

1984

## Abstracts of Papers to be Presented at the 53rd Annual Spring Meeting of the Academy

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

---

### Recommended Citation

(1984). Abstracts of Papers to be Presented at the 53rd Annual Spring Meeting of the Academy. *Journal of the Minnesota Academy of Science*, Vol. 50 No.2, 9-24.

Retrieved from <https://digitalcommons.morris.umn.edu/jmas/vol50/iss2/3>

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](mailto:skulann@morris.umn.edu).

COLLEGE OF ST. CATHERINE, ST. PAUL, APRIL 26 & 27, 1985

(Papers Alphabetized By Author's Name Under Each Section)

(Reproduced as Submitted)

**BEHAVIORAL SCIENCE**

HUMAN FACTORS IN THE CREATION OF A COMPUTER AIDED DESIGN (CAD) WORKSTATION. Aaron Bartell, 209 15th Avenue South, St. Cloud, Minnesota 56301

Expert CAD users were tested in mockup workstations to determine the optimum physical layout and characteristics of response peripherals and color CRT displays. In terms of physical layout, results indicated that:

- \*\* the CRT with primary information should be located above rather than beside the screen
- \* with secondary information, and
- \*\* response dials should be located above rather than to the outside of the button console.

Both these findings are specific to the present CAD workstation. However, they emphasize the need to efficiently group eye movements as well as hand/arm motions when designing the User-Computer Interface.

In terms of color CRT display characteristics:

- \*\* a 60 Hz non-interlaced monitor is likely needed to avoid flicker in a raster display, and
- \*\* a graphics image must be updated at a minimum of 7.5 Hz to avoid jerkiness when rotated in 3-d.

Achieving these CRT performance levels may require more expensive computer equipment.

Finally, results indicated that human factors standards for text legibility (McCormick, 1976) must be modified if applied to CRT displays rather than to printed matter -- especially for color compared to monochrome CRT raster displays.

THE LONG LIFE OF STEREOTYPES VIS À VIS SUPERIOR RECALL OF INCONSISTENT INFORMATION: A PARADOX? C. Jazwinski, Psy Dept., St. Cloud State Univ., St. Cloud, MN

Research on social stereotypes points to their pervasiveness and longevity (Miller, 1982). However, recent findings point to a paradox: information inconsistent with person schemas appears to have a recall advantage over consistent information (Srull, 1981). If inconsistent information is so readily recalled, then how can stereotypes persist? An attempt to resolve this paradox is made by discussing: a/ differences between recall and recognition: here inconsistent information does not have an advantage (Jazwinski & Lamwers, 1983, 1985; Srull, 1981); b/ implications of recognition vs. recall for social judgment; c/ impression vs. memory sets (Hamilton, et al, 1980); d/ independence of information and judgment (Crocker, et al, 1983); e/ memory for individuals vs. groups (Stern, et al, 1984); f/ information order (O'Sullivan & Durso, 1984; Wyer, et al, 1984); g/ attributions (Crocker, et al, 1983); h/ set size; i/ informational uncertainty; j/ self-exposure to information (Jazwinski, et al, 1981); k/ person vs. role schemas; and l/ information overload (Srull, 1981).

OBSERVATIONS OF THE AUCA (WAORANI) INDIANS OF THE ECUADORIAN RAIN FOREST. L. L. LAMWERS, Dept. of Psychology, and L.G. SOROKA, Dept. of Earth Sciences, St. Cloud State University, St. Cloud, MN.

The "Free Auca" are native South Americans living in a 620 square-mile protectorate in eastern Ecuador near the Cononaco River. In the isolation of the jungle, the Auca remain semi-nomadic hunters and gatherers. They gather wild fruits and honey and hunt birds and monkeys using blowguns and curare-tipped darts. Fish are harvested by poisoning streams. Modest gardens of manioc and bananas are tended. When the gardens are depleted (after 2-3 months), the Auca replant and move to another clearing, usually one or two days walk away. Their primitive life style may be threatened by recent intensified oil exploration, and the changing attitude of the Ecuadorian government toward maintaining their isolated existence.

**BOTANY**

FREEZE SUBSTITUTION OF TYPHA ROOT FOR SCANNING ELECTRON MICROSCOPY. \*M.R. Young and I. Charvat, Department of Botany, University of Minnesota, St. Paul, MN 55108.

Fixation procedures for plant tissue for scanning electron microscopy generally call for chemical fixation, followed by dehydration and critical point drying. We processed pieces of Typha roots by this conventional method and obtained prominent longitudinal ridges and depressions on the external surfaces which were not present prior to the fixation. Distorted internal structures were correlated with the external depressions. Since this study requires good root preservation, we tested a procedure in which the specimens were frozen in liquid propane, cooled by liquid nitrogen, then the cellular fluids were substituted with dry acetone or osmium tetroxide in dry acetone at -85°C. After substitution the specimens were critical point dried, coated, and viewed. The absence of prolonged chemical treatment and rigorous dehydration schedules gave good preservation of the root structures needed to determine the location and extent of mycorrhizal colonization. For a number of years freeze substitution has been used to process fungal tissue for transmission electron microscopy (Howard and Aist, 1979. J. Ultrastruct. Res. 66:224-234). Our study shows the value of this method for SEM studies of large pieces of Typha tissue. Funded by BECO.

DAILY VARIATIONS IN THE SENSITIVITY OF SOYBEAN SEEDLINGS TO LOW TEMPERATURE. \*M. COUDERCHET and W.L. KOUKKARI, Botany Dept., University of Minnesota, St. Paul, MN.

Different groups of soybean seedlings [*Glycine max* (L.) Merr., cv. Corsoy] were exposed to 10°C for 4 minutes every four hours over a time span of 32 hours. Extent of injury was evaluated after approximately 10 days by determining the weight of the plants and chlorophyll content of the cotyledons. The amount of injury was related to the time of exposure and displayed a significant 24 h oscillation. Plants maintained under an LD 16:8 regime were least susceptible to cold injury during the early portions of the dark span. Subjecting plants to water stress reduced cold injury.

#### EFFECTS OF LIGHT SPANS ON THE MOVEMENTS OF PHASEOLUS VULGARIS L. SHOOTS.

\*R. W. Eisenberg, L. Carlson, W. L. Koukkari, Dept. of Botany, Univ. of Minn., St. Paul, MN.

Circumnutations of young *Phaseolus vulgaris* L. c.v. Kentucky Wonder plants were monitored under constant conditions using both manual procedures and a computer assisted video system. Generally, 120-150 min were required for one complete revolution of the stem tips. In many experiments, velocities ranged from 2.8-9.4 mm/min, although velocities as high as 22.8 mm/min were observed in some experiments. Great variability in velocity was found not only for an individual plant, but also among plants in the population. Experiments were designed to entrain the nutation movements by placing plants between two fluorescent lamps with opposing light/dark schedules. It appears that certain light/dark regimens may have an effect on the cycle and velocity of nutations.

GRAY DRIFT AFFINITY IN THE DISTRIBUTION OF THE PURPLE CONEFLOWER, *ECHINACEA ANGUSTIFOLIA* DC. (COMPOSITAE), IN MINNESOTA. W.L. Ezell, Dept. of Biol. Sci., St. Cloud State Univ., St. Cloud, MN.

The narrow-leaved purple coneflower (*Echinacea angustifolia*) is an inhabitant of dry prairies ranging from Minnesota to Saskatchewan and south to Oklahoma and Texas. In Minnesota, it occupies prairies west of a line joining Jackson, Nicollet, Becker, and Clay counties. Preliminary investigations of state distribution data suggest that this species is associated with prairie soils resulting from gray drift of the Des Moines Lobe of Wisconsin glaciation. This lobe, as the earlier Wadena Lobe, advanced from the Winnipeg Lowland across western Minnesota in a southeastern direction. Gray (or Des Moines) drift is composed of a yellow- or buff-colored clay and calcareous-rich deposits with abundant shale and limestone fragments. There are no reports of *Echinacea angustifolia* occurring in eastern Minnesota on the red (or Superior) drift which resulted from the Superior Lobe of Wisconsin glaciation; this lobe and other southwest-advancing lobes originated from the Laurentian Shield. Gray drift is relatively alkaline, whereas red drift tends to be acidic.

MYCORRHIZAL PLANTS FROM LEAD MINE TAILINGS IN WISCONSIN. \*E. Fuge, Department of Botany, University of Minnesota, St. Paul, MN. 55108.

Following a study by S. Tikalsky in 1981 in which the highly acidic mine tailings were manipulated to a more hospitable pH, previously barren spoils at Mineral Point, Wisconsin now support moderate vegetative cover. The soil and roots from nine prevalent plants including *Agrostis*, *Ambrosia*, *Achillea*, *Populus* and *Chenopodium*

were collected throughout the growing season. The roots were cleared and stained according to the methods of Kormanik and McGraw in *Methods and Principles of Mycorrhizal Research*, N. C. Schenck, ed. and examined with light microscopy for the presence of mycorrhizae. Roots of most plants were infected with hyphae and vesicles of vesicular-arbuscular mycorrhizae. Mycorrhizal spores from the rhizospheres of seven plants including *Agrostis*, *Achillea*, and *Chenopodium* were collected by sucrose centrifugation and identified.

CYTOCHEMICAL LOCALIZATION OF TRANSPORT PHOSPHATASE IN *PHASEOLUS VULGARIS*. Kay E. LaBoone, Biology department, Northern Arizona University, Flagstaff, AZ.

*Phaseolus vulgaris*, the bush bean, was studied to determine the pathways by which nutrients are transported to the developing embryo. Transport phosphatase is a plasma membrane associated enzyme which uses ATP energy both to transport K<sup>+</sup> and Mg<sup>2+</sup> ions and to cotransport amino acids and simple sugars. A modified Ernst technique was used for enzyme localization. Tissue is incubated with ATP substrate as well as Sr<sup>2+</sup> capture ion to lead to the formation of an electron dense reaction product which is observed on the electron microscope. Controls included incubation lacking ATP and a complete media with vanadate, a potent inhibitor of transport phosphatase. The reaction product, electron dense granules associated with the plasma membrane, was also differentiated from the less electron dense osmophilic material. The results would indicate that the nucellus, and portions of the endothelium play a role in embryo nutrition.

#### DYNAMICS OF ARBUSCULE DEVELOPMENT AND DEGENERATION IN ROOTS OF *TRITICUM AESTIVUM* L.

\*R. A. Meier and R. Toth, Dept. of Biol. Sci., N. IL Univ., Dekalb, IL; Botany Dept. U-MN, St. Paul, MN.

Three parameters of the vesicular arbuscular mycorrhiza (VAM) formed between *Glomus fasciculatum* and roots of *Triticum aestivum* L. were quantified. These were: 1) the percentage of host cell occupied by fungus V<sub>v</sub> (f,c), 2) the percentage of host cell occupied by host cytoplasm, V<sub>v</sub> (cy,c), and 3) the ratio of surface area of the host protoplast to the volume of the whole host cell, S<sub>v</sub> (pr,c) from 0.12 μm<sup>3</sup> (in an uninfected cell to 1.13 μm<sup>3</sup> (average maximum of a mature arbuscule). Since the protoplast shrank in volume upon infection, the S<sub>v</sub> of the protoplast to its own volume is greater (2.62 μm<sup>2</sup>/μm<sup>3</sup>) than the S<sub>v</sub> of the protoplast to the volume of the whole host cell. Arbuscular branch formation progressed slowly at first, but increased late in development as the arbuscule reached maturity (when branches occupied 20% of the host cell). Degeneration of branches also occurred rapidly after maturity of the arbuscule. At maximum, total fungus occupied 35% of the cell; 15% of that was trunk. Development and degeneration of the trunk progressed more linearly than that of the branches. The onset of arbuscule degeneration resulted in an initially sharp decline in all parameters studied.

EVALUATION OF FUNGICIDES FOR CONTROLLING *Pythium ultimum* ON GREENHOUSE-GROWN GERANIUMS. N.L. Olson and F.L. Pflieger, Departments of Horticulture



Science and Plant Pathology, University of Minnesota, St. Paul, MN 55108.

Pythium ultimum is commonly associated with root and stem rot disease on Pelargonium hortorum. Rooted cuttings of P. hortorum were planted in 10 cm plastic pots containing pasteurized soil inoculated with 200 colony forming units (CFU)/gm of P. ultimum to evaluate the efficacy of three fungicides labeled for floricultural crops. Metalaxyl at 18.7 ppm was completely fungicidal with no CFU of P. ultimum recovered 30 days after the first drench. At the same time, 72% of the CFU of P. ultimum were recovered from soil treated with Truban at 145 ppm and 34% of the CFU of P. ultimum from soil treated with 240 ppm Banrot. Isolates from controls inoculated with P. ultimum were found to be more numerous than those from any of the treatments with 81% of the CFU of P. ultimum recovered.

EVOLUTIONARY TRENDS IN THE FERN GENUS CHEILANTHES. T. Reeves, Div. of Sci. and Math, Univ. of Minnesota, Morris, MN.

Evolutionary trends in Cheilanthes are assessed using examples from subgenus Physapteris. In this subgenus simple trichomes have apparently arisen through two distinct pathways: 1) from broad scales by loss of width and 2) from ciliate scales by loss of lumen and all but one cilium. Development is traced of discrete indusoid segment margins and bicolored rhizome scales. Examples of parallelism and convergence involving members of different subgenera of Cheilanthes are identified and placed in taxonomic perspective. Emphasis is placed on the characters unifying members of subgenus Physapteris and providing the basis for recognition of cases of apparent (but not true) affinity. Several heretofore "difficult to place" species are included in subgenus Physapteris on the basis of type of leaf vernation and form of crosswalls in blade indument.

REPRODUCTIVE BIOLOGY OF MALAXIS UNIFOLIA (ORCHIDACEAE). L. M. Reeves\* and T. Reeves, Div. of Sci. and Math, Univ. of Minnesota, Morris, MN.

Studies of flowering phenology, floral morphology and flowering period, timing of changes in floral morphology and percent fruit set in a northern conifer swamp population of Malaxis unifolia Michx. are presented. The species possesses an average of 23 very small, green flowers per plant. A single leaf is usually present. Pollinating insects are identified and their behavior described. Microhabitat characteristics for the species are identified. An hypothesis explaining the lack of observed hybridization between this and other sympatric species of Malaxis (M. paludosa and M. monophyllos) is discussed.

FACTORS INFLUENCING THE INCIDENCE OF CERCOSPORA BETICOLA ON SUGAR BEETS. Janell M. Stevens\*, Hamline University, St. Paul, MN 55104 and Dr. Wm. Shane, Dept. of Plant Pathology, Univ. of Minn., St. Paul, MN 55108.

Field studies of factors that affect the infection of commercially planted sugar beets by

Cercospora beticola were undertaken, because this pathogenic fungus has recently become resistant to currently used systemic fungicides. The factors studied include: temperature, relative humidity, time, rotation, severities, planting date, cultivar susceptibility, number of fungicide sprayings, latitude and adjacency. Correlation data was tabulated and used to determine which factors influence the incidence of Cercospora beticola infection of sugar beets. Temperature and relative humidity strongly influence the incidence of the fungus. Adjacency and rotation may also be involved since crosstilling from a previously infected field led to an increase of incidence in the present field. The factors influencing the incidence of Cercospora beticola in sugar beets can be used to formulate a model which farmers can use to anticipate infection.

A MICROSCOPIC TECHNIQUE TO MEASURE MESOPHYLL SUCCULENCE. S.G. ZAHN and M.D. SUNDBERG\*, Dept. of Biology, University of Wisconsin-Eau Claire, Eau Claire, WI.

Mesophyll succulence (Sm), the ratio of water content to chlorophyll content of a cell or tissue, has been proposed as an index of CAM potential. In plant tissues where all cells contain chloroplasts Sm may be measured easily. If water tissue, parenchyma lacking chloroplasts, is present however, severe technical difficulties arise. We have developed a comparable index, based on morphometric techniques, which allows rapid determination of chloroplast to vacuole volumes in cells. There is a high correlation between the results obtained by these two techniques. Advantages of the microscopic technique include: more rapid determinations, fewer equipment needs, ability to be applied in the field, and no need to physically separate water tissues from photosynthetic tissues.

STOMATAL DISTRIBUTION AND SIZE IN XEROPHYTIC PLANTS. M.D. SUNDBERG, Dept. of Biology, University of Wisconsin-Eau Claire, Eau Claire, WI.

The results of a previous study led us to hypothesize that different stomate distribution patterns evolved in succulent vs non-succulent xerophytic plants. In the present study over 130 species, representing eight desert life forms, were examined for distribution and size of stomates. Succulent species had significantly fewer stomates per unit area than non-succulent ones. Similarly, the stomate length in succulents was significantly greater than in most non-succulent life forms. Although a trend of decreasing stomatal length with increasing density was apparent for all forms, there was a significant difference in the slopes of the length vs density regressions for succulent vs non-succulent forms.

CONTROL OF HYDROLASES IN A REGULATORY MUTANT OF SCHIZOPHYLLUM. \*F. Tang, I. Charvat and K. Klein, Department of Botany, University of Minnesota, St. Paul, MN. Department of Biology, Hamline University, St. Paul, MN.

Colonies of a regulatory mutant of Schizophyllum commune were grown for 4 to 18 days on membranes covering either a defined solid medium or a complete

medium (undefined). Extracts of these colonies were used to determine activities of acid phosphatase and B-N-acetylglucosaminidase in the supernatant. When colonies were grown on the defined medium, the specific activity curves for both enzymes were similar to each other but different from those obtained for wild-types, two homokaryons and a dikaryon. The activities of the mutant increased to a peak at nine days, then decreased significantly, followed by a second increase which was correlated with the colonies reaching the edge of the plate. In contrast, the specific activities of both hydrolases fluctuated from 4 to 12 days, then finally showed a significant increase on day 13 when the colonies covered the plate. The data supports the hypothesis that this imidazole resistant mutant (Klein and Deppe, 1985. Genetics 109: 333-339) with a modifier regulates hydrolases differently than wild-types do.

MYCORRHIZA IN *Typha* spp. C.L. VAUBEL, Dept. of Botany, University of Minnesota, St. Paul, MN.

*Typha* from five different sites with varying water levels were examined for mycorrhiza. Sites were by the University of Minnesota St. Paul campus (A), by a golf course in St. Paul (B), and on Cedar Lake in Minneapolis (C-E). Whole plants were uprooted after severing the rhizomes, and the substrate was rinsed off. One cm sections of *Typha* roots were preserved in FAA. The sections of root were digested in KOH and stained with trypan blue in lactophenol. The procedure was modified from Phillips and Hayman (1970, Improved Procedures for clearing roots and staining parasitic and vesicular-arbuscular mycorrhizal fungi for rapid assessment of infection. *Trans. Br. Mycol. Soc.* 55, 158-163). The presence of endogonaceous mycorrhiza was verified in 1983, indicating a high level of infection. Mycorrhizal hyphae and/or vesicles were present at all sites, being found in 13 of the 15 samples. No correlation was evident between the water depth and the presence or absence of mycorrhiza. A year later, collections from patch B where mycorrhizae were particularly prevalent were no longer heavily mycorrhizal. It is possible that water levels were unusually low preceding the initial collections.

#### BUSINESS & ECONOMICS

PRIVATE RETURN OF RURAL-URBAN MIGRATION IN LESS DEVELOPED COUNTRIES: A CASE STUDY IN INDIA 1961-71. Tahmoures A. Afshar, Dept. of Business Admin., Moorhead State University, Moorhead, MN

The study attempts to contribute to the literature on Third World migration by examining the economic effects of rural-to-large city migration from individual point of view in the context of a major LDC, India.

Rural male workers--whether skilled or unskilled, relatively young or more mature--were found to improve their economic situation by moving to Bombay. Moreover, earlier migration was superior to delayed migration in terms of expected NPVs of lifetime earnings. Among different age cohorts still in the countryside, mature workers receive relatively large rewards compared to workers at other ages.

Based upon the results of this study, it can be claimed that all rural workers who moved to urban areas in India about 1971 were better off than those who remained behind.

SUNFLOWER GROWERS' BEHAVIORS, ATTITUDES, AND BELIEFS. M.W. Alexander, Dept. of Bus. Adm., Moorhead State Univ., Moorhead, MN.

Using an expectancy-value model to provide the theoretical orientation, measures of behavior, behavioral intentions, attitudes toward the behavior, beliefs relating behaviors to attributes, and importance of the attributes were elicited from a sample of North Dakota, South Dakota, and Minnesota sunflower growers. Significant relationships between attitudes, behavior, behavioral intentions, and beliefs were expected and found for most behaviors. Importance of the attributes, however, tended to attenuate the attitude-belief and behavior-belief relationships. Future research should (1) elicit the attributes from the sample rather than specify them a priori and (2) measure beliefs about the behavior rather than about the seed company. The findings are of particular interest to sunflower seed companies wishing to conduct research on their customers.

LOCATION DECISIONS OF MINNESOTA FAMILY PRACTICE PHYSICIANS. Theodore M. Breu, Dept. of Business Administration, Univ. of Minn.-Duluth, Duluth, MN.

This paper reports on the use of factor analysis in a preliminary study to determine the major constructs in a physician's practice location decision. In order to determine these constructs, this study relied on a comprehensive mail survey of all Minnesota family practice and general practice physicians. Variables thought to be important in the location decision were determined to include professional interest variables, life-style dimensions, financial motivations, community recruitment effects, and perceptions of medical need in the area. Factor analysis was used to reduce the original set of 29 variables into a smaller set of constructs. This reduced factor model is more efficient in that a single factor (combination of variables) explains more of the response variation than any one variable acting alone. Physicians were categorized according to ruralness of location. The first factor extracted for each physician group was the "availability of medical support services" construct. Lifestyle was also extracted early, along with a "geography/climate/recreation" dimension. Other dimensions were also extracted, though at a lower level. We note the lack of prominence of monetary motivation factors.

A STUDY OF THE GRAIN BUFFER STOCK POTENTIAL IN INDIA. Ashok Chowdhury, Department of Economics, Mankato State University, Mankato, Minnesota.

Food grains production in India is highly affected by the prevailing weather conditions and, therefore, experiences wide fluctuations from one year to another. These fluctuations in food production create uncertainties in food supply, prices, and farm income. A grain reserve program, if operated under certain rules by the government, may help in reducing these uncertainties. An econometric model to analyze such a buffer stock program, therefore,

has been developed. The present study makes an attempt to quantify the effective size of such a stock and also evaluate costs and benefits of such a program.

LOAN COMMITMENTS: A MICROECONOMIC INVESTIGATION by Robert Elder, Macalester College, St. Paul, MN 55105

This paper seeks to offer an explanation for the legally binding loan commitment arrangements that some commercial and industrial firms have with commercial banks. In pursuit of this objective, the negotiation, by a firm and a bank, of loan commitment contracts is modeled under various assumptions about the sources of uncertainty faced by each party and the attitudes toward risk displayed by each party. While it is shown that several scenarios exist for which commitments will be established, only one such scenario produces commitments which bear attributes similar to those appearing in commitments actually established between commercial and industrial firms and commercial banks. It is concluded that the negotiation of these particular contracts results from risk-averse behavior of banks and firms in an environment characterized by uncertainty with regard to the firm's future credit needs, the bank's future provision of spot credit, and the future level of the spot loan interest rate.

AN ECONOMIC ANALYSIS OF THE SALARY CAP IN THE NATIONAL BASKETBALL ASSOCIATION. DAN GALLAGHER, Dept. of Economics, St. Cloud State Univ., St. Cloud, MN

The labor market in professional team sports is characterized by restrictive contractual arrangements known collectively as the player reservation system. The primary purpose of the reservation system is to restrict bidding for players in order to create a balance of talent. The NBA has recently inaugurated a novel approach to restricting bidding on players, a cap on team salaries. The paper analyzes the impact of the cap on player salaries, team profits, and the distribution of talent. The paper also analyzes the relative gains from the new agreement between owners and players and contrasts with alternative approaches. The conclusions are that player salaries will be substantially reduced, league profits will rise, and greater balance of talent will result. The contractual arrangement is difficult to explain when one considers the strong position of the players' association going into the negotiations.

ECONOMIC DEVELOPMENT AND INCOME DISTRIBUTION: KUZNETS' U HYPOTHESIS REVISITED. D.P. HADJIYANIS, Dept. of Econ., College of St. Thomas, St. Paul, MN.

This study is a survey of the most important empirical works on Simon Kuznets' inverted U hypothesis which suggests that the country's distribution of income becomes more unequal during the "early" phases of development and less unequal in the "later" years. There has been as much support for this hypothesis as there has been rejection of it. A re-

view of the models, methodology and the data used casts a serious doubt on the inevitability of the hypothesis. While many of the cross-section analyses do not reject it, there is a great risk in using unwisely cross-country data to analyze temporal changes. The data are notoriously deficient and unreliable. The value and stability of the parameters and the statistical inference on their signs are suspect; it has been shown that there is a high sensitivity of the estimates to variations in the sample and/or in the method of measuring income distribution. Historical data on individual countries would be the most appropriate to use, and yet less than half of the countries examined give some credence to this hypothesis. No causal relationship has been convincingly established. In fact, the reverse relationship, income distribution affecting economic growth, has, in recent years, been theorized even though not empirically investigated.

A TEST OF THE EASTERLIN THEORY ON THE DETERMINANTS OF FERTILITY BEHAVIOR. Randall S. Johnson, St. Olaf College, Northfield, MN.

Richard Easterlin's hypothesis of intergenerational determinants of fertility behavior is examined in a cross-sectional context using 1980 U.S. Census data for cities and SMSAs above 250,000 population. Least-squares regressions are run on both completed and incomplete fertility measures, controlling for inter-city cost-of-living variations and other personal, social and demographic factors. Generally supportive of the Easterlin hypothesis, it was found that a positive relationship exists between second generation fertility and own earnings, and an even stronger negative relationship is apparent between second generation fertility and parental (first generation) earnings during the childhood of the former group. The effect of the presence of siblings on fertility in the second generation is inconclusive.

PERCEPTIONS OF FINANCIAL PLANNING SERVICES. Rose K. Reha, Department of BEOA, St. Cloud State Univ., St. Cloud, MN

Due to the relative newness of financial planning, many people are unaware or unfamiliar with the service that financial planners offer. However, when presented with some ways they might utilize this service, most of the respondents felt that they would utilize a financial planner for improving their investment portfolio and sheltering their income from taxation. Also, a significant number of respondents (76%) said that they would want budgeting advice from a financial planner.

Although the readings indicated that the majority of financial planners charge on a commission basis most of the respondents in this survey said they preferred to pay a flat fee for such a service. The number of respondents who had seen a financial planner was evenly distributed in all income categories. The majority of respondents in all income levels thought that financial planning should begin at the \$30,000 to \$40,000 income level.

Because so many of the respondents in this study hold to the traditional view of a financial plan-



ner as a consolidator of debt, or as a budget advisor, today's financial planner may do well to use this perception as a means for attracting new clients in the short run.

#### PRODUCTION SCHEDULING ON MICRO-COMPUTERS

Kenneth L. Rich, The College of St. Catherine, St. Paul, MN.

The focus of this paper is to examine the place of micro-computers in business and in particular in production scheduling. To gain some perspective, first, the introduction of micro-computers into a manufacturing company is described. This is done so with an eye toward understanding organizational problems as well as costs and benefits. With this background, the development of a production scheduling program is described. The program design had to consider the many criteria used by the production control manager and yet meet the time and budget requirements. There were two aspects of this. First it was necessary to design a model to consider various factors including lead times, probabilities of completion, and re-work cycles. Secondly, the program had to fit within the capacity of the micro-computer equipment then available. The resulting model was a program which while might be unsatisfactory to a professional programmer but met the needs of the production department. The cost/benefit of argues for the value of using micro-computers for some jobs still thought to require a mainframe.

#### CHILD SEX PREFERENCE AND FAMILY SIZE DECISIONS.

Ved P. Sharma, Department of Economics, Mankato State University, Mankato, Minnesota 56001.

Parents care about the sex (gender) of their children. In many societies, a strong male bias is alleged to exist. The high premium placed on the bearing of sons as opposed to daughters may be due to economic and social factors which raise the price of daughters relative to that of sons (Price Difference). In addition, "taste" factors may be operating (Sex or Gender Concern).

This paper develops a simple utility maximizing model to analyze the effects of sex bias on the choice of family size. According to the model, the direction of influence of sex bias on the desired family size depends on whether the sex bias originates in taste difference or price differences. Specifically, other things held constant, desired family size will be greater in the "gender concern" situation and smaller in the "price difference" situation. The model is also used to answer the dynamic question: Which parents are more likely to have a desire for additional children.

Effects of sex bias on family size are tested with a data set containing a sample of 6,300 observations. The overwhelming evidence is: if parents do not have one male child the likelihood of their having additional children is very high.

#### SEGMENTED EVALUATION OF HISTORICAL MUSEUMS.

R.O. SIELAFF, School of Business and Economics, University of Minnesota Duluth, Duluth, MN

Evaluation of historical museums by visitors may involve inherent bias based on demographic factors.

This study indicates that there may be bias in evaluations when respondent income levels are quite different. A total of 31.0% of those with household incomes of \$25,000 or more rated a museum as excellent, while 6.7% of those with household incomes below \$25,000 rated the museum as excellent. A total of 1.2% of those with household incomes of \$25,000 or more said they were uncertain about their rating, while 8.3% of those with household incomes below \$25,000 said they were uncertain. The chi square for the table was 20.24277 with 5 degrees of freedom and a significance of .0011.

Results were less significant for age, sex and residence of visitors.

Demographic factors may be important in creating evaluation bias, because they may reflect variations in cultural standards.

#### FORECASTING STATE TAX REVENUES: A SIMPLE ALTERNATIVE. \*D.N. STEINNES, S.Q. WONG, Dept. of Econ., Univ. of Minn.-Duluth, Duluth, MN

Recently the State of Minnesota experienced a fiscal emergency as a result, in part, of an inability to accurately forecast tax revenues. The approach used by the State is based on an econometric model that attempts to specify the linkages between the national and state economies. Such econometric models have been challenged because of their inability to forecast by those who propose a more mechanical, or statistical, approach. While econometric models estimate equations specified by theory, the statistical approach finds the best "model," or forecasting equation based on statistical criterion alone. Using a forecast error fitting criterion, recent studies have shown that one fitting approach, vector autoregression (VAR) can outperform econometric models. Given the complexity of VAR, as opposed to some simpler statistical approaches available, a question arises as to whether VAR significantly out-forecasts such naive methods. In this paper a simple time series method, Box-Jenkins analysis, is used to forecast monthly revenues for Minnesota using data from 1970-84 and the results compare favorably to VAR and econometric models for both aggregate (total tax) and disaggregated (sales and income tax) specifications.

#### LINCOLN LAKE RESORT AND CAMPGROUND. David J. Thomas, Management and Finance Department, Gerard Ford, Marketing and General Business Department; St. Cloud State University, St. Cloud, MN.

Lincoln Lake Resort and Campground is within fifty miles of St. Cloud, has fifteen cabins and forty campsites situated on forty-two acres of wooded land adjoining Lincoln Lake. Ten of the campsites are for tents, fifteen have water and electric power, and fifteen more have water, electricity and sewer hook-ups. The present owners, John and Elsie Law have owned the resort for twenty-three years. The paper will review the occupancy of the resort by month and present the most current annual income statement. The authors will review current problems involved in the resort owners maintaining their market.

The article presents a micro-economic view of the Minnesota tourist industry.

THE IMPACT OF A FOREIGN TRADE ZONE UPON ECONOMIC DEVELOPMENT. A. CLYDE VOLLMERS, PETER GEIB, AND KATHLEEN VOLLMERS, Dept. of Bus. Adm., Moorhead State Univ., Moorhead, MN.

Public and private planners are constantly searching for alternative strategies that can be utilized to enhance the local economy. One institution which has received extensive interest during the last decade has been the foreign trade zone. This study examined the impact that new zones have had upon local economies. Ten zones were surveyed that served small inland communities. These zones report that the zone had little impact but that as part of a larger economic development authority, a foreign trade zone can prove useful in attracting new or retaining existing business firms. The key element in the level of zone use seemed to be the management. And minimizing the amount of capital investment also was critical. Based upon the results of this study, the authors recommended that the communities of Fargo, North Dakota and Moorhead, Minnesota proceed with the development of a foreign trade zone. The use of existing facilities and cost effective marketing and management strategies should minimize the risk while maximizing the potential economic activity.

LEGAL AND ETHICAL CONSIDERATIONS OF SEXUAL RELATIONS BETWEEN THERAPISTS AND CLIENTS. WAYNE R. WELLS\*, Dept. of Marketing and General Business, and RICHARD J. SEBASTIAN\*, Dept. of Management and Finance, St. Cloud State University, St. Cloud, Minnesota.

This paper addresses the current ethical, civil, criminal, and administrative ramifications of sexual relations between therapists and clients. This topic is currently attracting considerable attention within the mental health profession and outside of it by the media, courts, and legislatures. The paper will focus on specific factual circumstances that have resulted in civil liability, criminal liability, licensing sanctions, and negative professional consequences. Additional discussion will be directed toward new developments in this increasingly visible area.

THE ECONOMICS OF RESIDENTIAL WOOD BURNING: A CASE STUDY OF BEMIDJI, MINNESOTA. Dr. Robert D. Ley, Mr. Pat Welle, Dept. of Economics, Dr. Spigarelli, Dept. of Environmental Studies, Jenny Wettersten\* and Linda Kingray, Research Assistants, Bemidji State University, Bemidji, Minnesota.

The purpose of this project is to compare the atmospheric emissions from residential wood burning with other combustion sources; explore potential environmental and economic impacts from wood burning; identify the benefits of using wood as a fuel; assess the cost differentials resulting from burning wood as opposed to other energy sources; evaluate the public awareness of the environmental impacts of wood burning; and, to estimate the dollar value attached to the environmental damage associated with residential wood combustion. These objectives are to be accomplished by: (1) a survey of the literature, (2) a questionnaire distributed in the Bemidji area, and (3) econometric analysis. The econometric analysis provides statistical evidence that the perceptions and economic valuations of wood burning vary

with socioeconomic characteristics, and with use of wood as a heat source.

## CHRONOBIOLOGY

DIFFERENCES IN PARAMETERS OF CIRCADIAN ADRENOCORTICOL RHYTHMS BETWEEN YOUNG AND OLD SUBJECTS. \*D.J. Lakatua, G.Y. Nicolau, L. Plinga, C. Bogdan, E. Petrescu, E. Ungureanu, E. Robu, L.L. Sackett-Lundeen, and E. Haus, St. Paul-Ramsey Med. Ctr./Ramsey Clinic, St. Paul, MN; "C.I. Parhon" Inst. of Endocrinol. and Berceni Clin. Hosp., Bucharest, Ro; Sec. of Endocrinol., Dist. Hosp. Tirgoviste, Tirgoviste, Ro.

The plasma concentrations of aldosterone (ALDO), cortisol and dehydroepiandrosterone-sulfate (DHEA-S) were determined by radioimmunoassay in 24-hour profiles consisting of 6 samples each, collected at 4 hour intervals. A total of 124 profiles were studied in 63 elderly men (75±7 yrs of age), 154 profiles in 86 women (79±8), 42 boys (11±1.5) and 51 girls (11±1.5 yrs of age). Rhythm evaluation was done by single and population mean cosinor analysis and the Bingham Test. The boys and girls showed a statistically significantly higher circadian mesor and amplitude in plasma ALDO and a higher mesor in plasma cortisol than the elderly subjects of the same sex. In DHEA-S, the girls only showed a higher mesor and amplitude than the elderly women. In both sexes the DHEA-S acrophase in the elderly subjects preceded that of the children. The acrophases preceded the elderly in the girls in plasma ALDO, and in the boys in plasma cortisol.

CIRCADIAN AND SEASONAL VARIATIONS OF PLASMA TESTOSTERONE (T), DEHYDROEPIANDROSTERONE-SULFATE (DHEA-S), 17-OH PROGESTERONE (17-OH PROG), FSH AND LH IN ELDERLY MEN AND WOMEN. \*G.Y. Nicolau, D.J. Lakatua, C. Bogdan, E. Petrescu, E. Robu, H. Berg, L.L. Sackett-Lundeen and E. Haus, "C.I. Parhon" Inst. of Endocrinol. and Berceni Clin. Hosp., Bucharest, Ro; St. Paul-Ramsey Med. Ctr./Ramsey Clinic, St. Paul, MN.

A total of 278 circadian profiles (6 plasma samples/24 hr span in 4 hr intervals) were studied in 63 diurnally active men (75±6 yrs of age) and 86 women (79±8 yrs of age), during 18 months covering all seasons. T, DHEA-S, 17-OH Prog, LH and FSH were determined by radioimmunoassay. The circadian rhythms were evaluated and quantitated statistically by the single and population mean cosinor procedure and the seasonal variations by two way ANOVA. Circadian rhythms of comparable timing were found in both sexes in T, DHEA-S, and 17-OH Prog. FSH and LH showed low amplitude rhythms which were statistically significant for LH in the women and in men and women pooled, and for FSH for the men only. Statistically significant seasonal variations or possible circannual rhythms were found in men and women in DHEA-S, and in men only in LH. Testosterone showed a statistically significant seasonal variation in both sexes, but with a marked phase difference.

SEASONAL VARIATIONS AND SEX DIFFERENCES IN CATECHOLAMINE EXCRETION IN CHILDREN. \*L.L. Sackett-Lundeen, D.J. Lakatua, G.Y. Nicolau, L. Plinga, E.



Petrescu, E. Ungureanu, A. Jachimowicz and E. Haus, St. Paul-Ramsey Med. Ctr./Ramsey Clinic, St. Paul, MN; "C.I. Parhon" Inst. of Endocrinol., Bucharest, Ro.; Sec. of Endocrinol., Dist. Hosp. Tirgoviste, Tirgoviste, Ro.

Urine was collected in 4 hour intervals over a 24-hour span in 87 boys and 106 girls  $11 \pm 1.5$  years of age. Subgroups of subjects of both sexes were sampled during each of the four seasons. Free epinephrine, norepinephrine and dopamine were determined by HPLC. Circadian periodicity was evaluated by single and population mean cosinor and the Bingham Test, and the seasonal variations and sex differences by one way and two way ANOVA. Circadian periodicity was ascertained ( $p < .05$ ) in both sexes. A seasonal variation or possible circannual rhythm was found in the entire group in urinary norepinephrine ( $p < .0001$ ) and dopamine ( $p = .0004$ ) with peaks in winter and summer-fall respectively. A sex difference was found in the circadian mesor and amplitude of free epinephrine excretion with higher values in the boys.

#### ECOLOGY/NATURAL AREAS

SPECIES AND SPATIAL ANALYSES OF BIRCH DIEBACK IN URBAN AREAS. J. BALL, Hort. Tech. Dept., University of Minnesota Technical College, Waseca, MN.

Birch dieback, the gradual decline of birch, is common throughout urban communities of the northern United States. Birch dieback is a dieback-decline complex that is initiated by environmental stress followed by colonization by an insect or disease. A major concern is which birch species are most susceptible. Another major question is what is the dieback's pattern of spread within urban areas.

Beginning in 1977, a survey was made of birch in the city of Okemos, Michigan. The survey took note of the species, location and condition of every birch within the city. This was repeated every summer through 1982.

Over the six years paper birch (*Betula papyrifera*) remained unaffected by the dieback. Gray birch (*B. populifolia*) was slightly affected while the European white birch (*B. pendula*) population declined significantly. The European white birch appeared to die in pockets that expanded over the time of study.

THE RELATIONSHIP BETWEEN LIFE-HISTORY TRAITS AND PRODUCTION-TO-BIOMASS (P:B) RATIOS IN FRESHWATER CLAMS (BIVALVIA: PISIDIIDAE). Daniel J. Hornbach, Dept. Biol., Macalester College, St. Paul, MN 55105

Many factors have been shown to affect annual P:B ratios in benthic invertebrates, but few studies have focused on variations within a taxon. Annual values of P:B vary from 1.0 to 14.0 in 17 populations of pisidiids. Members of the genus *Pisidium* had significantly lower P:B values (mean = 2.3) than members of the genera *Sphaerium* and *Musculium* (means = 4.0 and 8.2 respectively). There was no habitat effect on P:B. Significant + correlations were found between P:B and maximum adult shell length (MAX SL) and young produced per brood (YOUNG/BROOD), while - correlations were found with lifespan (LIFE), number of broods produced per year (BROODS/YR) and age at first reproduction (AFR). No correlation was found between P:B and

size at maturity, reproductive effort or assimilation efficiency. The canonical correlation between P:B and the variate of MAX SL, YOUNG/BROOD, AFR, BROODS/YR and LIFE was 0.91. The variate of P:B correlated best with YOUNG/BROOD (+) followed by BROODS/YR (-), LIFE (-), AFR (-) and MAX SL (+). This multivariate analysis stress the importance of life-history traits other than voltinism on variations in annual P:B ratios.

MINELAND RECLAMATION ON THE IRON RANGE. John T. Infelise, Biology Student, College of St. Thomas, St. Paul, MN.

Recently, reclamation on abandoned iron ore mines has been on the upswing. Various techniques are being used to make wastelands more receptive to wildlife, and more appealing to the eye. Techniques include: direct seeding, vermeer transplanting, bareroot tree planting, and containerized tree planting. At the Hill Annex Mine in Calumet, in their specially designed growth chamber, containerized seedlings are continually being improved. The major species grown in the growth chambers are: jack pine, white spruce, colorado spruce, red pine, birch, caragana, and box elder. These species have shown the best survival on soils which lack nutrients, hold little moisture, and are very compacted. Through work in the growth chamber and experiments in the field, survival percentages are increasing. At this point, we have a 75-80% survival rate for jack pine and a slightly lower percentage for the other species.

TOXICITY OF Zn AND Al TO THE FRESHWATER BIVALVE, *MUSCULIUM PARTUMEIUM*. Patricia E. Rose<sup>1</sup>\* and Daniel J. Hornbach. Dept. Biology, Macalester College, St. Paul, MN 55105

Acidification of freshwater habitats can decrease pH and increase the solubility of heavy metals. This increase in metal ion concentration may be responsible for the decreased survivorship of many aquatic organisms. In this preliminary study we attempted to assess the effects of varying concentrations (0.05-10 mg/L) of 2 metals (the chlorides of Al and Zn) on the survivorship of *M. partumeium* at a pH of approximately 6.3 (normal field pH). A series of choline chloride concentrations was utilized to control for deaths due to increased Cl<sup>-</sup>. No deaths were observed in the highest concentrations of Zn and Al (10 mg/L) for the first 7 days. After this time, deaths were noted in 10 mg/L Zn but the first deaths in 10 mg/L Al didn't occur until day 20. The LD<sub>50</sub> for Zn decreased from day 13 reaching an asymptotic value of 3-4 mg/L after day 20. The LD<sub>50</sub> for Al remained above 10 mg/L through day 25 and declined slowly after that. These data indicate that *M. partumeium* is fairly resistant to Zn and Al toxicity. Many deaths occurred at high concentrations of choline chloride possibly due to high Cl<sup>-</sup> and low metal ion concentrations.

WATER SHREWS IN MINNESOTA. D.L. Rubelke\* AND S.G. SAUPE, Biol. Dept., College of St. Benedict, St. Joseph, MN.

The purpose of this study was to better understand the distribution of water shrews (*Sorex palustris*) in Minnesota. Ten sites in semi-aquatic aquatic habitats in central (Stearns Co.) and north-

ern (Clearwater Co.) Minnesota were trapped from June-August 1983. This effort (8148 trap nights) resulted in 190 captures representing 10 species. Water shrews captures were rare; only 7 were taken during this study. Trapping success ratios for all species in the two study areas were similar, but water shrews were three times more abundant in the Stearns Co. sites. Continuous-selective trapping was more effective for capturing water shrews than saturation or water-surface trapping. Water shrews were associated with moving streams bordered by grass-sedge marsh and mud flats characterized by frequent flooding. Grass hummocks may be an important feature of water shrew habitat. There appeared to be a positive correlation between water shrews and beaver activity. *Zapus hudsonicus* occupied every site in which water shrews were found and may be a positive indicator for this species. *Sorex cinereus* and *Peromyscus* spp. may indicate sites unfavorable to water shrews.

#### GEOLOGY/SOIL SCIENCE

MODELING THE HORSESHOE CHAIN OF LAKES. B. ALLIE\*, C.L. NELSON, K.M. KNUTSON, Depts. of Earth Sci. and Biological Sci., St. Cloud State Univ., St. Cloud, MN.

A small model of the Horseshoe Chain of Lakes, Richmond, Minnesota, accurately predicts velocities, pathways, and stagnation areas of the flow of the Sauk River through the lakes. Discharges were determined from field data. Three discharge imprints: low, average, and high were computed for the model. An accurate systolic pump was used to simulate discharge. Time lapse photography of dye injection tracing allowed pathways and stagnation areas to be determined. Input density was varied to simulate prototype density variations. Dye injection tracings were undertaken on the prototype lakes. Using maps constructed from model tracings, model versus prototype pathways were compared. The model had an accuracy of less than 3% error. Several stagnation areas were known in the prototype but the reason for their existence was unknown. The model accurately illustrated the flow characteristics of the prototype which explained these areas. The model was developed to establish monitoring sites affected and unaffected by the Sauk River in the lake chain. It will be a powerful tool in determining pollution pathways, biomass transport and distribution.

UPPER CRETACEOUS PALEOTECTONISM IN NORTH-CENTRAL NEBRASKA. David A. Scheer, Dept. of Earth Science, St. Cloud State Univ., St. Cloud, MN.

Upper Cretaceous deposition was influenced by paleotectonism along the Transcontinental Arch (Weimer 1978). The Carlile shale and Niobrara formation of north-central Nebraska have been correlated through the use of mechanical log interpretations. Based on this data, isopach maps of these units in conjunction with structure contours of the overlying Ardmore bentonite reflect 2 discordant periods of paleotectonism. The interval from the top of the Greenhorn limestone to the base of the Niobrara indicates that tectonism occurred contemporaneous with deposition while a period of apparent quiescence occurred during Niobrara deposition.

CHARACTERIZATION OF A CLASS I-LIKE GENE. A. Cerne, Dept. of Microb., Univ. of Minn., Mpls., MN  
Molecular analysis of human genomic DNA indicates the presence of 15 to 20 genes structurally related to the HLA (human leukocyte antigen complex) class I -A, -B, and -C loci. The specific objective of this study is the description of these class I-like genes on the basis of genetic mapping, sequence analysis, and differential expression. Screening of a human genomic library using the cDNA clone of HLA-B7 has resulted in the isolation of several cosmid clones positive for HLA class I sequences. One such clone, designated D3 1.1, will be described in detail as it is representative of the approach that will be followed in the characterization of the putative class I-like genes. Genetic mapping studies utilizing HLA deletion mutants derived from a lymphoblastoid cell line indicate that D3 1.1 maps between the HLA-B and -A loci. Preliminary sequencing data reveals homology of 70% between the 3' untranslated region of D3 1.1 and that of HLA-A2, -B7, -Cw3, and pHLA 12.4. Northern blot analysis and cytoplasmic dot hybridization are currently being performed to determine whether D3 1.1 displays a limited tissue distribution.

**NONSPECIFIC INHIBITORY ACTIVITY OF BOVINE SEMINAL PLASMA ON VIRUS GROWTH *IN VITRO*.**  
H.A. Fahmi\*, T.W. Molitor & P. Virakul, Dept LACS, Coll. Vet. Med. U of M

The venereal transmission of viruses via infected semen is not well established. However, the utilization of extended semen in artificial insemination in cattle and the demand on disease free semen require special attention of virus detection. Bovine seminal plasma (SP) contains cytotoxic substances that often cause lesions in tissue cultures which are similar to those caused by cytopathic effect of viruses like infectious bovine rhinotracheitis (IBR) and bovine viral diarrhea (BVD). We studied the removal of cytotoxicity by dialysis and the effect of dialyzed SP (DSP) on IBR and BVD virus growth in culture. Sperm free SP was obtained from seronegative bulls. The SP was dialyzed and tested on tissue cultures of bovine turbinate cells (BTC). The DSP was incubated with TCID 100 of IBR and BVD viruses at different dilutions. The results revealed that dialysis of SP greatly reduced cytotoxicity. The DSP was found to inhibit IBR and BVD virus growth in cell cultures. It was concluded that bovine SP contained non-specific inhibitors of IBR and BVD viruses. This inhibition was not due to the presence of antibodies in the SP.

MICROANALYTICAL METHODS IN THE PURIFICATION AND STRUCTURAL ANALYSIS OF PROTEIN. James J. L'Italien, Molecular Genetics, Inc., 10320 Bren Road East, Minnetonka, MN 55343

The identification and subsequent purification of the specific proteins required for desired biological or immunological function is often the most critical step in our ability to eventually produce these molecules through biotechnology. Micromethods of purification and structural analysis are often necessary because these important molecules usually exist at low



concentrations in the complex milieu of the cell. Both the methods of approach and the scale at which proteins are purified have been revolutionized by the development of affinity chromatography, HPLC and electrophoretic methods. Individually these methods are very important, but when they are used sequentially they can streamline otherwise complex purification schemes which have historically been both material and labor intensive to analytical methods capable of complete purification in only a few steps. Furthermore, developments in analytical chromatographic methods have formed the basis for the recent advances in our ability to characterize proteins on a microscale by protein microsequence analysis and amino acid analysis. Several recent examples of these methods will be discussed.

**PEROXIDATIVE OXIDATION OF CARCINOGENS.** C.L. Ritter, J. Suilman and D. Malejka-Giganti, Dept. of Lab. Medicine and Pathology, Univ. of Minn. and VA Medical Center, Minneapolis, MN.

This reaction may be involved in the activation of the potent rat mammary gland (MG) carcinogen, N-hydroxy-2-fluorenylacetylamide (N-OH-2-FAA). We are investigating the peroxidative capacity of the rat MG in comparison to that of the uterus (UT), which has high levels of this activity. By extracting homogenates of the tissues with CaCl<sub>2</sub> or cetyltrimethylammonium bromide (Cetab), we have found that the ability of the MG to oxidize guaiacol (GU) or p-phenylenediamine (p-PD) is 1-5% that of the UT, whereas with 3,3',5',5''-tetramethylbenzidine, it is 7-14% as great. Higher levels of peroxidative activity are generally found in Cetab extracts. Optimal pH is similar for oxidations of GU or p-PD by both tissues. Extracts of both tissues in Cetab oxidize N-OH-2-FAA mainly to 2-nitrosofluorene (2-NOF) in an H<sub>2</sub>O<sub>2</sub>-dependent reaction. This result contrasts to that with horseradish peroxidase/H<sub>2</sub>O<sub>2</sub> which generates equimolar 2-NOF and N-acetoxy-2-FAA from N-OH-2-FAA and suggests a different reaction pathway.

Supported by USPHS CA 28000 and USVA.

**The Characterization of a porcine parvovirus isolate associated with vesicular lesions in swine**  
T. Molitor, C. Choi and H. Joo  
Department of Large Animal Clinical Sciences,  
College of Veterinary Medicine, University of Minnesota

Porcine parvovirus is commonly associated with reproductive failure in swine. Recently, outbreaks of a swine vesicular disease were reported in four midwestern states. In all outbreaks the virus isolated was a parvovirus antigenically related to porcine parvovirus. We undertook the following studies to compare the PPV skin isolate noted as "Kresse Virus", with that of the prototype virulent isolate NADL-8. We compared Kresse virus to NADL-8 immunologically, molecularly and pathogenically. Immunologically these two viruses were identical. Molecularly (both protein and DNA) these viruses were very similar but slight differences were noted. Pathogenically, differences were noted between these 2 viruses in vivo; however the pathogenic differences were not as pronounced as that of another PPV isolate, KBSH virus. Further studies

are underway in attempts to answer questions concerning the adaptation of Kresse virus to vesicular tissue and the clinical significance of this virus.

#### MN AREA ASSN. OF PHYSICS TEACHERS

**CAN GRAVITY COLLAPSE STARS?** F.H. Meyer, ISUS, INC., Minneapolis, MN.

In modern physical theory gravity always is an attractive force. Unlike electric and magnetic forces, gravity is supposed never to be a repulsive force. According to the same theory, gravity can and does collapse some stars, even to "black holes". Gravitational collapse is a conventionally plausible and currently popular explanation of compact galaxies, i.e. quasars, and compact stars, i.e. pulsars, white dwarfs, etc. A less well-known but more credible explanation for compact astronomical objects notes that motion is a reciprocal relation between space and time and distinguishes explosions in time at rates above unit speed *c* from more familiar explosions in space at rates below *c*. This explanation goes by the name of the RS (Reciprocal System) of physics. Expansion in time results in compactness from the spatial perspective of certain stars and galaxies. The RS explanation rules out gravitational collapse as the source of compact (high density) astronomical objects, because it takes into account that space-time is not an unprogressive continuum and also that inside a finitely divisible unit of space ( $4.55884 \times 10^{-5}$  cm.) gravitational force acts as a repulsive force.

#### PHYSIOLOGY/GENETICS/ZOOLOGY

**THE EFFECT OF CYCLOHEXIMIDE ON THE REGENERATION OF THE PLANARIAN WORM, DUGESIA DOROTOCEPHALA.**  
Joellen M. Bosch, Hamline University, St. Paul, MN 55104.

The effect of cycloheximide on planarian regeneration has been studied on planaria that were transected and placed in concentrations of cycloheximide ranging from 1 mg/l to 100 mg/l. Inhibition of regeneration, as well as severe morphological damage and subsequent death of worms occurred when they were placed in concentrations of 5 mg/l to 100 mg/l. At a concentration of 1 mg/l the completion of regeneration was delayed 2 days. The inhibitory effect of cycloheximide appears to be reversible. Worms placed in 5 mg/l and 10 mg/l concentrations and taken out after 2, 3 and 4 days, undergo complete regeneration with no morphological damage.

**THE PERTURBATIONAL EFFECTS OF THE SAUK RIVER ON MACROPHYTE DISTRIBUTION IN THE HORSESHOE CHAIN OF LAKES, RICHMOND, MN.** T.C. CHMIELEWSKI\*, K.M. KNUTSON, C.J. DINDORF, Dept. of Biol. Sci., St. Cloud State Univ., St. Cloud, MN.

The Horseshoe Chain of Lakes basin, through which the Sauk River flows, is separated into fourteen bay-like lakes. An investigation of the aquatic macrophytes of this riverine system showed dramatic variations in the species present, zonation and biomass resulting from the strong influence exerted by the Sauk River. *Ceratophyllum*



demersum, Nymphaea tuberosa, and Nuphar variegatum dominated in low density patches throughout the littoral zone of the whole lake system. Evidence indicates the perturbation of the Sauk River and heavy algal blooms were responsible for this patchy growth pattern. Becker Lake with its outlet in confluence with the Sauk River is affected only during the spring high water period and has less algal mat formation frequency. This lake serves as a good base to study the impact of the river on the other thirteen lakes. Becker lake littoral zone is completely overgrown by a great diversity of macrophyte species.

REPRODUCTIVE TERRITORIAL AGGRESSION IN THE FATHEAD MINNOW, PIMEPHALES PROMELAS RAFINESQUE. R. A. Clarke, Dept. of Biol. Sci., St. Cloud State Univ., St. Cloud, MN.

A laboratory study was conducted to investigate the aggressive behavior of the male fathead minnow Pimephales promelas Rafinesque during the breeding season. Level of aggressiveness was assessed by recording the response by the male member of a breeding pair to a stimulus placed near the nest site. No recognizable trend of increasing male aggressive behavior associated with spawning was observed. A model describing the changes in the levels of aggression associated with the breeding season was proposed. This four-part model depicts: a low plateau of aggression during schooling behavior; a relatively large rise in aggression associated with the transition to territorial behavior; a decline in aggression accompanying the firm establishment of territories and spawning; a high plateau of aggressive behavior maintained for the remainder of the breeding season until the onset of schooling behavior in the next cycle.

THE SAUK RIVER'S INFLUENCE ON THE HORIZONTAL VARIATION OF ALGAL CHLOROPHYLL "A" IN THE HORSESHOE CHAIN OF LAKES, RICHMOND, MN. C.J. DINDORF\*, K.M. KNUTSON, C. NELSON, Depts. of Biol. Sci. and Earth Sci., St. Cloud State Univ., St. Cloud, MN.

Horizontal variations in summer phytoplankton Chl."A" ( $\mu\text{g}/\text{l}$ ) levels at various sample sites on the Horseshoe Chain of Lakes were examined to assess the influence of the Sauk River flowage through the chain. Physical model assisted predictions indicated that the river follows its channel even though it is bordered by 14 connected bay-like lakes. Chlorophyll biomass correlations ranged ( $r=.82-.89$ ) for river channel stations within the lake system. Poor correlations ( $r<.2$ ) were found between river channel sites and lake sample sites. Lake chlorophyll levels were significantly different from the river transported chlorophyll levels at the F.05 level. The 16 sample sites selected based on flow patterns found using a physical model of the lake system that was both lab and field calibrated seem justified. The 1984 algal chlorophyll data supports the basis of site selection and usefulness of the model to achieve an adequate data base for lake management.

THE NATURAL HISTORY SURVEY OF AQUATIC INVERTEBRATES. ANN HEUSCHELE, Science Museum of Minnesota, St. Paul, MN.

The Natural History Survey of Aquatic Invertebrates has been established at the Science Museum in order to build permanent collections of Upper Midwest aquatic invertebrates and to organize information on their distribution. In conjunction with these collections, the Museum will provide a center for research and learning about this group of organisms. Three collections will be maintained by the Natural History Survey. (1) The research collection: a permanent catalogued collection of documented specimens accompanied by field and research data that will be used to provide distributional records and for taxonomic and ecological research. (2) The reference collection: a special part of the research collection selected for taxonomic completeness and to demonstrate key characteristics that will be used by professional biologists who need to be able to identify local aquatic invertebrates. (3) The teaching collection: an uncatalogued collection of mostly undocumented specimens that will be designated for use by adult classes. The Museum invites donations of aquatic invertebrates by biologists and collectors to the Natural History Survey.

TEMPORAL VARIATION IN ALLELIC FREQUENCIES OF SEA LAMPREY AMMOCOETES. L.D. Jacobson, Dept. of Fisheries & Wildlife, U. of MN, St. Paul, MN

Information about temporal and spatial variation in allelic frequencies of sea lamprey (Petromyzon marinus) ammocoete samples is necessary for interpretation of previous electrophoretic studies. Temporal and spatial variation in the allelic frequencies of sea lamprey ammocoetes from two Lake Michigan drainages was studied by starch gel electrophoresis. Log-linear models were used to analyze allelic counts arrayed in three-dimensional contingency tables. Allelic variation was detected among yearclasses within samples and among sampling locations in the same drainage. No significant allelic variation was detected among yearclasses for drainages as a whole. Results of this study suggest: (1) that heterozygote deficiencies observed in samples during previous studies may be due to allelic frequency differences among ageclasses in the samples, (2) that local groups of spawning sea lamprey are of small effective size, and (3) that allelic frequencies of ammocoetes in entire drainages are stable over time.

A STUDY OF PUNCTAL CANALS IN FOUR GENERA OF FRESHWATER BIVALVES. William C. James\*, Daniel J. Hornbach & Russell A. Whitehead. Dept. Biology, Macalester College, St. Paul, MN 55105

The punctae of 4 genera of freshwater clams (Corbicula, Musculium, Pisidium Sphaerium) were examined by scanning electron microscopy. Punctae tunnel through the cross-lamellar layer, but not the periostracum, of the shell. A potential function of these canals is for respiration in vernal habitats. If a larger concentration of punctae is found in clams from vernal habitats, this would support the proposed function. Preliminary analysis indicates that of the 4 genera, those with more species in vernal habitat had larger concentrations

of punctae. The mean number of punctae was highest for Musculium. This is consistent with the theory that Musculium evolved in vernal pools. Intra-specifically, M. partumeium from a vernal pond had significantly more punctae than individuals from a permanent pond. These data seem to support a respiratory function for punctae in vernal habitats. However, while the concentrations of punctae is greatest in genera and species from vernal habitats, the surface area of these punctae is greatest in genera and species from permanent habitats. This suggests that the use of punctae in respiration may be complicated by other factors.

NUCLEAR SIZE CHANGES DURING SPORULATION OF THE TRUE SLIME MOLD, DIDYMIUM NIGRIPES. Sylvia J. Kerr, Dept. of Biology, Hamline University, St. Paul, MN 55104.

Plasmodia of Didymium nigripes contain nuclei of several sizes. When plasmodia sporulate and daughter plasmodia are grown, the ratio of small: large nuclei often changes. Daughter plasmodia may contain either more large or more small nuclei than the parental plasmodium. The time of ploidy level change coincides with waves of nuclear degeneration that occur during sporulation. The extent and direction of nuclear ploidy ratio changes is random, suggesting that one size of nucleus is not "targeted" for degeneration during sporulation.

DNA CONTENT AND NUCLEAR STRUCTURE OF DEVELOPING ENDOSPERM IN ZEA MAYS. Richard Kowles, Biology Dept., St. Mary's College, Winona, MN.

A time-related pattern exists between increased DNA levels of centrally located endosperm nuclei and endosperm development in Zea mays following pollination. Mitotic activity sharply decreases in these cells after 10 days post-pollination. At this time nuclear size and DNA amount, which are highly correlated, continue to increase until peak levels are reached at about 14 to 18 days post-pollination. Feulgen cytophotometry shows the mean DNA content per nucleus in strain A188 to increase from 4.5C to 90C by this peak developmental stage, with a remarkably similar pattern over four consecutive growing seasons. Other strains tested over one growing season averaged peak levels of DNA per nucleus that were twice that of A188. Individualized nuclei reached levels as high as 690C. The overall pattern of DNA increases appears to be remarkably consistent among several different strains. Ploidy levels resulting in individualized chromosomes higher than triploidy do not account for the high DNA levels. Cytological studies reveal a pronounced variation in chromosome strandedness, a maximum of three nucleoli, a maximum of three nucleolus organizer regions, and approximately 30 diffuse chromatin masses.

FOSSIL INSECTS FROM THE MIOCENE OF NORTHERN IDAHO. Dept. of Biol. Sci., St. Cloud State Univ., St. Cloud, MN. S. E. Lewis.

Fossil insects from the "Latah" Formation, (Miocene), of Northern Idaho and Eastern Washington have been studied by several investigators since the early 1920's. This paper will present an update on the previously collected insect material and the new material collected by the author from 1977 to the present. Several

insect orders and families have been found that are new to this Formation. This Formation dates from 15-25 million years ago.

UNPROVOKED SEIZURES IN PATIENTS WITH ALZHEIMER'S DISEASE. MARCIA L. MORRIS, Dept. of Genetics and Cell Biol., The University of Minnesota, Minneapolis, Minnesota.

While anecdotal references are commonly made that presume that seizures are an eventuality in patients affected with dementia of the Alzheimer type (DAT), no previous study has documented the rate of new onset, unprovoked seizures in DAT patients. In a series of 83 autopsy proven DAT cases, medical records were scrutinized for the presence or absence of any seizure or myoclonic activity and final evaluations were made by a neurologist. Of the 83 cases, 8 had experienced one or more unprovoked seizures after the onset of DAT. Based upon age-specific incidence rates from a population study of Rochester, MN the expected number was 0.80. ( $p < .01$ ) Although no comparable population rates exist for myoclonus, it was noted that 8 patients developed myoclonus during the dementing illness and that there was no overlap between those who developed myoclonus and those who developed seizures. These data suggest that individuals with DAT have a tenfold greater risk for developing seizures than an age matched control, but that seizures cannot be considered a universal symptom of DAT. Whether this increase in risk is uniform or whether seizures or myoclonus define unique subgroups of DAT types remains to be explored.

HYPOHAPTOGLOBINEMIA: A GENETIC PREDISPOSITION TO EPILEPSY? S.S. Panter\*, S.M.H. Sadrzadeh, J. Haines P. Hallaway, V.E. Anderson, and J.W. Eaton, Dight Laboratories, University of Minnesota, Minneapolis, MN 55455.

The Minnesota Comprehensive Epilepsy Program has identified a group of families, each with at least two first degree relatives affected by idiopathic seizure disorders. Absent or reduced plasma levels of the hemoglobin-binding protein, haptoglobin, were observed in members of 5 of 14 kindreds. By immunonephelometric analysis, 16 of 36 individuals were hypohaptoglobinemic, and most of these also had seizure disorders. Less than 2% of the general population and none of 17 patients with non-familial epilepsy had hypohaptoglobinemia. The application of hemoglobin and other iron-containing substances to brains of experimental animals can trigger seizure states. Hence, we hypothesize that free intracranial hemoglobin may play a role in the development of seizure disorders in hypohaptoglobinemic humans.

LONG-TERM STORAGE OF SEEDS OF ARABIDOPSIS THALIANA. Charles A. Rehwaldt\* and Julie A. Schmid, Dept. of Biol. Sci., St. Cloud State Univ., St. Cloud, MN.

Arabidopsis thaliana is widely used for studies in plant genetics, development and physiology. Long-term storage of seed stocks is therefore important. We conducted germination tests on seeds that had been stored 20 years under cool, dark and dry conditions. The seeds were stored in light-tight desiccators containing CaSO<sub>4</sub> (Drierite) in an ordinary refrigerator. The moistened seeds were kept at 5° C for either 5 or 10 days prior to incubation in order to remove seed dormancy. The germination ranged from 93% to 100% after 5



## POLITICAL SCIENCE

days of incubation at 23° C. These tests demonstrate that seeds of Arabidopsis thaliana remain viable for long periods of time when stored in darkness under cool, dry conditions.

A PROGRESS REPORT OF A POSSIBLE PALEO-INDIAN KILL SITE IN CENTRAL MN. Dept. of Biol. Sci., St. Cloud State Univ., St. Cloud, MN. J.V. Sporleder, S.E. LEWIS .

In the fall of 1983, a research project was begun on a bog site in Central MN. which has shown to contain thousands of bison bones. Some of the bones recovered have induced surface striations which seem indicative of some type of human relationship with these animals.

In the summer of 1984 research was continued, and this presentation serves as an update to this investigation. Items to be discussed will be: 1)Numbers of animals 2)Butcher marks 3)Bones recovered from an undisturbed site 4)Bone anomalies 5)Future research objectives.

THE EFFECT OF 2-THIOURACIL ON PLANARIAN REGENERATION. Kevin T. Stephan, Hamline University, St. Paul, MN 55104.

The effect of 2-thiouracil on flatworm regeneration was studied by transecting planarians (Dugesia dorotocephala) and observing their regeneration in 2-thiouracil concentrations of 0-800 mg/l. In the absence of 2-thiouracil, regeneration takes nine days. In concentrations of 20-50 mg/l, completion of regeneration is delayed by 24-48 hours. In concentrations of 100-400 mg/l regeneration is further delayed and is limited to anterior segments growing tails, with lesser degrees of regeneration in posterior segments attempting to grow heads. 800 mg/l effectively prevents regeneration beyond blastema formation. A possible seasonal variation of the sensitivity of regenerating planaria toward 2-thiouracil will be discussed.

CHARACTERIZATION, REGULATION AND DISTRIBUTION OF  $Ca^{2+}$ -DEPENDENT PROTEASE IN THE RAT PROSTATE. M.J. WILSON<sup>1</sup> and J.M. THEIS<sup>2\*</sup>, VA Medical Center and University of MN, Minneapolis<sup>1</sup> and Dept. of Biology, College of St. Thomas, St. Paul, MN<sup>2</sup>.

Proteolytic enzymes are known to be secreted by the prostate gland into the seminal fluid and to function in cell degradation following castration.  $Ca^{2+}$ -dependent neutral thiol proteases have been found in a variety of tissues and are implicated in the cleavage of hormone receptors, cytoskeleton and some enzymes. We have isolated such a protease in the rat prostate but only after separation by DEAE-cellulose chromatography due to an endogenous inhibitor in the prostate cytosols. Following castration the activities of the  $Ca^{2+}$ -dependent protease and its inhibitor decreased on a per gland basis, but remained constant when expressed as per mg cytosol protein. The activity of the protease was higher in the ventral prostate than in the anterior prostate; no activity was detected in the dorsolateral complex. Protease activity was also absent in ventral prostate secretion. This protease does not appear to be involved in castration induced atrophy and is not a secretory protein; we suggest that it is involved in some regulatory processes in the prostatic secretory cell.

RESPONSIBILITY, RELIGION AND GOVERNMENT. R.W. Cox Dept of Pol Sci, Bemidji State Univ, Bemidji, MN  
At no time in our history has the controversy over the bounds between church and state been so confused. The controversy touches on not only the ethical, moral, theological and political beliefs as they exist today, but also as those existed at the founding of our nation. The question of ethics, morality, and responsibility in government will be examined from two perspectives. First from a Constitutional perspective and, second, from a religious perspective. The central thesis of this study is that Americans have lost all understanding of the religious liberty of the first amendment and of the context of the political role of religious freedom intended by the developers of our constitutional system. To engage this problem this paper will focus on three issues: 1) informed consensus as the dominant decision-making style of the founding period, 2) the subsequent shift away from this style in the development of two trends, first a mechanistic majoritarian style of decision-making that was assumed to be democratic and the development of the concept of "civil religion", 3) and finally suggestions for ways to redefine both democracy and religion, or at least our views on the inter-relationship between the two. This redefinition will be based upon a return to the founding period's understanding of a responsible government.

PASSIONATE ATTITUDES: CENTRALITY, COMMITTED ACTION AND GUN CONTROL. S. I. FRANK\*, D. CORRIGAN, P. LAMB, Dept. of Pol. Sci., St. Cloud State Univ., St. Cloud, MN.

Gun control is an example of an issue that arouses passionate attitudes. Although surveys indicate that most Americans favor stronger gun control legislation, the failure of such policy to be enacted is often attributed to the belief that the minority views the issue as more important or with more intensity. Some national research indicates that there may be no difference in the importance (centrality) or the intensity between pros and antis. What the difference may be is in "committed action," such as the frequency of each group's contacts with public officials. Using a telephone survey, a scientific random sample of 663 central Minnesotans were asked several questions concerning gun control as part of an omnibus survey administered during October, 1983. The results appear to confirm the national study. Although they do not favor a handgun ban, an overwhelming majority favor tougher purchase requirements. There was little difference between pros and antis in centrality. However, by an almost two-to-one margin the antis were more likely to have engaged in committed action.

DISCRIMINATION-CIVIL RIGHTS-THE CIVIL RIGHTS ACT OF 1964 PREVENTS DISCRIMINATION IN LAW FIRMS. R.K. Hanson, Dept. of Business Administration, Bemidji State University, Bemidji, MN.

Title VII of the Civil Rights Act of 1964 was created to eliminate discrimination in employment based on race, color, religion, sex, or national origin. Prior to 1984 a number of courts in the United States had determined that this Act did not apply to the traditional law firm setting. Attor-



neys, like other professionals, have long relied on the right to associate with others of their choice. When law firms expand, new attorneys with similar dispositions, talents, and beliefs are sought. Until recently, law firms have enjoyed complete freedom in employing attorneys of their choice, often relying on prejudices or biases in seeking compatible co-workers. In 1984, the U.S. Supreme Court decided the case of Hishon v. King & Spaulding and the Supreme Court held that law firms are subject to the anti-discrimination provisions of the 1964 Act. The Hishon case involved a female attorney who sued a prestigious Atlanta law firm for failing to promote her to partner because of alleged sex discrimination. This decision requires that law firms and other professionals take steps to insure that the hiring and promotion process be free from discriminatory practices.

THE IMPACT OF JUDICIAL REFORM ON THE MINNESOTA SUPREME COURT. S.H. HATTING\* AND J.F. KELLER, Dept. of Pol. Sci., College of St. Thomas, St. Paul, MN

On Nov. 2, 1982 a majority of Minnesota voters approved a constitutional amendment which transformed the state's appellate judiciary. A Court of Appeals currently consisting of twelve judges began accepting cases on Aug. 1, 1983 and deciding them on Nov. 1, 1983. In order to assess the consequences of this change, the rationale underlying the amendment is explored, the anticipated costs and benefits of implementation are examined, and caseload data are analyzed. Questionnaire responses from members of the Supreme Court are discussed, jurisdictional relationships between the two courts are explained, and decisionmaking practices are compared (including reversal rates, intracourt dissent patterns, and oral argument and published opinion frequency in cases raising constitutional questions). Prospects for enhancing the quality and reducing the quantity of decisions by the Supreme Court are good due to 1) the diversion of nearly 80% of new filings since Aug. of 1983 to the Court of Appeals and 2) the rapidity with which the Court of Appeals, sitting in panels of three, has been clearing its docket. The Supreme Court continues to dispose of a 1200 case backlog in Feb. 1985.

PUBLIC POLICY ANALYSIS IN A CORPORATIST POLITICAL SYSTEM: THE CASE OF SOUTH KOREA. M.A. LAUNIUS, Dept. of Political Science, College of St. Thomas, St. Paul, MN.

Corporatism, the vertical structuring of interest group representation by the state, has been noted in many newly industrializing countries: Brazil, Peru, Mexico, Singapore, and others. The permutations of this structuring range from the inclusive patterns found in modern Singapore to the exclusive variety noted in Brazil. Corporatist structuring processes are most notably found in areas concerning organized labor, both industrial and agricultural. In South Korea, a newly industrializing country in East Asia, such patterns of corporatization may be detected in the area of state policies effecting organized industrial labor. Consistently, industrial labor unions have been organized and manipulated by the state to systematically exclude workers from a) control over or input into the process of labor policy making and b) receiving too great a slice of the

benefits of economic growth. Analyzing and evaluating the performance of such a policy process requires the utilization of policy analysis tools somewhat different from those usually employed by Western political scientists, a corporatist perspective.

SCIENCE & TECHNOLOGY POLICY-MAKING IN KOREA: A NON-PLURALIST APPROACH. Bangsoon Yoon Launius, Department of Political Science, University of Hawaii at Manoa Campus, Honolulu, Hawaii.

Since the mid 1960s institutionalization of public R & D system was the catchword in Korea's S & T policy. This study is to analyze the Korean government's two policy-decisions on the creation of KIST(1967) and KAIST(1981), top national think tanks in the S & T field. The central argument in this study is to point out the inappropriateness of the pluralist model of policy-making, often uncritically assumed in policy literature. S & T policies in Korea were initiated and developed by the executive branch of the government without any interference from other branches of government, or from non-government sectors such as local industry which would serve as the major clients of the benefits of S & T. Within this general policy-making framework, however, some variations are observed: In the case of KIST, technocrats both within the government bureaucracy and the local S & T community were significant indicating the rise of technostructure in Korea; in the case of KAIST, however, no inputs by technocrats both within and without the government were found.

A STUDY OF THE INFLUENCES ON THE DETERMINATION OF ELEMENTARY AND SECONDARY PUBLIC EDUCATION LEGISLATION IN THE MINNESOTA STATE LEGISLATURE, JOYCE KRUIPEY, Lead Legislative Analyst, Minnesota Senate, Office of Senate Counsel and Research, GENE MAMMENGA\*, Director of Government Relations, State University System, St. Paul, Minnesota.

This study of the political climate in which elementary and secondary education is funded in Minnesota begins with the Minnesota Miracle of 1971. In each successive legislative session some adjustments have been made in this formula. In this paper we will describe the various lobbying groups which try to affect education legislation. We will also discuss the role played by the Governor, key legislators, legislative and Department of Education staff, the State Board of Education and the Commissioner of Education in education policy formation. In conclusion, we will summarize major formula changes since 1971 and review the many education related issues before the legislature during the 1985 session. We conclude that major public education decisions are ultimately made by a few key legislators and legislative staff, although input is provided by many groups.

FUTURISM IN LATIN AMERICAN RELATIONS. John R. O'Boyle, Department of Modern and Classical Languages, Bemidji State University, Bemidji, Minnesota 56601

The present problems in Latin American and the United States' policy has followed a predictable,

historical course. This article simply briefly provides background and introduces a proposal for a form of political merger of Mexico, United States and Canada as a preliminary step toward the altering of all relations between the nations of the hemisphere. The method followed will be essay. A revised form of the article containing reactions and summaries will ultimately be sent to government officials.

#### SCIENCE EDUCATION/MN SCIENCE TEACHERS' ASSN.

##### THE APPLICATION OF LEARNING THEORY TO THE TEACHING OF CHEMISTRY AT THE AMERICAN HIGH SCHOOL AND JUNIOR COLLEGE LEVEL.

J. CHATTERJEE\* & R. BRATED, Dept. of Chem., Univ. of Minn., Minneapolis, MN.

The study of Chemistry involves a uniquely taxing combination of intellectual demands, from the purely factual, through the conceptual to the theoretical, mathematical levels. Several cognitive theories, particularly Piagetian developmental psychology and the subsumption learning theory of Ausubel have been applied to the learning of Chemistry. Educators have shown interest in Information-Processing theory, particularly its application to Chemistry problem-solving. This paper presents the authors' recent synthesis of these cognitive theories and of relevant studies involving their application to Chemistry instruction. The overall impact of cognitive theory on Chemistry teaching is addressed and directions for future research are suggested.

##### THE EFFECTIVENESS OF SUPPLEMENTING THE SCIENCE CURRICULUM WITH AN INTERACTIVE COMPUTER SIMULATION ON THE CONCEPTS OF VOLUME DISPLACEMENT. B.K. DECLERCQ, Chisago Lakes Area Schools, Lindstrom, MN.

The concepts of displaced volume have been identified as difficult to teach yet essential to the understanding of other science concepts such as density and buoyancy. This study examines posttest scores, retention scores, and the differential effects on "higher" ability and "lower" ability students. Students in 9th grade Introductory Physical Science classes were pretested, divided into "high" and "low" pretest groups, and randomly assigned to either the control or experimental group. After completion of the regular text material, demonstrations, and experiments on volume displacement, the experimental group received an additional 15-20 minutes of instruction on these concepts using an interactive computer simulation. The posttests revealed that the experimental group scored significantly higher than the control group who received no exposure to the computer simulation. No decline in test scores was found when a retention test was given approximately 45 days later.

##### THE EFFECTIVENESS OF USING SIMULATED EXPERIMENTS ON JUNIOR HIGH STUDENTS' UNDERSTANDING OF THE VOLUME DISPLACEMENT CONCEPT. E.D. Gennaro\* and Byung-Soon Choi, College of Ed., U. of MN.

The purpose of this study was to compare the effectiveness of microcomputer simulated experi-

ences with that of parallel instruction involving hands-on laboratory experiences for teaching the concept of volume displacement to junior high school students. Girls and boys were randomly assigned to experimental and control groups during each of five periods of the day. The results of this study showed that there were no significant differences in the retention levels when the retention scores of the computer simulation groups were compared to those that had the hands-on laboratory experiences; however, analysis of the data from a comparison of the retention scores revealed that males in both treatment conditions retained knowledge of volume displacement better than females. The study suggests that computer simulated experiences on some topics of science could be used in place of hands-on laboratory experiences with an expectation of equal performance levels by students and that learning of certain topics in science can be learned in a shorter period of time when using a micro-computer simulation.

##### AN APPROACH TO TEACHING SCIENCE WRITING FOR COLLEGE BIOLOGY STUDENTS. EVAN B. HAZARD, Prof. of Biology, Bemidji State Univ., Bemidji, MN.

Biol. 298 Literature of Biology has been a requirement for Biology majors at Bemidji State since the middle 1960s. We try to help students achieve several objectives in Literature: a hands-on acquaintance with the professional literature and the major abstracting services, an insight into the "sociology" of the biological professions, an ability to organize ideas and information from the literature and to present them in concise standard English, a related ability to read the professional literature intelligently and critically, and the realization that written English is a rich resource and that writing, even scientific writing, can be fun. In recent years, we have used several interactive techniques learned from the MN Writing Project, the North Country Writing Project, and an editor at the U. of M. Press. Feedback from students and colleagues indicates that Biol. 298 is relatively successful. We solicit conversation and correspondence with others on comparable courses or on improvement of undergrad writing in the sciences.

##### A STUDY OF THE LATENT EFFECTS OF FAMILY LEARNING COURSES IN SCIENCE. E. D. Gennaro, N. A. Hereid\* & K. Ostlund, College of Education, University of Minnesota, Minneapolis, Minnesota.

Out-of-School Science Experiences has produced five short science courses intended for children in middle school grades (6, 7, and 8) and their parents that supplement traditional science teaching. The program employs the family as a motivator and reinforcer in a cooperative learning venture. Statistical evidence from multiple offerings of each course demonstrate that both students and parents significantly gain in science knowledge due to these experiences. This study is an attempt to determine participant reaction to the course experience as well as the influence that the courses had on subsequent learning behavior and the relationship between parents and children two to three years after the course experience. Three data-gathering techniques were employed; face-to-face

interviews, telephone interviews, and mail questionnaires. Participants' reactions suggest that the family learning courses were both enjoyable and challenging experiences. Most parents and children reported that the courses had an effect on their learning behavior and indicated that taking the course together strengthened their relationship and/or increased communication within the family.

ROBOT IN THE CLASSROOM K.A. OSTRAND,  
Dept. of Science, Harding Sr. High School  
St. Paul, Minnesota

Student interest is enhanced by the use of Audio-visual aids and demonstrations. Robots are on the leading edge of technology and can be used as "attention getters" and demonstrate applications of electronics and computers.

Students built the robot from a kit. It demonstrates applications of speech synthesis, sonar, infra-red, radio control and computer programming.

Student interest is wide spread and showing up in areas other than electronics.

EDUCATION, YOU GET WHAT YOU PAY FOR. L.G. SOROKA, Dept. of Earth Sciences, and L.L. LAMWERS, Dept. of Psychology, St. Cloud State University, St. Cloud State, MN.

Recently, former Education Secretary Terrel Bell compiled the composite scores of schools throughout the nation and ranked schools by state with respect to a Quality Index. This ranking provided for the first time a qualitative measure to which other variables could be compared. In an attempt to determine if average teacher salaries were related to academic quality, we calculated a Pearson Product Moment Correlation. The correlation coefficient was .587,  $p < .005$ . This finding strongly supports the belief that states which pay their teachers well also have high quality education programs.

THE EFFECTIVENESS OF A COMPUTER-ASSISTED INSTRUCTION PACKAGE IN SUPPLEMENTING INSTRUCTION IN HIGH SCHOOL CHEMISTRY. Camille L. Wainwright, Mounds Park Academy, St. Paul, MN 55109

The use of a commercial microcomputer software package was evaluated as a supplement to traditional instruction in general chemistry classes in a suburban high school. The topics under study included writing and naming formulas and balancing chemical equations. The experimental group received drill, review and reinforcement by using the microcomputer; the control group used conventional pencil-and-paper worksheets. The results follow:

The use of the microcomputer materials did not contribute to more effective learning on the selected topics; the control group students' scores were significantly higher on the achievement test than the CAI group mean. Some research literature has suggested that CAI may be more effective for students of low cognitive development levels; no significant interactions were found, however, to favor either CAI or the control activity for students of differing cognitive development levels. In measuring attitudes toward computers, chemistry, and the use of computers in studying chemistry, differential treatment effects were discovered between males and females, as indicated by an interaction between treatment and gender.

AN INTERACTIVE TUTORIAL COMPUTER PROGRAM IN GENERAL CHEMISTRY. \*Archie S. Wilson, Dept. of Chem., Paul W. Fox, Dept. of Psych., University of Minn., Minneapolis, MN.

We describe an interactive tutorial quiz/homework management system for use with large classes in general chemistry. The purpose of the project is to provide a systematic approach to ensuring that students in large (lecture) courses participate actively in study and self-testing activities known to be important to the learning process. A special feature of the system is its use of confidence ratings to supplement the information available to the instructor from student answers to (multiple-choice) quiz questions. Feedback tutorial information is adjusted according to both student answer and level of confidence. The system is now being developed for use with the MERITSS system. It will also be available for use on microprocessor (IBM-PC compatible, Apple IIe) within the next year. Preliminary evaluation data indicate student acceptance of the system.