produced two notable findings: (i) substitution of aspartate for Thr-456 abolishes enzyme activity. Presumably, this occurs because the negative charge introduced via the aspartate carboxyl group into the active-site functionally mimics the RP inactivation/phosphorylation at this position; and (ii) serine can serve as an RP phosphorylation substrate, while aspartate and valine cannot. This suggests that RP may be related to the Thr/Ser family of protein kinases. More extensive data concerning *in vitro* inactivation/phosphorylation of mutant PPDKs by RP, as well as data on additional Thr-456 mutants, will be presented.

BOARD F: THE USE OF A DIELECTRIC SENSITIVE PROBE IN DESCRIBING PHOSPHOLIPID MOVEMENT DURING MEMBRANE FUSION

Drew Catron, St. Olaf College, Northfield, MN

We used a fluorescent probe sensitive to the environmental dielectric constant, to monitor changes in phospholipid bilayer structure. Preliminary experiments demonstrated that the emission spectrum of our probe, Laurdan, was sensitive

to the state of the lipids. Specifically, there were unique emission spectra in the fluid and in the gel states of the membrane suggesting that the state of the lipids and/or the position of the probe changed with temperature. We also tested whether a fluorescent probe could follow rearrangements in phospholipid bilayers as they moved to a more gel-like state. In addition we wanted to study how the rate of lipid shifting compared to the actual rate of fusion. Lipid gel states were induced by temperature changes and divalent cations. Laurodan spectra after the addition of divalent cations were identical to lipids in the gel state. We used the ratio of the fluorescence intensity at these two wavelengths to follow changes with time after the addition of ions. It was found that Laurodan monitors environmental change very well. Fusion occurred faster under our experimental conditions and was complete before the lipid rearrangements were complete. Thus, total lipid rearrangement is not required for fusion.

BOARD G: LIPID VESICLES FUSED TO SOLID SUPPORTS

Matt Hedberg, St. Olaf College, Northfield, MN 55057

Lipid vesicles fused to solid supports were studied with three main techniques (1) fluorescently labeled probes, (2) surface pKa measurements using a pH indicator dye, and (3) the Atomic Force Microscope (AFM). The spreading and fusing of lipid vesicles made of L- α -Phosphatidylserine (bovine brain PS) or palmitoyl-oleoyl-phosphatidylcholine (POPC) applied to a solid support made of glass or quartz was studied by fluorescently labeled probes. From this lipid model, we could determine whether and to what extent the vesicles fused. Surface pKa measurements of bovine brain PS were attempted by fusing lipid vesicles to a 0.15 mm quartz cell, measuring the absorbance of a pH sensitive indicator dye (Bromocresol Green), and determining the pH in the cell by comparison with an absorbance versus pH (titration) curve. Atomic Force Microscopy images were obtained from similar lipid preparations (either dry or hydrated) using contact and tapping modes. Both POPC and bovine brain PS fused to the solid support in the form of supported planar bilayers (SPBs). The pKa of bovine brain PS fused to a quartz support is, as yet, undetermined. However, a valuable method has been developed. Finally, the Atomic Force Microscope told us the surface was covered with a bilayer and some small vesicles that did not fuse.

BOARD H: EFFECTS OF SUCROSE ON DETERGENT-LIPID INTERACTIONS

Gregg VanderWaerd, Saint Olaf College, Northfield, MN 55057

The transition from egg phosphatidylcholine (EPC) vesicles to mixed EPC-octylglucoside vesicles was examined in aqueous media with various sucrose concentrations. Phospholipids spontaneously arrange into bilayers that form vesicles in water. Octylglucoside (OG) is a nonionic detergent that spontaneously forms micelles. Neither its solubility nor its interaction with the EPC bilayer is expected to be directly altered by nonionic aqueous solutes, such as sucrose. However, changes in the activity of the water may alter the solubility of pure OG and its partition coefficient into EPC bilayers. We measured the critical micelle concentration of OG using the fluorescent probe (ANS) as a function of aqueous sucrose concentration. As [sucrose] increased from 0 to 2M, the OG cmc decreased from 22.2 to 11.8 mM. The aqueous [OG] at the point of mixed micelle formation from EPC vesicles, also decreased from 16.9 to 9.3 mM. The ratio of OG/EPC in the mixed EPC-octylglucoside vesicles increased slightly from 2.79 at 0M sucrose to 4.29 at 2M sucrose. At high sucrose concentrations additional transition intermediates appeared. The effects of sucrose on OG appears to be in the solubility of OG, and the interactions of EPC headgroups within and between vesicles and mixed micelles.

BOARD I: ANTIOXIDANT PROPERTIES OF MELATONIN IN ARABIDOPSIS THALIANA EXPOSED TO OZONE

Robert H. Griffiths, Department of Biology, Macalester College, 1600 Grand Avenue, St. Paul, MN 55105

Ozone creates damaging active oxygen species in plants and animals. These reactive species can be very damaging to cellular components, particularly cell membranes. Melatonin, a hormone, has been studied extensively in animals and its role as an antioxidant has been proposed. There has been little research of melatonin in plants. In a time of increasing ozone in the atmosphere, it would be interesting to determine if melatonin also plays an antioxidative role in plants. We observed the effects of ozone on plants with varying amounts of melatonin and felt valuable information could be gained by focusing on three main issues: the comparison of levels of melatonin in plants exposed and not exposed to ozone, a comparison of levels of oxidative damage in treated and untreated plants, and the relationship of melatonin production as compared to another free radical scavenger, superoxide dismutase after treatment with ozone. Melatonin concentration was measured with the radioimmunoassay techniques and oxidative damage of membranes was measured using reactivity to thiobarbituric acid. By gaining information on these questions we hope to have a better understanding of the role of melatonin in plants. Preliminary results show that melatonin levels may indeed rise in plants that are exposed to ozone and that higher amounts of melatonin in plants may correlated to reduced oxidative damage in plants.

BOARD J: REGULATION OF MELATONIN IN PLANTS

Sida Ly, Macalester College (Dr. Daphne Foreman)

Research on melatonin has mainly been focused in the animal kingdom although this hormone occurs in both plants and animals. This project aims to increase the understanding of melatonin's effects on the growth of plants, specifically the developmental regulation of melatonin concentration. The species that was used for this experiment is *Arabidopsis thaliana*, the Columbia ecotype. Plants were grown on agarose containing a nutrient mix and a melatonin supplement. Plants were then harvested every four days from the five-day to 25-day stages, including the whole life-cycle of the plants from seed to flowering. Whole plant samples were then assayed for melatonin concentration using radioimmunoassay. The final concentrations of melatonin in each sample was determined after careful calculations of disintegrations per minute (DPMs) from the samples and a standard. Results showed that melatonin concentration is regulated at certain stages of growth. Plants do not regulate their melatonin concentration in the early stages of between 5 and 13 days. Overall concentration is not strictly regulated until the 25th day. Melatonin is regulated according to both the amount of exogenous melatonin and according to growth.

BOARD K: OBSERVATIONS OF THE EFFECTS OF THE HORMONE MELATONIN ON THE PLANT SPECIES ARABIDOPSIS THALIANA: ANALYSIS OF UV-LIGHT INDUCED PHOTBLEACHING

Mike Marshak, Macalester College, 1600 Grand Avenue, St. Paul, MN 55105

The damaging effect of photobleaching in plants occurs when chloroplast membranes are damaged by free radicals or singlet oxygen which react with chlorophyll a damaging these molecules causing them to lose their green color. The cause of photobleaching may be related to decreased level of antioxidants. The Columbia species of *Arabidopsis thaliana* was used for the experiment and two groups were designated: the control group was plated and grown in a regular agarose nutrient medium and the experimental group was plated and grown in the same medium with the hormone melatonin added. At day 5, 10, and 15, individual leaf samples were taken from each group and placed on slides for analysis under UV-light. The samples were exposed

to UV-light under an epi-fluorescent microscope for a three hour time span and photographs were taken every 20 minutes by a camera mounted on top of the scope. The results supported the initial hypothesis that melatonin treated species would take longer to photobleach than the non-melatonin control group. The photographs displayed the differences in degree of photobleaching over time between the two groups. Additional experiments are being carried out at this time.

**BOARD L: IDENTIFICATION OF THE WOOD TICK
(*DERMACENTOR VARIABILIS*) BY USING SILVER-STAINED
DNA SEQUENCING GELS**

Angelic Glennie and Mari Gustafson, Bemidji State University,
1500 Birchmont Dr NE, Bemidji, MN 56601

We used a method of non-radioactive DNA sequencing to identify *Dermacentor variabilis* ticks. The Polymerase Chain Reaction was performed using oligonucleotide primers that amplified a section of the tick 16S rRNA gene. The PCR product was then purified by gel filtration or membrane filtration. The sequencing reactions and gel staining were performed using the Silver Sequence reagents (Promega, Madison, WI). The DNA sequence read from the gel was used to query the Genbank database. All ticks in our sample that produced readable DNA sequences could be unambiguously identified as *D. variabilis*.

BOARD M: ANALYSIS OF WOOD TICKS (*DERMACENTOR VARIABILIS*) FROM BELTRAMI COUNTY, MN FOR THE PRESENCE OF *BABESIA MICROTI* AND *BORRELIA BURGENDORFERI*
Therese A. Kreutzberg, Bemidji State University, 1500 Birchmont Dr. NE, Bemidji, MN 56601

Babesia microti and *Borrelia burgdorferi* are the agents of two emerging tick-transmitted zoonotic diseases. The protozoan pathogen *B. microti* causes babesiosis and the bacterial pathogen *B. burgdorferi* causes Lyme disease. *Ixodes sp.* are the primary tick vectors. Some reports suggest that *Dermacentor variabilis* is not a competent vector for either of these pathogens. However, the fact that *Dermacentor sp.* are capable of transmitting other *Babesia sp.* (e.g. *B. caballi*, *B. equi*) and the association of *B. microti* and *B. burgdorferi* in ticks led us to further investigate the potential for transmission of these pathogens by *D. variabilis*. We analyzed 60 *D. variabilis* ticks from Beltrami county, MN for the presence of *B. microti* and 50 for *B. burgdorferi*. We performed Polymerase Chain Reaction (PCR) amplification specific for each pathogen on individually prepared tick lysates. No pathogen-specific DNA was detected based on agarose gel electrophoresis of the PCR reactions.

**BOARD N: EFFECT OF ASCORBIC ACID ON
THE TRANSFORMATION FREQUENCY OF C3H-BT1 CELLS**

Shana M. Pazdernik, Biology Department, Bemidji State University, Bemidji, MN 56601

A mouse embryonic fibroblast cell line (C3H-BT1) which exhibits a high frequency of cell transformation, was used to test the effect of ascorbic acid on the expression of the transformed phenotype. Depending upon severity of the transformation, transformed foci were scored as types I - III, with type III representing the most aggressive cell type. Without ascorbic acid, 44% of the cells expressed the transformed phenotype. At concentrations up to 18 µg/ml, ascorbic acid significantly decreased all types of transformation without affecting survival. Survival was decreased at concentrations above 18 µg/ml. Cells that did express the transformed phenotype expressed a lower frequency of type III and a higher frequency of types I and II transformation in proportion to increasing concentrations of ascorbic acid. At a concentration of 18 µg/ml of ascorbic acid, total transformations were decreased by 9% and type III transformations were decreased by 13%. The results of this experiment are definitive for a relationship between ascorbic acid and the reduction of expressed transformation.

BOARD O: THE EFFECTS OF SITE-DIRECTED MUTAGENESIS ON THE DOUBLE-STRANDED RNA ACTIVATED PROTEIN KINASE PROMOTER ACTIVITY

Anthony Koo¹ and Jennifer Hoest², ¹Department of Biology, Macalester College, St Paul, MN 55105; ²Department of Pathology, Northwestern University, Chicago, IL 60611

Studies have identified the double stranded (ds) RNA activated and interferon induced protein kinase (p68 or PKR) as a part of the cellular anti-viral and tumor suppression mechanisms. Although the catalytic components of PKR have been well-characterized through mutational studies, regulation of PKR transcription via the promoter has been poorly understood. In this study we examined the functional activities of the PKR promoter through site-directed mutagenesis constructs. All constructs had two to four mismatched base pairs in each of the following sites: distal NF-κB, proximal NF-κB, GAS, proximal E1, Sp1, proximal NF-IL6, E2F and the ISRE. The regulation of these transcription factor binding sites were analyzed through reporter assays. Constructs were inserted into a vector (pCAT) and transfected into HeLa cells. Chloramphenicol acetyl transferase (CAT) activities were then measured. Results show that mutations in Ets, proximal NF-κB, NF-IL6, and ISRE sites significantly decreased promoter activity while activities in GAS, Sp1, and E2F mutants stayed the same. The distal NF-κB mutant increased almost two folds compared to the a wild-type PKR promoter activity,

BOARD P: DETERMINATION OF A PROTEIN TRANSCRIBED BY THE J_k1C_k LIGHT CHAIN IMMUNOGLOBULIN TRANSCRIPT
Cheryl Schmit, Saint Mary's University, 700 Terrace Heights, Winona, MN 55987

In recent research, the detection of a germline transcript from the J_k1C_k light chain immunoglobulin gene has been identified in murine and human pre B cells. An examination was done to determine the possible formation of a protein being encoded by this J_k1C_k light chain Ig transcript. The detection of a protein was determined by using immuno precipitation and the Western Blot technique.

BOARD Q: MAPPING THE EPITOPE OF MONOCLONAL ANTIBODY 11D4 TO RAT EPIDIDYMAL SECRETORY PROTEIN
Molly M. Freeman, Dept. of Cell Biology and Neuroanatomy, Univ. of Minnesota Medical School, Mpls., MN 55455

Proteins D and E are highly similar epididymal secretory proteins that localize to the sperm head and tail, respectively, during transit through the epididymis. Monoclonal antibody (Mab) 11D4 was raised against protein D. It recognizes the carboxyl termini of D and E in epididymal epithelial tissue and fluid. Once bound to sperm, protein D is recognized by Mab 11D4, but the membrane form of protein E is not. Our lab hypothesizes that a processing event occurs during the binding of protein E that cleaves its carboxyl terminus containing the epitope for Mab 11D4. A clone encoding the carboxyl terminus of protein D was obtained by immunoscreening a 1gt11 rat epididymal cDNA library. By ligating this clone into the pGEX 4T-1 vector, a fusion protein was made with galutathione-S-transferase, facilitating purification of the fusion protein. The predicted amino acid sequence of the homologous mouse protein (CRISP-1), which is also recognized by Mab 11D4, was compared to our clone, and a stretch of nine identical amino acids identifying a putative site for the epitope was found. Controlled exonuclease digestion of the recombinant plasmid and subsequent expression of progressively smaller fusion proteins will define the exact amino acid sequence of the epitope of Mab 11D4. Knowledge of the epitope will assist in further investigation of the differences between proteins D and E and help elucidate their role(s) in sperm-egg fusion.

BOARD R: HEART TRANSPLANT DNA DETERMINATIONS: A CYTOPHOTOMETRIC STUDY OF FEULGEN STAINED NUCLEI

Mark Krampf and Benjamin Van Vranken, Department of Genetics and Cell Biology, University of Minnesota, 1445 Gortner Avenue, Saint Paul, Minnesota 55108-1095

Our laboratory has transplanted cardiac anlage from *Rana pipiens* of one ploidy to another. The ploidy difference makes possible monitoring persistence of the transplant Heart forming regions of triploid (3N) tadpoles were grafted into diploid (2N) tadpoles. The animals were allowed to mature. The heart was resected and the excised organ rudiment was touched to a clean glass slide. Nuclei adhere to the glass and these can be stained with the Feulgen procedure (specific for DNA). The stained nuclei were analyzed by Mendelison's two-wavelength photocyotometric method and compared against control nuclei of known ploidy. The ratio between the two nuclear populations was compared with the student t-test. It was ascertained that some larval animals had a 2N/3N ratio of about 1.5. This finding provides cytochemical evidence that the transplanted heart anlage persisted in those animals with this ratio. We have incomplete data on hearts after metamorphosis. We thank Dr. Richard Knowles, Saint Mary's College, Winona for his instruction in DNA measurements and we thank Dr. Robert McKinnell and Ms. Kristine Klos for providing heart transplant animals for this study

BOARD S: IN SEARCH OF HETEROCHRONIC GENES IN CAENORHABDITIS ELEGANS

Jodie Miller, University of Minnesota, College of Biological Sciences, 1475 Gortner Ave., St Paul, MN 55108

Caenorhabditis elegans is a small nematode that develops through four larval stages before reaching adulthood. The timing of *C. elegans* development is controlled by heterochronic genes. Four genes in the heterochronic pathway, *lin-4*, *lin-14*, *lin-28*, and *lin-29*, have been sequenced and cloned. Our goal is to identify additional genes in this pathway by screening for mutations. We are using transposable, Tc1 elements as the mutagen. Tc1 elements move around and insert themselves randomly in the *C. elegans* genome. The worms screened are *lin-4⁻* so the switch from larva to adult is delayed. *Mut-6* enhances the movement of Tc1 elements in the strain. A *col-19* promoter fused to the gene for green fluorescent protein (GFP) serves as a reporter gene. In normal worms, *col-19* is only expressed in the adult cuticle. In the event of a Tc1 disrupting a heterochronic gene, the worm is pushed through the L/A switch thus expressing GFP. Thus far, I have isolated 15 mutants, one (*tc+25*) has a mutation in the identified but not yet sequenced heterochronic gene *lin-42*. We are in the process of locating the single *tc1* that interrupted *lin-42*. The DNA flanking this *tc1* is *lin-42* sequence.

BOARD T: OPTIMIZATION OF GROWTH CONDITIONS FOR AVIAN CELL CULTURES

Tara L. Smith, Linda K. Foster, Douglas N. Foster, Science in Agriculture, University of Minnesota, 495 AnSc/VM, St. Paul MN 55108

The purpose of this project was to optimize avian cell growth using the immortalized chicken embryo fiberblast cell line UMN-SAH/DF-1. Four of the most common tissue culture media were used to support the growth of the avian cells: 1) DMEM with high glucose; 2) DMEM with high glucose supplemented with a 1% selenium, insulin, and transferrin mixture; 3) Medium 199; and, 4) F12/Minimal Essential Medium (MEM) along with eleven different sera from Gibco (Life Technologies Inc., Gaithersburg, MD) and Hyclone (Hyclone Inc, Logan, UT). Each of the sera were added to the four media giving forty-four different permutations of 10% serum enriched media to use for comparison of cell growth. Cells at 3.5×10^4 ($3.65 \times 10^3/\text{cm}^2$) were seeded onto six well plates and grown and maintained with each of the various enriched media for five days. To monitor reproducibility,

each enriched growth medium condition was replica plated three to five times. Results of the different see/media combinations were recorded photographically. An additional experiment was conducted using half of the enriched growth medium conditions above on a primary avian cell culture. This was done to determine if the results of culture conditions obtained with the immortalized line were similar for a primary cell line which is more widely used experimentally.

BOARD U: EVIDENCE FOR A NOVEL ZN²⁺ TRANSPORTER REGULATED BY KNOWN PROTO-ONCOGENE TRANSCRIPTION FACTOR MYB

Aubie K. Bundy, G. Bradley Alsop, (Colleen Belk), Department of Biology, University of Minnesota-Duluth, Duluth, MN 55812.

ZRT1 and ZRT2 are known to be the genes primarily responsible for Zn²⁺ uptake in *Saccharomyces cerevisiae*. *zrt1/zrt2* double mutants are capable of Zn²⁺ uptake when they are grown on high Zn²⁺ media, suggesting the existence of a third transporter. To further investigate this possibility, a cDNA library of *Arabidopsis thaliana* was transformed into the *zrt1/zrt2* double mutants and the cells were plated on low Zn²⁺ media, thereby selecting against the double mutants with no other means of Zn²⁺ uptake. We isolated six colonies capable of Zn²⁺ uptake. Three were characterized as containing IRT1, an Zn²⁺ transporter capable of limited Zn²⁺ uptake. The other three colonies were sequenced and found to contain the proto-oncogene *myb*. *myb* is a known transcription factor that is generally active during cell proliferation. Proto-oncogenes, like *myb*, are involved in cell cycle control, and when mutated can lead to cancer. We found that the DNA binding domain of *myb* is a zinc finger domain and as such requires Zn²⁺ as a cofactor. It is our hypothesis that *myb* induces transcription of a third Zn²⁺ transporter (as yet uncharacterized), thus enabling *zrt1/zrt2* double mutants to acquire enough Zn²⁺ for survival.

BOARD V: SYNTHESIS OF POLY(PHENANTHRYL METHYLENE)

David R. Boggs, Bemidji State University, 1500 Birchmont Drive NE, Bemidji, MN 56601

Synthesis of short chain aromatic compounds containing one carbon bridges have displayed electrical conductivity properties and are thermally stable. The research that will be presented involves the synthesis and characterization of Poly(phenanthryl methylene). The synthesis begins with the reduction of 9-phenanthrene carboxyaldehyde to 9-phenanthrene methanol. This alcohol is then chlorinated by substitution to produce 9-chloromethyl phenanthrene. The polymer is then synthesized by Friedel-Crafts self condensation polymerization producing poly(phenanthryl methylene). Characterization of the monomers and polymer include melting point, FT-IR and NMR analysis.

BOARD W: HELIUM-NEON LASER INITIATED PHOTOSENSITIZED OXIDATION KINETICS OF 1,3 DIPHENYL ISOBENZOFURAN

Anthony Haag and Matthew King, Bemidji State University, Department of Chemistry, 1500 Birchmont Drive NE, Bemidji State University, Bemidji, MN 56601

The photosensitized oxidation of 1,3 Diphenyl Isobenzofuran was initiated by a Helium-Neon laser at 632.8 nm with Methylene Blue photosensitizer. The reaction kinetics was followed by monitoring the absorbance of 1,3 Diphenyl Isobenzofuran at 420 nm. The overall second order rate constant for the above reaction is obtained by measuring the absorbance decay at different concentrations of 1, 3 Diphenyl Isobenzofuran and Methylene Blue with methanol as the solvent. A kinetic model is developed to explain the photosensitized oxidation mechanism for the above reaction.

BOARD X: COMPARATIVE ANALYSIS OF PESTICIDE EXTRACTION METHODS

Julie A. Lapos, College of St. Benedict, 37 South College Avenue, St. Joseph, Minnesota 56374

Solid phase extraction on C-18 SPE disks, liquid liquid extraction using methylene chloride, and liquid liquid extraction using a 75:25 hexanes: ethyl acetate solvent were compared. Aliquots of water (500mL) spiked with alachlor, atrazine, and trifluralin were extracted using each of the techniques. The extracts were concentrated and analyzed using Gas Chromatography/Mass Spectroscopy. 2-Nitro-m-xylene was added as a surrogate and d-10 phenanthrene was used as an internal standard. At spiking levels of 15-40 µg/L there was not a significant difference between the methods.

BOARD Y: STUDY OF MEMBRANE FLUIDITY OF HYPERTENSION RATS

Janelle Balvik, Mathew Baily, Becky Dangerfield, Abbas Pezeshk^a, and Derick Dalhousie^b, ^aDepartment of Chemistry and ^bDepartment of Psychology, Moorhead State University, Moorhead, MN 56563

It is known that systemic hypertension is one of the major risk factor for coronary heart disease. The membrane fluidity of erythrocytes was studied in spontaneously hypertensive rats (SHR) and Wistar-Kyoto rats (WKY) using electron paramagnetic resonance (EPR) spectroscopy and spin labeling technique. Our preliminary data show that the membrane fluidity has been altered in hypertensive rats. The values of the order parameter and the maximum splitting parameter for a fatty acid spin-label (5-SASL) were found higher in erythrocytes of SHR than in those found in WKY rats. These results suggest that the decreased of membrane fluidity might be associated with various functional or structural abnormalities of cell membranes.

BOARD Z: MOLECULAR DISSECTION OF MAIZE RECOMBINANT C₄-PYRUVATE,PI DIKINASE CATALYSIS

Brent Selle and Jason Louie, Department of Biology, Moorhead State University, Moorhead, MN, 56563

A major enzyme of the C₄-photosynthetic pathway of higher plants is pyruvate, orthophosphate dikinase (PPDK). PPDK has been demonstrated by several studies to limit the amount of CO₂ assimilated into sugars by C₄ photosynthesis in maize leaves. Our goal is to fully understand how this enzyme works in the maize leaf so it can be genetically engineered for improving photosynthetic performance in maize leaves. As a first step in exploring the details of catalysis, we have targeted the central catalytic histidine in the enzyme active-site for site directed mutagenesis. Our goal is to confirm the role of this amino acid in overall catalysis as well as confirming that it is necessary for diurnal light-dark regulation of activity.

BOARD AA: LIPID FLIP-FLOP DURING MEMBRANE FUSION

Timothy Schulz, St. Olaf College, Northfield, MN 55057

Current models of vesicle fusion generally either hold that the lipid monolayers remain segregated, or that lipid movement between monolayers (flip-flop) is permitted. We explored methods of asymmetrically labeling phosphatidylserine (PS) vesicles with the fluorescent membrane probe octadecylrhodamine (R18). R18 is a self-quenching probe that should allow us to observe whether flip-flop is taking place during Ca²⁺-induced fusion. While the outer monolayer could be labeled with considerable specificity, attempts to exclusively label the inner monolayer were unsuccessful. Fusion of vesicles labeled on the outer monolayer revealed that it allows an opportunity for R18 to flip-flop from the outer to the inner monolayer. Whether naturally-occurring lipids actually flip-flop has yet to be determined.

BOARD BB: HOW DOES TOURISM AFFECT THE WATER QUALITY IN ELY AREA LAKES?

Amanda Leino, Hamline University, 1536 Hewitt Ave., St. Paul, MN 55104

During the months of June, July and August 1996, Burntside and Shagawa Lakes were tested weekly to determine the effects of the area's increasing tourist trade. Tests were done to look for transparency, pH, nitrate content, phosphate content, dissolved oxygen, B.O.D., and for the presence of *E. coli*. The results were compared with past research and examined for their correlation with the Lake Management Plan. Throughout the summer, there was a trend toward increasing transparency, with fluctuating levels of nitrates and phosphates. *E. coli* was found at the Crab Crick site in Burntside (site #1) and at the Shagawa Lake site near Olsen's Bay (site #6). Overall, the increase in use of the lake areas had no adverse effects on the water quality and both lakes were considered within their prescribed averages throughout the summer. To ensure continuing high lake quality, further monitoring should be done. Potential problem areas should also be monitored so something can be done if increasing levels of contamination occurs.

BOARD CC: AN OPTIMIZATION APPROACH TO MODELING FOOD WEB COMPLEXITY

A. Croft and V. Card, Macalester College, St. Paul, MN

Modern natural ecosystems are continually confronted with exotic species. These newcomers play an often unpredictable role in their new environments. The Brownie Lake, MN case study indicates that the introduction of a new top predator drastically altered the composition and dynamics of the lake's trophic system. A mathematical model has been constructed to simulate this invasion and its effects on trophic structure and community stability. The model tests the hypothesis that community complexity and age are inversely proportional to invasive species success.

BOARD DD: A CENTURY OF CHANGES IN DIATOM SHAPE AND ABUNDANCE IN BROWNIE LAKE, MINNEAPOLIS

Nissa Dalager and Virginia Card, Macalester College, 1600 Grand Ave., St. Paul, MN 55105

Diatom research was conducted on a sediment core from Brownie Lake, MN. The core was made into epoxy embedded petrographically thin-sectioned slides, which were analyzed with microscope at 400 power. Diatoms were counted, measured, identified, and put into morphology categories based on shape at one to two year intervals along the core. The morphology categories were: round, long and thin, oblong, and irregular oblong. These categories were established based on the effects of shape on three of the four parameter of diatom existence: nutrient uptake, predation, and sinking rate (photosynthesis is the fourth parameter but was not analyzed in this study). Biodiversity, species richness, and abundance were calculated for each interval. This information was then compared to physical changes the lake experienced as it shifted from holomixis to meromixis. Trends in biodiversity, species richness, and abundance were observed for each mixing period. Certain morphologies and species were found to be dominant at different periods in the core. The goal of this study was to use the information collected in order to determine which diatom morphology is most adaptive in a given set of conditions and why.

BOARD EE: THE EFFECTS OF ARTIFICIAL CIRCULATION ON TROPHIC STRUCTURE IN CRYSTAL LAKE, MN USING PALEOLIMNOLOGICAL TECHNIQUES

Nathaniel M. Dewar, Macalester Biology Department, Macalester College, 1600 Grand Ave., St. Paul, MN 55105

Paleolimnological analysis of microfossils in a 35 cm lake core was used to assess the trophic structure of artificially circulated Crystal Lake in Robbinsdale, MN. Artificial circulation began in 1973 to mitigate severe cultural eutrophication from urban development on the lake's

watershed. Destratification and oxygenation of the water column resulted in a decline in nuisance algae populations, abatement of periodic fish kills, and improved sports fishing. Trophic models suggest that changes in piscivore abundance will cascade down the food web, leading to changes in zooplankton community structure. Quantification of microfossil abundance and composition and throughout the sediment core indicated the immediate impact of artificial circulation on trophic structure and its present stability.

BOARD FF: CONSERVATION GENETICS OF FRESHWATER MUSSELS USING PCR

Zachary D. Hayden, Department of Biology, Macalester College, 1600 Grand Ave., St. Paul MN

North American mussel populations are an intrinsic component of our freshwater fauna, acting as both ecological indicators and food sources for predators. However, they are among the most endangered organisms in the U.S. Population management presents difficulties because larval stages are dispersed by fish hosts. Several efforts have been made to devise efficient and accurate methods of identifying larval stages found in fish hosts during transit. Polymerase chain reaction in conjunction with restriction enzyme digests have previously been used to "fingerprint" some species from Pennsylvania. We have examined mussels, using the same techniques, from the same subfamilies and in some cases the same species to confirm and extend previous work to another geographic location (St. Croix River). Preliminary analyses indicates that this technique can be species-specific and thus will allow for the identification of larval forms found on fish hosts. Also, since this technique requires little tissue, endangered species will not be sacrificed for analysis. We plan to extend this technique to all thirty-nine species in the St. Croix River.

BOARD GG: OBSERVED DIATOM DISSOLUTION AS A RESULT OF SPECIES SPECIFIC DIFFERENCES IN ELEMENTAL COMPOSITION OF SILICIOUS MICROFOSSILS IN BROWNIE LAKE, MINNEAPOLIS, USA

E. W. Mielke and V. Card, Department of Biology, Macalester College, 1600 Grand Ave. St. Paul, MN 55105

Paleolimnological diatom fossils have been used to recreate historical changes in water chemistry. Under some conditions these diatoms have been observed to be poorly preserved or partially dissolved. To study this phenomena, diatom frustules were obtained from a freeze core taken from meromictic Brownie lake. Samples at various level in the sediment were inspected for signs of dissolution using Scanning Electron Microscopy. These results were compared with known historical changes in the application of road salt to an adjacent highway by the Minnesota Department of Transportation. Instead of a linear correlation between preservation and inferred monomolimnion and sediment salinity, uneven dissolution among species of diatoms at the same levels in the sediment was observed. Individual species of diatoms at four levels in the sediment were inspected for elemental composition differences using Energy Dispersive Spectrometry. Results support the hypothesis of a species specific trend in diatom dissolution. This may affect interpretation of paleolimnological analysis of diatom assemblages.

BOARD HH: POLLEN HISTORY OF THE PRAIRIE AREA AT THE KATHARINE J. ORDWAY NATURAL HISTORY STUDY AREA OF MACALESTER

Kirsten E. Redborg & Virginia Card, Department of Biology, Macalester College, St. Paul, MN 55105

Pollen analysis is a valuable tool that can be used to reconstruct past vegetative environments. It was hypothesized that pollen analysis could be used to determine disturbance history and subsequent vegetation changes for the prairie area at the Katharine J. Ordway Natural History Study Area of Macalester College. Sediment samples were collected from two sites, a temporary pond and a permanent

pond. Samples were processed and pollen was concentrated using the standard pollen prep method. Slides were made and 300 pollen grains were identified and recorded for each sample collected from the two ponds. Differences in both the type and number of pollen grains were observed between samples however these preliminary results are unclear due to poor pollen preservation in deeper sediment layers. At both sites tree pollen abundance seemed to decrease as depth of sediment layer increased. This suggests that trees may have been less abundant in the study area in the past or alternatively, tree pollen does not preserve as well as other pollen types.

BOARD II: CELLULASE PRODUCTION FROM WASTE PAPER VIA TRICODERMA REECEI

Mark D. Almlie and John L. Giannini, St. Olaf College, Northfield MN, 1500 St. Olaf Ave, 55057

The demand for ethanol as a renewable and more environmentally friendly alternative to fossil fuels has continued to increase. Most ethanol is currently produced from starch crops such as corn and beets. An alternative production method involves using lignocellulosic biomass and a biological intermediate. One such process uses the fungus *Trichoderma reecei* to break down the lignocellulosic biomass into sugar, which can then be fermented into ethanol in a process known as the simultaneous saccharification and fermentation process (SSF). This study deals with optimizing *Trichoderma reecei*'s ability to produce cellulase enzymes which are used to break down the lignocellulosic material. We have implemented a process for the production of these cellulase enzymes and are testing the effects of nutrient concentration, aeration, and temperature on the efficiency of this process.

BOARD JJ: GENETIC VARIATION WITHIN AND AMONG POPULATIONS OF LEMNA MINOR L. (DUCKWEED)

Justin Straub, Saint Olaf College, 1500 St. Olaf Ave, Northfield MN 55057

Analysis of genetic variation among six populations of *Lemna minor* L. (Duckweed) was studied using seven enzyme systems, which resolved nine loci; 50 fronds from each population were analyzed. The mean number of genotypes per population was 22.7, with a total of 86 clones detected in all populations. 62% of the clones detected were found in only one population, and 26% found in two populations, implying geographic barriers to dispersal. We believe sexual reproduction, contrary to expectations, creates the relatively high levels of variation observed within these populations. F_{ST} values were not significantly different from zero, indicating similar allelic frequencies among populations. Deviations from Hardy-Weinberg expectations were observed, but 64.8% of the loci examined conformed to expectations. An excess of heterozygosity was observed (mean $F_{IS} = -0.313$) for half of the loci. We have no compelling explanation for the high levels of heterozygosity; many factors (obligate outcrossing, ploidy levels, gene duplication, and selection forces) could play a role.

BOARD KK: THE CONSEQUENCE OF POPULATION SIZE AND FLORAL TRAITS ON SEED SET IN RUDBECKIA HIRTA

Christy Olson, Department of Ecology, Evolution and Behavior, University of Minnesota, 1987 Upper Buford Circle St. Paul, MN 55108

Pollinator visitation may depend on plant population size and floral traits, affecting fitness of insect-pollinated plants. In addition, species such as *Rudbeckia hirta* (Black-eyed Susan), that have a self-incompatible breeding system, require pollen from a donor with a different S-allele at the incompatibility locus. Smaller populations with lower S-allele diversity may decrease seed set. To examine the influence of population size and floral traits on seed set, inflorescences on twenty-five *R. hirta* plants were observed within two large and two small populations. Pollinator visitation was recorded for each inflorescence. As an estimate of fitness, seed set was

determined for all inflorescences. Multiple regression analyses determined the influence of floral traits, pollinator visitation, and population size on seed set. Population size accounted for most of the variation in seed set, with smaller populations having lower seed set. Variable floral morphologies significantly affected seed set when the data was pooled, but visitation traits were insignificant. Future field work will focus on insect visitation as a function of individual floral traits in one large population, and a greenhouse experiment will more directly determine the level of S-allele diversity within populations.

BOARD LL: INSECT HERBIVORES AND SEED SET IN AN ENDANGERED CALIFORNIA ENDEMIC PLANT

Erika Bailey, Division of Science and Math, University of Minnesota-Morris, 600 E 4th Street, Morris, MN 56267

Blennosperma bakeri (Asteraceae) is an endangered plant species occurring exclusively in California's Sonoma Valley. This small, yellow-flowered plant grows in temporary vernal pools – shallow depressions which catch winter rain and slowly dry up by summertime. In 1993, my advisor, Joan Leong, studied pollination processes of *B. bakeri* at a mitigation site. Mitigation sites are places where developers have to preserve or create vernal pools for other pools being destroyed. My part in this project involved counting and analyzing *B. bakeri* seed set and thrip abundance in restored, created and natural vernal pools. Preliminary analysis suggests a higher seed set in restored vernal pools than in created and natural pools. Thrip presence or absence did not seem to have an effect on seed set. However, these analyses did not include one variable of interest, the size of the flower patches. The size of the *B. bakeri* flower patches might affect the seed set within patches. My advisor and I are presently analyzing the additional variable of flower patch size.

BOARD MM: ECONOMIC CONSEQUENCES OF MODEL SELECTION ON AGRONOMIC INPUTS: NITROGEN ON ZEA MAYS L.

Joel Anderson, University of Minnesota-Morris, 600 East Fourth Street, Morris, Minnesota 56267

The value of corn production in the U.S. is nearly \$20 billion annually. Producers depend on nitrogen (N) fertilizer application rates that are determined by applying response models to yield data. When no single model fully explains yield-fertilizer relationships, consequences of selecting models must be examined. The purpose of this evaluation was to compare economic consequences of selecting common response models, namely a quadratic [$f(N_Q)$] function, a splined quadratic-plateau [Q/P] function, a hyperbolic tangent [$\tanh(N)$] function, and a Mitscherlich exponential [M_{EXP}] function in 40 data sets. Models were fitted to yield data collected over five years from a silt loam in which four tillage treatments, two hybrids and five N rates were used. Prices for corn, \$0.103 kg⁻¹, and N, \$0.392 kg⁻¹, were determined from historical data. For all models, average optimal economic N rates ranged from 89 to 209 kg N ha⁻¹. Root mean square error and r² values of the $f(N_Q)$, M_{EXP} , and $\tanh(N)$ models showed these models were better than the Q/P model. The $f(N_Q)$ model predicted larger corn yields and profits most often. Both $f(N_Q)$ and $\tanh(N)$ models minimized economic consequences of choosing an incorrect model.

BOARD NN: BEHAVIORAL EFFECTS OF NERVE GROWTH FACTOR IN SPINALLY-MEDIATED ANTINOCICEPTION IN MICE

Julie Knoll, Macalester College, 1600 Grand Avenue, St. Paul, MN 55105

The understanding of nociceptive (pain) pathways and possible ways to intercept them using drugs is an important facet of pain and neuroscience research. The purpose of this study was to determine the effect of spinally administered recombinant human nerve growth factor (rhNGF), a type of neurotrophin, on nociceptive processing in mice. The hot-plate thermal nociceptive assay was the behavioral technique used to assess this effect. It was found that intrathecal rhNGF had no effect on hotplate latencies when

administered in naive mice compared to control. It did, however, significantly reduce hyperalgesia in mice which had been pretreated with a bilateral intraplantar administration of carrageenan. Carrageenan is used to create a model of local inflammation similar to that observed with chronic pain such as arthritis. This effect of NGF was dose-related and blocked by co-administration of AG-879, a protein kinase inhibitor which acts as an antagonist of the NGF receptor, *trk A*. These studies seem to indicate that there is a change in spinal neurotrophin sensitivity in the carrageenan model of inflammation. This altered sensitivity may be due to a change in *trk A* receptor number or affinity.

BOARD OO: CHARACTERIZATION OF CARRAGEENAN-INDUCED HINDPAW INFLAMMATION IN THE MOUSE

K.E. Sloan, J.S. Knoll, R. Nakkash, L. Aanonsen, Dept. of Biology, Macalester College, St. Paul, MN 55105

Although a few laboratories have reported using carrageenan (carra) to induce an inflammatory response in the hindpaws of mice, there has yet to be a complete characterization of carra-induced hyperalgesia in this animal. The purpose of this study was to characterize the development of hyperalgesia, edema and leukocyte infiltration in mouse hindpaws that were intraplantarly injected with carra. Prior to injection, baseline responses to a thermal nociceptive test (hotplate, 54°C) were determined and paw widths were measured using digital calipers. Ten µl of 6% carra was injected bilaterally into the intraplantar surface of the mouse hindpaws. Paw widths and hotplate latencies were measured over a 48 hour period following treatment. Carrageenan produced a significant nociceptive response at 30-60 min post-treatment which was blocked in a dose-dependent manner by indomethacin. Paw widths of care-treated mice were significantly greater than saline controls throughout the time course. At several time points, planter tissue was removed, fixed and processed for light microscopy. Tissue from the carra group showed a much higher concentration of neutrophils and macrophages than the saline group. The hyperalgesia, edema and infiltration of immune cells observed in this study confirm that carrageenan induces an acute inflammatory response in mice.

BOARD PP: THE EFFECTS OF RADIATION ON DNA: THE ROLE OF ANTITUMOR DRUGS ON RADIATION DAMAGE

Michele Jacobson, Christine Carlson, and Abbas Pezeshk, Department of Chemistry, Moorhead State University, Moorhead, MN 56563

The radiation damage to DNA proceeds via two fundamental mechanisms. In one, damage is indirect since dilute aqueous solutions are studied at ambient temperatures. Under these conditions, the damage is largely confined to water molecules. In the other mechanism, damage is direct in which damage is primarily within the DNA molecule. We have been interested to study the direct damage processes using electron paramagnetic resonance (EPR) spectroscopy. Exposure of frozen aqueous solutions of DNA to gamma radiation at 77 K resulted in the formation of guanine-center radical-cations (G^{•+}) and thymine radical-anions (T^{•-}) or cytosine radical-anions (C^{•-}). These radical centers have been clearly identified. We have also investigated the effects of radio-protective agents and radio-sensitizers on the extent on the radiation damage to DNA.

BOARD QQ: MYOCARDIAL PRECONDITIONING: ISCHEMIC VERSUS PHARMACOLOGICAL

Elizabeth E. Painter, Peter L. Hoth, John N. Bachman, Cristine M. Reiling, and David G. L. Van Wylene, Saint Olaf College, 1500 St. Olaf Avenue, Northfield, MN 55057

Ischemic preconditioning of the heart is a phenomenon in which brief ischemia (low blood flow) induces enhanced tolerance against subsequent periods of ischemia. This study investigated ability of pharmacological preconditioning to mimic ischemic preconditioning. Tyramine, which causes norepinephrine release, and adenosine, which has been

proposed to mediate ischemic preconditioning, were used as pharmacological preconditioning agents. A coronary artery was snared and a microdialysis probe was used to sample myocardial interstitial fluid from the ischemic zone. Four groups of ketamine xylazine anesthetized rabbits were studied. All animals were exposed to 30 min. of regional ischemia and 2 hours of reperfusion. One of four treatments preceded ischemia: 5 min. ischemic preconditioning, adenosine preconditioning (200 µg/kg/min. for 5 min.), tyramine preconditioning (1.5 mg/kg bolus), or no preconditioning. The endpoints used to assess preconditioning-induced protection were; 1) an attenuated increase in purine metabolites during ischemia, and, 2) a reduction in the size of the ischemia-induced infarct. Ischemic preconditioning effectively reduced infarct size and attenuated purine metabolite accumulation. Both pharmacological preconditioned groups showed signs of intermediate reduction of infarct size without a significant reduction in purine metabolite accumulation. We conclude that pharmacological preconditioning can mimic some aspects of ischemic preconditioning but does not offer complete protection.

BOARD RR: THE EFFECT OF DEFIBRATION ON HYPERACUTE XENOGRFT REJECTION

Leif Dableen, Brad Chmielewski, University of Minnesota - Twin Cities

The role of fibrin in hyperacute rejection (HAR) is controversial. Fibrin has been thought to play an active role in the pathophysiology of HAR, but fibrin deposition in xenorejected grafts may only represent postmortem artifact (unrelated to the rejection process). To study this question, we used ancrod, a thrombin analogue derived from pit viper venom, and hirudin, a thrombin-inactivating compound derived from leeches. Ancrod cleaves fibrinogen to fibrin monomers, which are incapable of polymerization and are quickly degraded; the end result is fibrinogen depletion. Hirudin binds and inactivates thrombin, rendering it unable to convert fibrinogen to fibrin, but it does not affect fibrinogen levels. In our study, we performed guinea pig-to-Lewis rat heterotopic cardiac xenotransplants. We divided recipients into 4 treatment groups; untreated controls, heparin treated, ancrod treated, and hirudin treated animals. Serum samples were drawn to determine fibrinogen levels, aPTT, TT, and CH50 complement activity. Graft survival time was determined upon rejection. The coagulation data from animals in each of the three treatment groups showed effective dosing. However, survival time was only prolonged in the ancrod treated group. We then found that ancrod has a dramatic effect in decreasing CH50 complement activity. Inhibition of the complement system is known to prolong xenograft survival in this model and is likely responsible for the prolonged graft survival in the ancrod group. These findings suggest that fibrin does not play an active role in the temporal progression of HAR.

BOARD SS: MICROBIAL DEGRADATION ON ASPHALT

Holli Sprague, Bemidji State University, 1500 Birchmont Drive NE, Bemidji, MN 56601

The research of Microbial Degradation on Asphalt samples investigated microbial activity along Minnesota roadways. The test examined asphalt samples and soils from five districts, by submerging asphalt puck samples to observe the microbial activity in laboratory conditions. The soils were held in a container designated for each district and moisture content (i.e. Bemidji puck samples were submerged in Bemidji area soil at 30%,60% and 90% of field capacity). Control puck samples were put in a container of the same moisture contents, but not in soil. Pucks were then removed from the soil at three, seven, twelve and finally eighteen month periods. Tests of Alkalinity, pH, Nitrates, Nitrites, NH⁴-N, Total Nitrogen, Hydrocarbon and Total Phosphorus were done. Seventy-four isolates were found to belong to the genera *Pseudomonas*, *Micrococcus*, *Flavobacterium*,

Mycobacterium and *Pro-actinomyces* and *Actinomyces*. Tests concluded a direct correlation between microbial activity and the chemical composition due to the microbial degradation. A direct correlation was also found between microbial population in the soil and degree of degradation.

BOARD TT: IDENTIFICATION OF GENES HOMOLOGOUS TO THE PSEUDOMONAS SYRINGAE EPIPHYTIC FITNESS GENES *estA* AND *estB*

Timothy Schmitt, Concordia College, 275 N. Syndicate, St. Paul, MN 55104

Previous studies have discovered that two genes, *estA* and *estB*, affect epiphytic fitness in *Pseudomonas syringae*, a gram negative bacterium that is common to numerous plant species. The specific function and their conservation within the *Pseudomonads* and other epiphytic bacteria are poorly understood. In this study, *estA* and *estB* were isolated and used to probe genomic DNA from different species of bacteria for genes similar in sequence to the epiphytic genes *estA* and *estB* found in *P. syringae*. Genes homologous to *estA* were found to be conserved within a small group of *Pseudomonads*. The group of *Pseudomonads* possessing genes homologous to *estA* are closely related, based on previous r-DNA homology studies. A gene similar to *estB* is shared among all of the *Pseudomonads*. Curiously, other species of epiphytic bacteria, such as *Erwinia* displayed no such homology to either the *estA* or *estB* gene, although all epiphytic bacteria overcome the same set of harsh environmental conditions.

BOARD UU: TEMPERATURE DEPENDENCE OF THE SPUTTERING YIELD OF Ag/Cu ALLOYS

Christopher D. Hawes, Terrence D. Krueger, Kim W. Pierson, Department of Physics and Astronomy, University of Wisconsin-Eau Claire, Eau Claire, WI 54702

Measurement of the total sputtering yield of multi-phase Ag/Cu alloys as a function of temperature for normally incident 200 eV Ar⁺ at a dose of 3 x 10¹⁹ ion/cm² has been performed. The yield was a maximum at the lowest temperatures and decreases as the temperature increases. This difference in yield between high and low temperatures can be explained in terms of the development of an altered surface topography during sputtering. SEM micrographs reveal the presence of pronounced cones, ridges, and pebble-like features on the high temperature sample; whereas, at low temperature the sample surface is relatively smooth. A roughened surface will decrease the yield due to redeposition of the sputtered material onto neighboring features. Bombardment enhanced surface mobility accounts for the formation of the altered surface topography at high temperature.

BOARD VV: GENDER AND COMPUTERS: A LOOK AT THE SOFTWARE USED BY UPPER ELEMENTARY STUDENTS

Sarah J. Waddingham, Timothy J. Davis, Mankato State University, PO Box 8400, MSU Box 35, Mankato, MN 56001

The use of computers is now common in many classrooms (Kling, 1991) Research has shown that computer use is viewed as more of a male domain (Wilder, Mackie, & Cooper, 1985), however, it is not clear whether males and females use computers for the same reasons or whether they use them to do the same things. Therefore, the current study examined the different types of software employed by fifth grade boys and girls. It was hypothesized that software containing war games and sports would be more popular for fifth grade boys, whereas software that is art and learning oriented would be more popular for fifth grade girls.

BOARD WW: HYPERMNESIA AND RATIO OF REPETITION IN FREE RECALL

Brian Zaruba, Mankato State University, Phil Goernert Ph. D., Psychology Dept. P.O. Box 35, Mankato, MN 56002-8400

The present experiment examined whether free recall and organization of recall would increase over repeated testing. Twenty subjects were tested three times on their ability to recall words from a list of forty (eight groups of five words related by category) presented once in random order. The results showed that both free recall and ratio of repetition (the number of times a word from one category is followed by a word from the same category divided by the total number of words recalled) significantly increased across tests. It appears that hypermnesia (increases in recall over subsequent tests) may result from subjects increasing the organization of information contained in memory.

BOARD XX: PHYSIOLOGICAL CONCOMITANTS OF STORY-LISTENING

Julie Fiedler, St. Olaf College, 1520 St. Olaf Avenue, Northfield MN 55057

Storysharing, the process of sharing personal experiences (i.e., "stories") has generated considerable interest in the literature, with claims made for positive health benefits, or at least a sense of well-being among story tellers and story listeners. Anecdotal reports abound of a sense of well-being which follow listening to another speak of experiences that are also personally meaningful in a positive way to the listener. This study was designed to test whether there are reliable cardiac concomitants which covary with level of meaningfulness of stories listened to. Specifically, four measures of cardiac reactivity as a dependent variables were examined as a function of listening to material of three levels of personal meaningfulness as independent variables (non-story, story, and a personally meaningful story). Orders of presentation of the three types of materials were counterbalanced. Following relaxation instructions to establish baseline, Systolic, Diastolic, mean arterial blood pressure (MAP), and heart rate were measured automatically once per minute with a Critikon Vital Signs Monitor Model 1846. In an analysis of variance design, cardiac measures relative to individual baseline levels were contrasted. Implications for use of story listening as an intervention for cardiac health are discussed.

BOARD YY: VISUAL SEARCH FOR FACIAL EXPRESSIONS: WHY ANGER-SUPERIORITY?

Danny Madson, University of Minnesota, Morris, 600 East 4th Street, Morris, MN 56267

A computerized visual search task was used to test how fast college students can locate an angry face in a crowd of happy faces compared to a happy face in a crowd of angry faces. Hansen and Hansen (1988), using photographs of real human faces as stimuli, reported that search times for angry faces were faster and speculated that this "face-in-the-crowd effect" (FICE) was due to special, pre-attentive perceptual mechanisms that enable rapid detection of potential threats. We wanted to see whether the FICE would occur when the face stimuli were composed of identical primitive visual features, so we used simple line drawings that differed only in positioning of the eyebrows and curvature of the mouth (corners up in the happy face and corners down in the angry face). Preliminary data replicated Hansen and Hansen's basic finding. However, the results are best explained in terms of a more efficient serial (face by face) search for the angry targets, not a special threat-detection mechanism.

BOARD ZZ: INFLUENCE OF POSTEVENT CREDIBILITY IN THE REPORT OF EYEWITNESSED EVENTS

Shelly Wolesky, Winona State University-Rochester Center, 859 30th Avenue Southeast East Highway 14, Rochester, MN 55904

Previous research dealing with the effects of source credibility on eyewitness' memories has found that sources that are seen as credible by the eyewitness' are more likely to be believed and more often change the witness' original memory than do sources seen as not credible. The present experiment is an extension of the previous research testing if adults that witness an event are affected differently by the misinformation presented by a child or an adult. Twenty people were shown a video depicting a scene of a husband and wife arguing in their home. They were then given a narrative that contained some misinformation and some neutral information about four critical details. Subjects were randomly assigned to receiving one of the four possible narratives. Finally the subjects' memory for the original event seen was tested with a standard forced-choice recognition test. Accuracy and confidence levels were measured. The analysis found that witnesses were influenced by the postevent information presented by the two sources. However, source credibility did not affect witnesses accuracy differentially, $p > .05$.

BOARD AAA: ABANDONED FARMSTEADS OF EASTERN COTTONWOOD COUNTY MINNESOTA

Lisa M. Rainey, University of Minnesota, Twin Cities, Minneapolis, Minnesota, 55455

Farms in Minnesota have grown and fewer farm families are necessary because farm technology has changed. This has made farms redundant. Abandoned farmsteads are important indicators of farm change in Minnesota. The number of farms in Cottonwood County, MN has dropped from 2,063 in 1950 to 876 in 1992, while the average size of farms has risen from 200 acres to 428 acres. I have mapped the distribution of farmsteads in a nine-township study area in the peak year (1950) and the current farmsteads. I have interviewed local residents to determine why farmsteads have been abandoned in the area and to gain insight into changes in the agricultural economy and their relation to trends in farming as a whole.

BOARD BBB**A COMPARISON OF BIRD POPULATIONS IN TWO BORDERING HABITATS IN EASTERN BOLIVIA**

Bridget Anderson, Macalester College, 1600 Grand Ave., St. Paul, MN 55105

To ensure the conservation of migratory birds, knowledge of every environment they inhabit along their migration routes is required. In eastern Bolivia, which lies along major migratory routes for many neotropical bird species, two distinct ecosystems overlap -- wet tropical forests from the north and drier semi-tropical thorn scrub from the south. The purpose of our study was to set up a monitoring station to describe the bird communities in both of these habitats and record the relative number of migrants utilizing each throughout the year. We sampled birds in a small reserve in eastern Bolivia that contained patches of both semi-deciduous tall forest and chaco thorn scrub within its borders. Bird censuses were conducted in each habitat by mist-net capture and point-count census techniques. Many species were found exclusively in only one habitat and despite the two capture stations being less than 1km from each other, no individuals were captured at both sites. Our results suggest that many bird species have specific habitat preferences for either tall forest or chaco. In a time when many native habitats in and around Bolivia are being threatened this presents an argument for their preservation.