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PROGRAM ABSTRACTS
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Index of Contributed Papers by Authors

*(The principal author or presenter is indicated by *)*

GENERAL SESSIONS

I. The Space Shuttle Program: Past, Present and Future.

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In the early 1970's NASA began planning the future for the United States manned space program for the remainder of the twentieth century. The Apollo moon-landing program had been a true success, but there was a definite need to utilize space technology for the benefit of mankind. Nasa proposed two projects: (1) permanently manned laboratory, materials processing facility and space manufacturing operation, the Space Station; (2) a transportation vehicle to service the Space Station, the Space Shuttle. Due to political and funding decisions, only the Shuttle was authorized, and even then it was under-funded and probably poorly managed. In spite of these difficulties, it did become operational in 1982, serving as a laboratory in space, satellite launching pad, observatory and rescue vehicle. Then came the Challenger tragedy in January 1986. Since that accident, the Shuttle "fleet" has undergone significant technological upgrading and is once again providing the United States with a worthy space transportation vehicle. The future is indeed reasonably bright for the United States space program, fully utilizing the Space Shuttle's capabilities to place the Hubble Space Telescope in orbit, launch the Galileo probe to Jupiter, send the Magellan spacecraft on to Venus, provide servicing for the Space Station starting in 1995, and many more opportunities. We need to once again look at space technology as a resource for all mankind that is just waiting to be tapped.

II. Poisoning of America

Michael K. Brown, Journalist and Author, New York

The Love Canal is located in a once-residential Niagra Falls, New York neighborhood. The Hooker Chemical Company had been disposing of toxic chemicals in a chemical waste dump for years. Eventually, these chemicals leaked into the ground and ultimately into the Love Canal. Residents there began noticing unusual health problems among the population such as rashes, skin lesions, nervous disorders, tumors, and hearing loss. Cancer among women showed a dramatic increase. Household pets lost their fur and developed internal tumors. Some pets mysteriously died for no apparent reason. Strange liquids were observed oozing from walls and freshly painted surfaces were observed to peel and crack. An investigation of the canal revealed the presence of benzene and over 100 other chemical substances, many of which were carcinogenic. Local city and health officials resisted attempts to expose the problem because of the economic impact that Hooker Chemical had on their community. Even the local newspaper showed a reluctance to offer support to efforts to uncover the problem. Only after great journalistic effort was public attention drawn to the situation.

III. High-Temperature Superconductors: On the Path from Discovery to Application

Dr. John R. Clem, Department of Physics, Iowa State University, Ames, IA 50011

A large amount of fundamental and applied research on superconductors (elements or compounds that have zero electrical resistance below some characteristic transition temperature T_c) has been done since the discovery of superconductivity in 1911. This subject recently has received renewed public attention because of discoveries of materials with transition temperatures above liquid-nitrogen temperature. These discoveries resulted from a surge of world-wide research activity prompted by a 1986 paper by J. G. Bednorz and K. A. Muller (IBM Zurich), who already in 1987 received the Nobel Prize in Physics for their breakthrough research. This talk will summarize the key developments in the field of superconductivity, explain the reasons for the current excitement in the scientific community, and describe the chief technical problems impeding widespread applications of these materials.

SECTION PROGRAMS

Agricultural Sciences

1. Effect of local soil management on the leaching of banded fertilizers

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Barriers to soil water flow were studied as a means of altering the movement of applied fertilizers. Barriers placed above or below a fertilizer band can direct soil water away from the band. As a result, it may be possible to delay leaching and retain the fertilizer within the rootzone for a longer period.

A field experiment was conducted using a set of buried lysimeters. Calcium nitrate and calcium chloride were applied as a band below the soil surface in each lysimeter. Treatments consisted of several different water flow barriers. Nitrate and chloride movement were monitored by analyzing effluent collected with suction samplers at the bottom of each lysimeter. Results showing relative effectiveness of the flow barriers to reduce leaching will be presented.

2. Analytical solution to 2-dimensional soil heat transfer under a partial surface mulch

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In agricultural fields, non-uniform surface conditions such as partial surface mulches cause horizontal temperature variations. These variations are important to crop production because seed germination and plant growth depend on soil temperature. Previously, two-dimensional soil heat transfer analysis has been restricted to numerical modeling because of the complexity of the problem. Analytical solutions are needed to verify numerical approaches and to provide for more convenient formulas for investigating the effects of model inputs.

In this paper we present an analytical solution to the heat conduction equation in two dimensions. Temperature at the soil surface is approximated by sinusoidal variation in time. The mean temperature, amplitude, and phase constant of the sinusoidal surface wave are all arbitrary functions of space. Calculated temperatures and heat fluxes are presented and the results discussed from a perspective of managing rootzone temperature.

3. Predicting the hydraulic conductivities of unsaturated soils

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Determining the hydraulic properties of unsaturated soil are, generally, complicated and difficult yet they are especially important, since most processes involving water flow in the rooting zone occur under unsaturated conditions. Therefore, determining hydraulic properties with simplified methods would be useful.

The relationship between the unsaturated hydraulic conductivity and air permeability at selected soil water tensions was investigated in the laboratory using undisturbed soil samples. A method of predicting unsaturated hydraulic conductivity from the more easily measured air permeabilities was developed. To accurately predict the unsaturated hydraulic conductivity K(h) at any given soil water tension from measured soil air permeability data, one needs only two independent measurements of unsaturated hydraulic conductivity.

4. Mobilization of vegetative nitrogen and its relation to seed yield of soybean

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Sixty-four soybean lines--38 PIs, 17 cultivars, and 9 ancestral lines--were grown 2 years in a replicated trial. Yields ranged from 1.8 to 3.7 t/ha in 1986, 2.2 to 3.9 t/ha in 1987. Total leaf nitrogen (TLN) accumulated by R5, reproductive duration (RD) estimated as the time from R1 to R7 and lodging (L) were the traits most consistently related to yield performance (R^2=.675 in 1986; .574 in 1987; .675 combined for both years). Partial correlation of yield on TLN, holding RD and L constant gave a r^2=.40 for 1986, .32 for 1987. Of the ten lines consistently performing in the top 20% on a yield basis, five were related to Corsoy. These data show that two extremely important factors determining the yield in soybean lines are the amount of mobilizable nitrogen accumulated by the beginning of seed filling and the duration of reproduction. TLN does not appear to be a heritable trait, however.

5. Relationship between brown stem rot and charcoal rot of soybeans.

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The incidence of charcoal rot (CR), caused by Macrophomina phaseolina, related directly with the severity of brown stem rot (BSR) caused by Phialophora gregata when both diseases occurred in a BSR experiment designed to study the interaction of the BSR with moisture. Moisture was controlled using a movable weather shelter (MWS) and by irrigation. CR occurred in 14.6% of plants of Hardin vs 5.9% for BSR 101 (P=.01). BSR severity in Hardin and BSR 101 were 12.2 and 3.3%, respectively, which were significantly different (P=.01). Incidence of CR under the MWS was 16.3 vs 4.1 outside the MWS (P=.01), and was 6.4 and 14.0 under irrigated and not irrigated (P=.01). BSR under and outside the MWS were 8.9% vs 6.6%, and wet and dry were 8.8% vs 6.6%, respectively, which were not significant. Correlation between CR incidence and BSR severity was r= 0.516 (P=.001). The yields of 233 g/plot of BSR 101 and 220 g of Hardin were not significantly different. Correlation between BSR and yield was -0.103 and CR and yield was 0.024, respectively, but neither were statistically significant.

6. Incidence of bacterial tan spot in soybean seed from cooperative regional soybean tests

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Bacterial tan spot of soybean, caused by Curtobacterium flaccumfaciens, has been reported only from Iowa and is seed-transmitted. A study to determine if the disease occurs in other soybean-producing states was begun in cooperation with soybean breeders from 17 states, each supplying seed samples of cultivars grown in the Uniform Soybean Tests in 1985. The pathogen was found in Iowa and in all adjacent states. Other soybean-producing states where the pathogen occurred are Indiana, Ohio, and Ontario, Canada. It was found in 75% (33 of 44) of the locations sampled and was distributed among 13 states. Among cultivars with infected seeds, the mean incidence of infection at some locations was: Douglas, 30%, Ohio; Fayette, 28%, Indiana; and Century, 26%, Michigan. The pathogen occurred as far south as Texas and as far east as Maryland. This research establishes that bacterial tan spot is a common disease in many soybean producing regions of the United States and it also occurs in Canada.

7. Seed transmission of Helminthosporium carbonum race 1 in an Iowa stiff stalk synthetic maize population

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Seed was collected from selfed ears from S_2 plants of BS13(S)C_5 that were partially rotted by Helminthosporium carbonum race 1 and came from plants with severe foliar infection by the pathogen. S_3 seed from 10 ears (160 seeds/ear) was planted in isolation in the greenhouse and seed from 8 ears produced seedlings infected with H. carbonum (ave.=13%). When placed in a moist environment, lesioned and dead plants were a source of inoculum for infection of sister plants. The number of dead plants and infected plants from seed grown in unsterilized soil exceeded those in sterilized soil by a 2:1 ratio. A strong positive correlation was observed between number of lesioned plants and number of dead plants ($r=.83$, $P<.01$). Isolations from dead plants and primary and secondary lesions yielded H. carbonum that was determined to be race 1 by reactions on different host plants. Seed transmission of H. carbonum race 1 was proven to occur in maize.

8. Reciprocal full-sib selection in corn

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Recurrent selection is used for the genetic improvement of corn populations, including intra- and interpopulation methods. Reciprocal full-sib selection is an interpopulation method based on full-sib progenies produced between two populations. The method emphasizes selection for additive and nonadditive effects in full-sib progenies.

Reciprocal full-sib selection was initiated in 1963 in two prolific corn populations, BS10 and BS11. Grain yield was emphasized in selection. Eight cycles of selection have been completed and evaluated for direct (BS10 x BS11) and indirect (BS10 and BS11 per se) response to selection. Selection was effective. Grain yield of the population cross increased 60.4%, or 7.6% per cycle, with a significant decrease in grain moisture and stalk lodging. Yield of BS10 and BS11 increased 23.6 and 13.0%, respectively. Reciprocal full-sib selection was effective for the traits selected.

9. Seed loss caused by tarnished plant bugs feeding on amaranth heads

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The tarnished plant bug (TPB) prefers to feed on newly developing tissues of many plant species, including amaranth. TPB feeding on amaranth can cause whole branches to become brown and die. If the TPB feeds on immature seed, it causes them to shrivel and turn brown or black.

TPB population levels and the duration of feeding were tested to determine their effect on seed production. Seed weight taken from non-terminal heads, helped determine the plants ability to compensate when the TPB fed only on the terminal head.

Twelve TPBs feeding for five weeks on the terminal head resulted in a significant seed reduction. Seed production from non-terminal heads was not affected by populations level or the duration of feeding.

10. Variability in a Cuphea viscosissima collection

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Cuphea viscosissima Jacquin is a species with potential for domestication for the production of medium chain-length triglycerides. Thirty-nine accessions of C. viscosissima were collected from five Central US states in 1987. These accessions were grown at Ames in 1988 to evaluate morphological and enzymatic variability. Of the eleven enzyme loci evaluated in our laboratory or at Oregon State University, polymorphism was found in only one locus, Diaphorase (Dia). One accession was found to have a different Dia allele from the other accessions evaluated. A single accession from Arkansas has light green stems and pale flowers, while all other accessions possess red stems, and purple flowers. Significant variability was found within and between accessions for plant height and total plant weight. Accessions with "tall" plants were more apt to come from the more eastern part of the collection area (Southeastern Missouri, Southern Illinois), while the accessions with "high" plant weight were more frequently from the western locations (Eastern Kansas, Southwestern Missouri).

11. Impact of rose rosette disease on multiflor rose reproductions

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Rose rosette, a disease of unknown etiology, has been shown to be present in Iowa and is lethal to Rosa multiflora (Thunb.). The disease is being investigated for its potential as a biological control for this noxious plant which has become naturalized on over 1,000,000 acres of grazing and recreational lands in Iowa. Study plots have been established in several naturally infected stands of R. multiflora in southern Iowa.

Infection leads ultimately to death of the plants, usually within 3 years. Development of the disease within the plant is progressive and significantly reduces fruitfulness of infected canes. The number and size of the fruit, as well as the number of seeds borne on symptomatic canes are reduced during the season of first expression. The earlier that symptoms appear the greater the reduction in fruiting. No fruit is formed on symptomatic canes during the second year. Symptomatic plants had greatly reduced root systems by the second year.

POSTER PRESENTATIONS

12. Determination of organic acids in soils by high-performance liquid chromatography

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Organic acids produced in soils are involved in the solubilization, mobilization, and transport of mineral constituents in soils as well as possible phytotoxic effect on the growth and development of higher plants. In this work, a soil sample (5 g) and 0.112 g of crop residue [alfalfa (Medicago sativa L.), corn (Zea mays L.), or soybean (Glycine max. (L.) Merr.)] were mixed in a 50-mL plastic centrifuge tube, treated with 10 mL of water, and incubated at 25°C for 72 h. The free organic acids produced were determined by a Beckman HPLC system coupled to a Perkin-Elmer LC-25 RI detector, after centrifuging and filtering (0.45 μm membrane filter) the resulting suspension. With the concentration in parentheses, the following organic acids were produced in the crop-residue-treated soils: acetic acid (3 to 17 mM), propionic acid (1 to 3 mM), and n-butyric acid (0.2 to 1 mM). Trace amounts of organic acids could be detected in soils incubated under waterlogged conditions, and none could be detected in crop-residue-treated soils when incubated under aerobic conditions at 25°C for 72 h.

13. Effect of exchangeable metals on phosphate adsorption by soils

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In this study, five acid and neutral Iowa surface soils were converted to monoionic forms by saturating the exchange sites with each of alkali metals, alkine earth metals, or heavy metals. The phosphate adsorption isotherms were studied at 25°C by using a range of phosphate concentrations made in water, 0.01 M KCl, or 0.01 M $CaCl_2$. Results showed that phosphate adsorption is markedly affected by the equilibration medium, exchangeable cation, and the cation-exchange capacity of soils. Application of the Langmuir equation showed that the adsorption maximum and the adsorption isotherm constant are related to the type of exchangeable cation in soils. The electrolyte content of the background solution showed a marked effect on phosphate adsorption. Phosphate adsorption decreased in the following order of equilibration media: 0.01 M $CaCl_2$ > 0.01 M KCl > deionized water.

14. The transposable element Uq in BSSS(R) and BS13(S) corn breeding populations

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Iowa Stiff Stalk Synthetic populations have found a seemingly unending source of genetic variability in long term recurrent selection (Hallauer et al., 1983). One possible source of this variation is the insertion and excision of transposable elements, which can lead to changes in the base pair sequence of a gene (Schwarz-Sommer et al., 1985). Activity of the transposable element Uq has been found in Iowa Stiff Stalk Synthetic (BSSS) (Cormack et al., 1988). Eleven cycles of BS13(S) (seven cycles of half-sib selection, four cycles of S2 selection) and eleven cycles of reciprocal recurrent selection (BSSS(R)) were analyzed to determine at what frequency the element Uq was present, and how that frequency varied between cycles. Statistical analysis showed a positive linear relationship in the BS13(S) series and a negative linear relationship in the BSSS(R) series.

Anthropology

15. Scripting a life: narrative and self-authoring in the life history of a Hindu woman.

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Recently, anthropologists have shown a renewed interest in life history or biography. Unlike the older culture-and-personality school that also used biographical data, current anthropology, cognitive psychology, literary criticism, and feminist theory emphasizes the importance of narrative processes and structures in life history and biography. The act of telling a life story to the anthropological interlocutor is a collaborative, self-constitutive enterprise which invites the informant to examine the culturally-approved, gender-specific scripts available for interpreting her/his life. If these conventional scripts are inappropriate, the narrator may improvise a new one and attempt to legitimize this script by appealing to other culturally approved motives. Alternately, the informant may interpret his/her life as unscripted, as a literally idiosyncratic sequence of events. These issues are explored with illustrations from the life history of a young, non-traditional Hindu woman.

16. In search of authenticity: ethnic tourism in eastern Iowa

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Tourism can be a by-product which evolves out of normal community practices or an end-product which is developed by hosts for economic benefits. Either type of tourism causes change.

Ethnic communities have some degree of cultural cohesion which each type of tourism affects differently. The variables which determine these consequences are the history of the ethnic community, the behavior of tourists, the level of commercialism, and the degree of authenticity in attraction activities.

Conclusions are based on the ethnographic research of tourism in Decorah, Pella, Czech Village, Kalona and Amana. Tourism and its consequences in each ethnic community will be discussed.

17. Prisoners in their own homes: a cognitive and structural interpretation of the problems of battered women.

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During the past two decades the problems of battered women have attracted increasing public attention, giving rise to new support groups and services. Previous research on battered women uses family network and systems theory. To this we add the frameworks of (1) Mary Douglas's grid/group analysis, a comparative, structural perspective, and (2) consensus modeling, an assessment of the degree to which battered women share a relatively uniform interpretation of their experience of abuse. Lengthy, semi-structured interviews were conducted with a small, purposive sample that includes members of a support organization for battered women. Grid/group analysis illuminates the changes in the social networks of the battered women as they emerge from the abusive relationship, usually high grid, low group, into a more solidary low grid, high group support structure. Consensus modeling shows that the women have a collectively consistent interpretation of their experiences.

18. Late Middle Woodland field camps in the Cedar valley

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Survey and testing of two proposed road projects within the Cedar River valley have resulted in the location of several new prehistoric occupational sites. Ceramics recovered at two of the sites, 13LN236 and 13LN243, are identified as Late Middle Woodland period specimens, dating to ca. A.D. 200. Both sites border Cedar River tributaries, occupying high terrace formations within the broad bottomlands of the Cedar valley. The type and distribution of artifacts suggest that both sites represent field camps, functioning as repeatedly utilized, short-term, extractive and processing sites. Previous research at sites of similar age has focused on small, protected rock shelters and large, long-term "village" sites. The identification of field camps in the areas investigated provides a more complete picture of Late Middle Woodland settlement patterns in the Cedar valley.

19. Late Woodland archaeological remains from the Buchanan Site (13 SR 153)

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Recent excavations at the Buchanan site (13 SR 153), located in a sidewall valley of the Skunk River on the outskirts of Ames, Iowa, have yielded substantial evidence of Late Woodland occupation. The material includes abundant, well-preserved food remains and the lateral distribution of various kinds of debris suggests spatial segregation of certain activities, eg. food preparation and flint knapping. Particularly noteworthy in view of the identification of the Late Woodland period with the emergence of an agricultural economy is the preponderance of wild fauna in the subsistence residue at the site. In this paper, we summarize the Buchanan site's contribution to our knowledge of Late Woodland culture history and subsistence-settlement practices in regional perspective.

20. Prehistoric utilization of little barley (Hordeum pusillum) at a Nebraska phase (Central Plains tradition) earthlodge

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Archaeological or ethnographic documentation of Native American use of little barley (Hordeum pusillum) is available for the Southwest, the Great Basin, western Illinois, and Arkansas. Prehistoric utilization of this grass now is reported for the first time for Iowa and the Great Plains. Archaeobotanical analysis of remains from 13ML176 -- a Nebraska phase earthlodge near Glenwood, Mills County, Iowa -- indicates utilization of the seeds (caryopses) of little barley within a broadly based, horticultural subsistence economy. Although the nutritive value of little barley caryopses has not yet been assessed, the grains likely were used as a late spring-early summer food supplement. The grains may have been collected from wild plants or from a cultivated variety. (Project supported in part by the Iowa Science Foundation.)

Botany

21. Line intercept studies spanning 12 years on Floyd River flood plain.

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Line transect data was collected in 1976, 1979, 1982, 1985, and 1988 using a grid system consisting of steel posts every 20 meters on a 4½ acre plot near the city of Alton in NW Iowa.

This site has been undergoing old field succession since 1968. Importance values were determined for each species. Of the 90 species found on the site during this span of time 29 species at one time or other reached or exceeded the importance value of 6. Of these 29 species 16 increased and then decreased; 7 disappeared and 4 new ones emerged. Boxelder and silver maple trees have demonstrated a marked persistent increase and today exhibit the highest importance values.

Species of particular interest were: reed canary grass, late and Canada goldenrods, tall yellow coneflower, elderberry, and garden parsnip.

22. Restoration of remnant prairie flora on southern Iowa pastureland

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Native warm-season grasses can enhance forage availability and production on properly-managed pastureland in the tallgrass prairie region. Re-establishing warm-season grasses from remnant plants or seedbank sources was investigated on southern Iowa pasture. By suppressing or eliminating introduced cool-season grasses, potential warm-season components may be given an opportunity to increase.

Fire and atrazine treatments were replicated on experimental plots in a randomized block design. Responses of various plant species were evaluated by measuring relative shoot frequency and biomass before and after treatments.

In general, atrazine treatments affected decreases in cool-season perennials, increases in warm-season native perennials, and mixed responses in weedy annual species. Fire treatments decreased some cool-season species, and usually increased weedy annual species. A restoration procedure will be discussed.

23. An index for evaluating the natural quality of Loess Hill prairies

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Prioritization of natural areas for protection and management is difficult in the absence of articulated conservation goals and objective measurement of desirable qualities. In this application, twenty-six prairies in the new Loess Hills Pioneer State Forest and related public lands were evaluated based on their floristics, community structure, and size. Desirable qualities were defined as: a) flora with many "conservative" species of high fidelity to prairie habitats and which decrease in response to grazing or brush encroachment, b) vegetation with high frequencies of conservative species, and c) large size. Sites were ranked by relativized sums of floristic Wilhelm scores (Qf), vegetational Wilhelm scores (Qv), and the logarithm of acreage (log A). Maximum (reference) scores were Qf = 43 points, Qv = 41 points, and A = 30 hectares.

24. Rare plant discoveries from Iowa fens during 1988.

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In 1988 128 potential fen sites in Iowa were inventoried for rare plant species. Forty-one new records on 23 fens in 12 counties were found in Iowa Surface fens. Among these were new sites for Betula pumila, Cacalia suaveolens, Gentianopsis procera, Lobelia kalmii, Rhynchospora capillacea, Salix candida, and Scleria verticillata. Seventeen new records from 6 fens in 2 counties were found in Des Moines Lobe fens. This included new sites for Berula erecta, Lobelia kalmii, Mimulus glabratus, Platanthera hyperborea and Triglochin palustris.

25. Morels and false morels of Iowa

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A morel-false morel survey has been conducted in Iowa each spring for the last five years, 1984 through 1988. The many people who contributed specimens and site information have made it possible for us to accumulate significant data about the occurrence of these fungi, their distribution in the state, and the variation within each species.

The Iowa spring morel-false morel fungus group includes five species of Morchella, two species of Verpa and two species of Gyromitra. During these five years, collections from 81 counties were observed. The earliest collection recorded during the survey was on April 11, 1985 and the latest on May 26, 1984. Morels and false morels are generally associated with areas of eastern deciduous forest in the state. Two species have a very limited distribution. One, Verpa bohemica, occurs in the northeast and the other, Morchella angusticeps, is in a few counties in the east central and south eastern area. Morchella esculenta, the common tan morel, was recorded from 66 counties and could most probably be found anywhere in the state in a favorable year.

26. Aquatic hyphomycetes from Río Chiquito and Río Tamaná from Utuado, Puerto Rico.

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Fourteen species of aquatic hyphomycetes were collected from foam samples at Río Chiquito and Río Tamaná in Utuado, Puerto Rico. The following species are reported for the first time in these two rivers from Utuado: Alatospora acuminata; Anguillospora crassa; Brachiosphaera tropicalis; Campylospora chaetocladia; Campylospora parvula; Clavatospora longibrachiata; Flabellospora crassa; Lemonniera curvula; Phalangispora constricta; Triscelophorus acuminatus; Triscelophorus monosporus; Tetracladium marchalianum and Tetracladium setigerum

27. A light microscope study of endosperm development in Glycine max (L.) Merr.

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Endosperm of soybean exists for only 15 days: from the first division of the primary endosperm nucleus to the near obliteration of the endosperm by the developing embryo. Initial divisions of endosperm precede those of the zygote. 3 days following fertilization the pre-globular embryo is immersed in a free-nuclear endosperm. The common cytoplasm

and nuclei of the endosperm are displaced to the chalazal and micropylar ends by formation of a large central vacuole. Cellularization of endosperm creates dense cells with numerous vesicles at the micropylar end. At the chalazal end incomplete cytokinesis produces a peripheral and cellular endosperm that surrounds the remaining free-nuclear endosperm. Cytokinesis of the endosperm continues until day 8 when the heart -shaped embryo is embedded in a cellular endosperm. The endosperm then becomes vacuolate until only a single layer adjacent to the nucellus contains cytoplasm. The endosperm cell walls degenerate in front of the expanding cotyledons. By day 15 only a remnant endosperm remains in the embryo sac.

28. Incorporation of [^{14}C] precursors into roots of Yucca to study calcium oxalate crystal formation

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Precursors [^{14}C]-ascorbic acid and [^{14}C]-glycolic acid were added to a non-toxic phosphate buffer into which excised *Yucca torreyi* primary roots had been placed. Different roots were exposed to each precursor for 45 min, washed thoroughly with buffer and then allowed to metabolize for periods of 1.6 to 12 hrs before they were fixed and embedded in resin. Sections for light and electron microscopy were coated with autoradiographic emulsions and exposed. Results showed that [^{14}C] from ascorbic acid appeared in calcium oxalate crystals and in cytoplasm of files of crystal idioblasts less than 3 hrs after incorporation. [^{14}C] from glycolic acid occurred throughout root tissues and not primarily in crystals. These results suggest that in nonphotosynthetic roots ascorbic acid is preferably converted to oxalate without going through the intermediate glyoxylic acid. This alternate pathway for oxalate formation supports nonphotosynthetic production of oxalate in this poorly understood process of oxalate-associated calcification common to many higher plants.

29. Mycorrhizal calcium oxalate in Monotropa uniflora

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Monotropa uniflora L. mycorrhizae collected from Iowa woodlands were examined with light and electron microscopy. Characteristic changes in the mycorrhizal mantle were observed when the plants flowered in late summer. The fungal storage products glycogen and polyphosphate disappeared, and calcium oxalate crystals were found between senescing mantle hyphae.

Monotropa plants do not photosynthesize and are nourished entirely by their mycorrhizal partners. Although specialized absorbing structures are formed at the host-fungus interface, in other respects monotropoid mycorrhizae resemble those of the ectomycorrhizal forest trees with which they share fungal symbionts. There are reports of calcium oxalate on extraradical hyphae of ectomycorrhizae, but the presence of crystals within the fungal mantle apparently has not been described. Calcium oxalate production by monotropoid mycorrhizae may be a result of the rapid movement of water, carbohydrates, and minerals from fungus to vascular plant that occurs during flowering.

30. Holocene vegetational history of an abandoned Mississippi River channel in southeastern Iowa

B. K. Nations

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Pollen and plant macrofossil analysis of a core collected from Klum Lake, an abandoned Mississippi River channel in Louisa County, permits reconstruction of the area's Holocene vegetational history. Three radiocarbon dates provide time control. Three pollen zones are identified; an oak-elm zone dating from 10,300 to 2,290 Y.B.P., a grass-chenopod zone from 7,290 to 2,560 Y.B.P., and an oak-NAP zone from 2,560 Y.B.P to the present. Plant macrofossils were analyzed in order to understand local wetland versus regional changes in vegetation.

31. Holocene paleoecology of eastern Iowa: evidence for a Mesic forest ecosystem at Mud Creek, Scott County, eastern Iowa

P. M. WITINOK

Geography Department, University of Iowa, Iowa City, Iowa 52242

Paleoecological studies of the natural environment try to provide the link between climate and vegetational expansion through time, which can interpret the environmental conditions. Plant macrofossil and pollen analysis data continually added to the record seeks to modify and redefine the presently developed theory on vegetational change. Plant macrofossils and pollen have been collected and analyzed from Mud Creek, Scott County, eastern Iowa, to establish the character and species composition of upland and aquatic ecosystems in early Holocene time. Forest, forest-understory, and aquatic species predominate in the alluvial deposits which date from 9400 to 5400 B.P. This flora contrasts with those in central Iowa, which show maximum prairie dominance at this time, but are in accordance with studies in progress in northeastern Iowa. These studies indicate that the expansion of the "Prairie Peninsula" is not as simple as many previous workers have suggested, but that more of a forest/prairie mosaic prevailed and postulated movements of prairie-forest border are apparently wrong in eastern Iowa due to inadequate data.

Cellular and Molecular Biology

32. Flow cytometry as a tool to study the anther tapetum in fertile (N) and Texas cytoplasmic male sterile (Tcms) corn (Zea mays L.)

M. VARGAS-OLVERA AND H. T. HORNER

Department of Botany and Bessey Microscopy Facility, Iowa State University, Ames, IA 50011

Flow cytometry (FC) has provided experimental approaches for the analysis, characterization, and individual selection of cells and organelles based upon endogenous or introduced fluorescence. FC has several advantages over other microscopic procedures. It is rapid, accurate, and sensitive. However, variations in sample preparation and DNA stains make the comparison of results obtained from different laboratories difficult. Several isolation techniques for (N) and (Tcms) corn tapeta, methods for their fixation (including buffers and ethanol fixation), and quality of fluorochromes were compared. DNA fluorochromes were ranked by relative fluorescence: (1) 4',6-diamidino-2 phenylindole (DAPI) >(2) mithramycin >(3) acridine orange =(4) propidium iodine. In addition, tapeta were measured and compared to DNA standards in the FC library [chicken blood, soybean and corn (N) and (Tcms) root tip cells and leaves]. Methodology presented serves as a step toward understanding cellular/molecular differences leading to corn cytoplasmic male sterility.

33. Stage-specific changes in protein complement accompany early spikelet development in the maize ear

T. S. FINDLAY AND A. R. ORR

Department of Biology, University of Northern Iowa, Cedar Falls, IA 50614

Analyses of Zea mays strains that exhibit mutations at specific stages in the organogenesis of the ear and tassel indicate the initiation/development of inflorescence primordia is genetically regulated. A long term goal of our laboratory is to study the relationship between the morphological events and the underlying biochemical changes in maize inflorescence development. Soluble proteins of three successive developmental stages (spikelet primordia, glume primordia, and floret primordia) of the ear were analyzed by high resolution 2-D PAGE. The results show a pattern of qualitative changes in the protein complement that are coincident with the morphological events. These putative protein markers will be compared to protein changes specific to earlier stages of ear development. The control of maize inflorescence morphogenesis appears, in part, to be sequentially imposed at successive developmental stages.

34. Lectin receptors in embryonic chick tissues.

J.D. WULFKUHLE AND C.H. SULLIVAN

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Carbohydrates located on the surfaces of cells have a variety of important functions in development. Previous results from our laboratory have identified regional differences in glycoproteins found in the chick ectoderm. We have taken an alternative approach of using fluorescent lectins to examine the types of carbohydrates found in all tissues of the chicken embryo. We have tested for the presence of glycoconjugates containing fucose, galactose, and mannose, during the first 40 hours of development when tissue interactions important for organ formation are occurring. We found very little binding of any of three lectins to tissues in 20 hour embryos, and by 40 hours the pattern was unchanged for two lectins. Concanavalin A (mannose) and UEA-1 (fucose) did not bind with any specificity to a particular tissue. However, substantial differences existed in the pattern of binding of peanut lectin to galactose moieties. By 40 hours, peanut lectin receptors have appeared on the inner and outer surfaces of the neural tube, with less binding to other ectodermal structures. Therefore, changes in lectin receptors accompany nervous system formation in the developing chick embryo. (Supported by Grants from Research Corporation and NIH to CHS).

35. Analysis of ovine growth hormone release using a reverse hemolytic plaque assay: identification of functional heterogeneity.

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The reverse hemolytic plaque assay (RHPA) has proved enormously successful in detecting and quantitating hormone release from mixed pituitary populations of rodent origin. This assay employs antibody-directed, complement-mediated erythrocyte lysis around secretory cells to microvisualize hormone release. To expand this approach to other species, we developed an RHPA that recognizes growth hormone (GH) release from ovine somatotropes present in monodispersed pituitary tissue. Somatotropes represented 15-20% of all cells in the mixed ovine pituitary dispersion. There was considerable variation in the incubation time required by individual somatotropes to form a plaque, demonstrating that some somatotropes secreted GH more rapidly than others - the phenomenon of individual functional heterogeneity.

36. Molecular marker analysis of Iowa Stiff Stalk Synthetic

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Since its synthesis in the early 1930's, the Iowa Stiff Stalk Synthetic (BSSS) maize population has been an important source of widely used inbred lines. In addition, BSSS has also been included in basic research studies. This study characterizes BSSS by utilizing molecular markers. Restriction fragment length polymorphism (RFLP) analysis involved 58 DNA clones distributed throughout the nuclear genome and two restriction enzymes. The genetic materials involved in the study included; 14 of the 16 progenitor lines of BSSS, the two parents of one of the missing progenitors, seven elite inbreds derived from BSSS, and 89 random S7 inbred lines derived from the base

population (CO). The 89 lines consist of 22 high-yielding per se, 23 low-yielding per se, and 44 lines selected at random.

The objectives of this study were: 1) to compare the relative effectiveness of two restriction enzymes for detecting RFLPs in BSSS, 2) to examine the extent of molecular genetic diversity detected among the progenitor lines of BSSS, 3) to estimate the RFLP allele frequencies in the CO, and 4) to identify RFLP loci exhibiting differences in allele frequencies between the high and low yielding groups.

37. Construction of an RFLP Map in Maize

R. FEAZEL, W. NELSON, D. BLAIR, M.L. KATT, D. GRANT, W.D. BEAVIS, J. MARTICH, J.S.C. SMITH, S.L. BOWEN, R.A. TENBORG, AND O.S. SMITH

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We have constructed an RFLP map for the maize genome which can serve as the starting point for the genetic localization of agronomically important genes. Random, 0.5-2.5 kb Pst-generated DNA frag- ments were individually hybridized to DNAs prepared from the inbreds B73, Mol7 and 112 F2 plants derived from a cross between these inbreds. Each F2 plant was scored for its allelic composition at the locus defined by the probe. A genetic linkage map was constructed from these data by establishing linkage among RFLP marker loci by estimating recombination values using the maximum likelihood method. Genetic linkage groups were assigned to chromosome arms by 1) using as probes DNA sequences whose location was known, 2) using as markers isozyme loci whose loca- tions were known and/or 3) hybridizing representa- tive probes against DNAs prepared from plants mono- somic for known chromosomes. 166 of these markers were mapped to 10 linkage groups that cover the genetic map of maize. We have included probes from other published RFLP maps to compile a densely populated, composite RFLP map.

38. Identification and Genetic Localization of Loci Affecting Yield and Other Agronomic Traits in Maize

M.L. KATT, W. NELSON, D. BLAIR, D. GRANT, W.D. BEAVIS, R. FEAZEL, J. MARTICH, J.S.C. SMITH, S.L. BOWEN, R.A. TENBORG, R.R. FINCHER, R. MEIER, AND O.S. SMITH

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We have used an RFLP map of maize to identify and localize to chromosomal regions Quantitative Trait Loci (QTLs) affecting the expression of 20 agronomically important traits. This was accomplished by correlating the genotype as determined by RFLP markers and the whole-plant phenotype for the measured traits in a F2 population derived from the cross B73xMol7. Field data were collected from replicated trials (two reps at three and four locations, respectively) for both the F2- derived F4 families tested per se and the F2-derived F3 families topcrossed to an unrelated inbred tester. In both cases, the family means were used to determine the phenotype of the original F2 plants. For some traits, a single QTL (ie. a single gene or small group of genes) accounted for greater than 10% of the total variation observed in the F2 population.

39. Regulation of rRNA gene replication in Tetrahymena thermophila

D.D. LARSON, W.-L. SHAIU, and A.R. UMTHUN

Department of Zoology, Iowa State University, Ames, IA 50011

We are using a combination of genetic, molecular and biochemical approaches to investigate the replication of the rRNA genes (rDNA) in *Tetrahymena thermophila*. Our work is aimed at identifying cis-acting DNA sequence signals critical for rDNA replication and trans-acting factors that interact with these regions to modulate replication. Analysis of mutants with altered replication properties has identified a cis-acting sequence element in the origin region that may play a role in regulating transcription as well as replication of the rDNA. Using a gel mobility shift assay, we have identified and begun to purify an activity from *Tetrahymena* cell-free extracts that interacts with sequences in this region. We are using electron microscopy, two-dimensional gel electrophoresis, and *in vitro* labelling of nascent DNA chains to precisely map the sequences at which DNA replication initiates. Currently, we are characterizing a cell-free system capable of faithfully replicating exogenous rDNA templates.

40. Telomere DNA structure and telomere binding activity in Tetrahymena thermophila.

E.R. HENDERSON AND B.J. MIXAN

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Telomeres, the structures at chromosome termini, are essential for chromosome stability. All telomeres have a G-rich and C-rich strand with a G-strand overhang of 12-16 nucleotides. We have shown by NMR analyses that synthetic oligonucleotides corresponding to the G-strand overhang can assume a novel non-Watson-Crick base paired structure involving G:G base pairs containing guanines in the syn conformation. DMS protection and base analog substitution studies (replacing guanine with inosine) corroborate this observation.

Using a gel mobility shift assay, we have identified an activity from Tetrahymena extracts that binds to the G-strand, even in the presence of 1000-fold excess non-telomeric single-stranded DNA. Binding is best in the presence of the divalent cations Mg++ and Ca++ but not Zn++, and is inhibited by the monovalent cations Na+ and K+.

We propose that the unusual structure formed by the G-strand, or one related to it, may serve as a recognition signal for a telomere G-strand binding activity such as that we have identified. This complex would then constitute a telomeric "cap" protecting chromosomal termini and thereby stabilizing the chromosome.

41. A study of heatshock protein 58 in xenopus laevis oocytes

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The messenger RNA encoding Heatshock Protein 58 (an evolutionarily conserved inner mitochondrial membrane protein

which protects organisms possessing it from heat shock and which may play a role in mitochondrial activation) was isolated from Xenopus laevis oocytes and characterized with respect to size, base sequence, and location (animal or vegetal pole) in the oocyte. Implications of the results of these studies regarding the role the protein may play in early Xenopus development will be discussed.

42. Evaluation of transgenic tobacco plants and their progeny obtained via microprojectile bombardment of tobacco leaf pieces

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Transgenic tobacco plants carrying genes for kanamycin resistance (NPTII) and beta-glucuronidase (GUS) were chacterized for the amounts of enzyme produced from the inserted genes, presence of DNA integrated into the nuclear genome, and segregation patterns to progeny. The transgenic plants were recovered following microprojectile bombardment of intact cells of tobacco leaves of var. Xanthi with 1.2 uM particles coated with DNA which consisted of the NPTII and GUS genes. Several transgenic plants which have been investigated in detail, express the enzymes of the introduced genes at high levels, and have one or more copies of the inserted DNA in the nuclear genome. The inheritance of the inserted genes follow Mendelian inheritance in some cases, but not all. The expression of the introduced genes vary in the progeny because of genetic segregation and possibly because of rearrangements of the introduced DNA. The microprojectile bombardment method of direct DNA delivery into plant cells appears to share similar characteristics of gene expression and inheritance to other methods of direct DNA delivery into plant cells.

43. Methods for cryopreservation of maize callus

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Two methods for preparing embryogenic maize callus were found to be comparatively successful. Explants were selected from the callus mass either as: (1) small fragments of the mass (relatively free of basal tissue), or (2) larger segments (containing more basal tissue). The smaller fragments were then manipulated to simulate a cell suspension and frozen according to suspension protocol. The larger callus pieces were submerged in cryoprotectant, blotted dry, and frozen. The "small fragment" method resulted in quality regrowth and regeneration within a short period of time, while the "dry freeze" method exhibited a time delay in regrowth and resulted in less recovered material.

44. Somatic embryogenesis in pejibaye palm, Bactris gasipaes H.B.K.

K. M. STEIN AND L. C. STEPHENS

Department of Horticulture, Iowa State University, Ames, IA 50011

Pejibaye is an important crop in some areas of Latin America, especially Costa Rica, used particularly for fruit and palm-heart production.

Somatic embryogenesis was induced by 2,4-dichlorophenoxyacetic acid (2,4-D) in vitro, in a modified Murashige and Skoog (MS) medium. The best responses were obtained on media containing 100 and 75 mg/l 2,4-D, with 2.5 g/l activated charcoal and 100 ml/l coconut water.

Genotypic variation played an important role in determining the expression of somatic embryogenesis in this monocotyledon.

POSTER PRESENTATIONS

45. Dispersal and survival of epiphytic Bacillus pumilus when used as an inoculant for hay. N. TOMES*, T. SHELLEY, J. PRICE, G. ALLEN, G. BALDNER, C. HENDRICK. Pioneer Hi-Bred International, Inc., Microbial Genetics Division. Johnston, IA 50131.

Risk assessment for application of naturally occurring non-pathogenic microorganisms in field studies depends on the number of bacteria applied, their dispersal, survival in the environment, and impact on the resident populations in their natural environment. We have been developing a Bacillus pumilus inoculant for preservation of hay. Using a selective medium we determined normal field populations of B. pumilus to range from 10^{5-6}/g in field soil, 10^{2}/g in alfalfa and 10^{4}/g in alfalfa hay. Rifampicin-resistant (Rif^{r}) mutants for the four inoculant strains were selected for field dispersal experiments. B. pumilus Rif^{r} strains were sprayed on alfalfa at 10^{5}/g as hay was baled. Aerial dispersal of mutants from the point of application was assessed by placing open petri dishes of selective medium at uniform distances up to 100m. The highest populations were directly under the baler and decreased exponentially to barely detectable levels at 100m. Rif^{r} mutants could not be detected in field soil samples 7 days after treatment of alfalfa hay. Populations in hay were maintained at inoculation levels for 60 days of storage.

46. The effects of activated charcoal, coconut water, and plant age on callus production in pejibaye (Bactris gasipaes H.B.K.) shoot tips

K. M. STEIN AND L. C. STEPHENS

Department of Horticulture, Iowa State University, Ames, IA 50011

The pejibaye palm is an important crop in some areas of Latin America, used primarily for fruit and palm-heart production.

Shoot tips of 1½-year-old and 4-month-old pejibaye seedlings were cultured in vitro on modified Murashige and Skoog (MS) media containing various combinations of 2,4-dichlorophenoxyacetic acid (2,4-D), coconut water, and activated charcoal.

Coconut water had a significant inhibitory effect on callusing of older tissue, but enhanced callusing in younger tissue.

Calus production was completely inhibited in media with 2.5 g/l activated charcoal if the 2,4-D concentration in the medium was 50 mg/l or lower.

Overall, callusing was most pronounced in the shoot-tip cultures of the younger seedlings, even though both seedling ages are considered juvenile.

47 Control of DNA replication in Tetrahymena: Analysis of mutants with altered replication properties

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We are studying the ribosomal RNA genes (rDNA) of the protozoan, *Tetrahymena thermophila* to investigate the mechanisms that regulate DNA replication in eukaryotic cells. These genes are amplified at a specific developmental stage and are subsequently maintained at a high copy number throughout vegetative divisions. Previously, we used a genetic selection scheme to isolate mutants defective in amplification or replicative maintenance of the rDNA . Our analysis of one mutant and another naturally-occurring variant has identified a cis-acting control element in the replication origin region that regulates rDNA copy number.

To localize other cis-acting regulatory regions, we have examined two additional mutants as well as recombinant rDNA molecules generated by crosses between mutant and wild type strains. These studies have shown that somatic recombination within a 25 bp region of mutant rDNAs can give rise to new rDNA molecules with a replication advantage relative to both parental types.

48. **Control of DNA replication in *Tetrahymena*: Characterization of origin-specific DNA-binding factors**

A. R. UMTHUN AND D. D. LARSON

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Origin-specific DNA binding proteins have been shown to be important components of both prokaryotic and eukaryotic replication systems. A known origin exists in the 5' non-transcribed spacer region of the rRNA genes (rDNA) of the protozoan *Tetrahymena thermophila* . These genes are amplified and maintained at a high copy number in the transcriptionally active macronucleus. We are interested in the mechanism of replication control that regulates this constant high copy number. Using a gel mobility shift assay on cell-free extracts from *Tetrahymena* , we are attempting to identify sequence-specific DNA-binding proteins that may be involved in this regulation. Recent results indicate a potential origin-specific binding activity in the extracts. Currently we are purifying these DNA-binding proteins by heparin-agarose and affinity chromotography.

Chemical Education

49. The Synthesis of a Compound Containing the Elements N, H, S and O: An Experiment Involving Several Chemical Concepts.

W. HUTTON and S.A. HEIDEMAN

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A single compound is used as the basis for five separate experiments which illustrate different fundamental concepts in general chemistry. Students synthesize the compound to be studied from common reagents: household bleach, urea and sulfuric acid. They are told only that the compound ($N_2H_6SO_4$) contains the elements nitrogen, hydrogen, sulfur and oxygen, and that the latter two elements exist in the compound as sulfate ions. They use a portion of "their" compound in the following experiments, which are performed at times in the course which correspond to the discussions of related topics in the lectures: gravimetric analysis of sulfate ion, determination of the nitrogen content of a compound by gas evolution, determination of a titration curve for an acid, determination of the molecular weight of a compound from its acid-equivalent weight, and deducing the stoichiometry of a redox reaction. Using the results of these experiments, they characterize the compound. Among the chemical principles investigated in these experiments are stoichiometry, acid-base titrations using a pH meter and chemical indicators, redox chemistry and the gas laws. Experimental details and an analysis of student results for these experiments will be given.

50. A model of academic/industry cooperation

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For over a decade Morningside College and the Iowa Public Service Company(IPS) have cooperated on a joint project which has benefitted both organizations. Initially Morningside performed environmental monitoring for IPS as IPS expanded their coal-fired power plants on the Missouri River near Sioux City. Parameters monitored included water quality, bacteria, plankton, thermal plumes, and fish populations. Chemistry and biology faculty and a research supervisor directed the studies and Morningside College students worked year around as research assistants.

In 1986 the program changed direction and is now called the Science Education and Undergraduate Research Project. This project emphasizes summer research and science education projects and offers research opportunities for college and gifted high school students.

51. The laboratory safety dilemma: what to do when your favorite chemical is a suspected carcinogen.

S. A. HEIDEMAN AND W. HUTTON

Department of Chemistry, Iowa State University, Ames, IA 50011

The list of suspected carcinogens is long and includes a number of chemicals likely to be used in laboratory courses. Is it necessary or desirable to remove these from the lab? Can some be used safely? At what educational level should students use these? Can a chemist build a reasonable case for using these chemicals in a laboratory course? A method which we have found useful for dealing with this dilemma will be discussed.

Chemistry C (Inorganic, Analytical & Physical)

A. Organic monomolecular assemblies: characterization by infrared reflection spectroscopy, scanning tunneling microscopy, and electrochemistry.

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Ames Laboratory-USDOE and Department of Chemistry, Iowa State University, Ames, Iowa, 50011

The self assembly of monomolecular films provides a facile means to manipulate the electrochemical interface. However, the performance of such assemblies is limited by pin holes and other structural defects. Further, little is known regarding how the fundamental chemical and physical interactions between adsorbate, substrate, and solvent influence interfacial reactivity.

This presentation examines approaches to the fabrication of monomolecular assemblies which regulate heterogeneous electron-transfer by size selectivity. The performance and structural characteristics of these films, which were constructed as mixtures of thiolated cyclodextrins, and by the "skeletonization" thiols monolayers at Ag were examined with infrared reflection spectroscopy (IRS), scanning tunneling microscopy (STM), optical ellipsometry, and contact angle measurements.

52. Homogeneous redox catalysis studies of 7-octen-2-one: Determination of the reduction potential and the reductive cyclization

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Direct reduction of 7-octen-2-one leads to the formation of a mixture of 7-octen-2-ol and cis-1,2-dimethylcyclohexanol. Reduction in the presence of aromatic hydrocarbon redox catalysts gave, exclusively cis-1,2-dimethylcyclohexanol. The rate of cyclization of the radical anion of 7-octene-2-one was measured using methods of homogeneous redox catalysis. Cyclic voltammetric studies involving several aromatic hydrocarbon catalysts were employed in this rate determination. The first catalysts chosen where the electron transfer was faster and at a potential where the rate of electron transfer from the catalyst radical anion to the ketone was the rate limiting step. Further studies involving catalysts with more negative potentials, where the rate limiting step was the rate of cyclization of the ketyl radical anion, allowed the cyclization rate to be measured.

53. Homogeneous redox catalysis studies of the reductive cyclization of 6-hepten-2-one and 5-phenyl-2-pentanone.

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Direct reduction of 6-heptene-2-one consumed 2 Faradays per mole and gave 6-hepten-2-ol. Reduction in the presence of an aromatic hydrocarbon redox catalyst allowed reduction to occur 200 mV to 500 mV positive of the reduction of the ketone, itself and afforded only 1,2-dimethylcyclopentanol. Using homogeneous redox catalysis techniques the E^{o} of the ketone and the rate of cyclization of the ketyl radical anion were measured. Similar results have been obtained for the reduction of 5-phenyl-2-pentanone, and the rate of cyclization was much slower. These results are consistent with the mechanisms previously proposed for the catalysis of these reductive cyclizations by dimethylpyrrolidinium ion.

B. Signal Processing Techniques for Rapid Analysis of Fourier Transform Infrared Data

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A variety of applications exist in which Fourier transform infrared (FTIR) spectroscopy is used to monitor rapidly changing chemical processes. These applications range from the use of FTIR in the laboratory to monitor chromatographic or kinetics experiments to industrial applications in which information obtained from the infrared data is used to adjust critical parameters in an ongoing chemical reaction. In each of these cases, a premium is placed on the speed with which the pertinent analytical information can be extracted from the collected FTIR data. To be maximally effective, the required data processing must be performed in real time, i.e. between infrared scans. In the work presented here, FTIR signal processing strategies will be described that allow such a real-time analysis to be performed. Based on the use of time-domain digital filters, these algorithms allow both qualitative and quantitative analytical information to be extracted directly from raw FTIR interferograms. The use of these algorithms will be demonstrated with several examples.

C. Electron-transfer reactions in metalloprotein complexes

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Displacement of water ligands in the trimetallic cluster $[Ru_3(\mu_3\text{-}O)(\mu_2\text{-}OAc)_6(H_2O)_3]^+$ with cytochrome *c* yields the protein clusters $[Ru_3(\mu_3\text{-}O)(\mu_2\text{-}OAc)_6(H_2O)_{3-x}(cyt)_x]^+$. The kinetics of electron-transfer reactions involving these new clusters is studied by stopped-flow spectrophotometry.

Cytochrome *c* and plastocyanin form natural electrostatic complexes, and they can be covalently cross-linked in several ways. Interprotein electron-transfer reactions are studied by pulse radiolysis and flash photolysis. In the electrostatic complex the reaction is fast ($1100\ s^{-1}$). In the covalent complexes the reaction does not occur (less than $0.05\ s^{-1}$) even though the metalloproteins are not noticeably perturbed by cross-linking. This great contrast in reactivity indicates the importance of correct mutual orientation of the proteins. When the orientation is incorrect, and cannot be changed by rearrangement, there is no electron transfer.

54. FAB/MS studies palladium complexes

L. M. MALLIS AND W. J. SCOTT

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The use of palladium to catalyze the coupling of nucleophiles with electrophiles has become an increasingly important method for the formation of carbon-carbon bonds. The reaction is believed to proceed by an oxidative addition/transmetallation/reductive elimination scheme. While each step of the proposed catalytic cycle has precedent for the Group 10, only the product of the oxidative addition step has been demonstrated under coupling conditions.

Fast Atom Bombardment Mass Spectrometry (FAB/MS) has been used to identify transient species in organic reactions. We are developing an understanding of the fragmentation characteristics of typical palladium complexes under FAB/MS conditions in order to apply this to a study of transient species which might be detected during coupling reactions.

55. Reaction of $(\eta^5\text{-}C_{13}H_9)Mn(CO)_3$ with PET_3: formation of a monohapto fluorenyl complex and its decomposition via loss of fluorenyl radical

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Reaction of $(\eta^5\text{-}C_{13}H_9)Mn(CO)_3$ (I) with PEt_3 leads to formation of a species which was characterized by IR and ^1H, ^{31}P, and ^{13}C NMR as $(\eta^1\text{-}C_{13}H_9)Mn(CO)_3(PEt_3)_2$ (II), the first spectroscopically characterized η^1-fluorenyl transition metal complex. II decomposes via Mn-C bond homolysis to $C_{13}H_9$ radical and $Mn(CO)_3(PEt_3)_2$ (III), a green radical species which slowly reacts with excess PEt_3 to yield $HMn(CO)_3(PEt_3)_2$ (IV) as a final product. Characterizations of III and IV are based on spectroscopic data and literature precedents for $P(n\text{-}Bu)_3$ analogs. These results conflict with an earlier literature report on the reaction of I with $P(n\text{-}Bu)_3$ in which an analogous green intermediate was identified as $(\eta^1\text{-}C_{13}H_9)Mn(CO)_3(P(n\text{-}Bu)_3)_2$ and the final product as $(\eta^3\text{-}C_{13}H_9)Mn(CO)(P(n\text{-}Bu)_3)_2$.

D. Multinuclear NMR Studies of Molybdenum and Tungsten Carbonyl-Isocyanide Complexes

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Department of Chemistry, Grinnell College, Grinnell, IA 50112.

$M(CO)_n(CNR)_{6-n}$ (n=0-6) complexes (M=Mo, W; R=2,6-dimethylphenyl, t-butyl, cyclohexyl, isopropyl) have been synthesized. Depending on the R-group of the isocyanide ligand, four or six carbonyl groups in $M(CO)_6$ can be replaced. The NMR properties of the atoms in these complexes have been studied by ^{95}Mo, ^{183}W, ^{14}N and ^{13}C NMR. The chemical shift changes during the successive substitution of carbonly groups by isocyanides will be discussed.

56. Synthesis, Structure and Properties of $Mo(NC_6H_4NH_2)Cl_2(S_2CN(C_2H_5)_2)_2$

D.W. WHISENHUNT, M. R. CARSON AND M. MINELLI

Department of Chemistry, Grinnell College, Grinnell, IA 50112-0806.

J.L. HUBBARD

Department of Chemistry, University of Vermont, Burligton, VT 05405

The reaction of $MoOCl_2(S_2CN(C_2H_5)_2)_2$ with 1,2-phenylenediamine yields $Mo(NC_6H_4NH_2)Cl_2(S_2CN(C_2H_5)_2)_2$ as the main product. The structure of this complex will be compared to the structure of $Mo(NC_6H_5)Cl_2(S_2CN(C_2H_5)_2)_2$. The electrochemical, UV-Vis, ^{14}N NMR,and ^{95}Mo NMR properties of the compounds will be discussed.

57. Kinetics of ligand exchange and isomerization of some chiral olefin complexes of platinum(II)

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Department of Chemistry, Grinnell College, Grinnell, IA 50112

The lability of coordinated olefins in their metal complexes varies widely and is of considerable interest in catalytic processes.

As part of an on-going study of chiral olefin complexes of platinum(II), we have employed nmr techniques to determine the rates of olefin exchange and of isomerization of several chiral species. For slow isomerization reactions, spectral changes have been monitored as a function of time, whereas for fast isomerization reactions, line shape analyses based on H-1, C-13, and Pt-195 spectra have been employed to obtain rate data. Examples of both approaches, involving complexes of olefinic alcohols, will be presented.

E. Chemistry of $Cp_2Zr(R)^+$ Olefin Polymerization Catalysts

R. F. JORDAN

Department of Chemistry
University of Iowa
Iowa City, Iowa 52242

Cationic d^0 alkyl complexes $Cp_2Zr(R)(L)^+$ are formed by reaction of neutral precursors Cp_2ZrR_2 with one electron oxidants and ca be isolated as BPh_4^- salts. The THF complexes $Cp_2Zr(R)(THF)^+$ polymerize ethylene in the absence of Al cocatalysts. These results support recent proposals that cationic alkyls $Cp_2M(R)^+$ are active species in the classical soluble Cp_2MX_2/AlR_nX_{3-n} Ziegler-Natta olefin polymerization catalyst systems and the recently developed alumoxane systems. The availability of discrete, well characterized $Cp_2Zr(R(L)^+$ catalysts provides an opportunity to study the mechanisms of the key reactions in olefin polymerization catalysis at the molecular level. The results, and implications for catalyst design, of kinetic, mechanistic, and structure/reactivity studies of stoichiometric insertion, beta-H elimination, and M-R bond hydrogenolysis reactions of $Cp_2Zr(R)(L)^+$ complexes will be discussed. Recent applications of $Cp_2Zr(R)(L)^+$ complexes in catalytic C-H bond functionalization reactions will also be discussed.

POSTER PRESENTATION

58. Simultaneous determination of metals in soils by ion chromatography

N. T. BASTA AND M. A. TABATABAI

Department of Agronomy
Iowa State University
Ames, IA 50011

An accurate and precise ion chromatographic (IC) method for determination of total Cu, Ni, and Zn in soils was developed. The method consists of three steps: (1) digestion of the soil sample by using HNO_3, $HClO_4$, and HF; (2) extraction of the metals of interest by dithizone in $CHCl_3$; and (3) destruction of the metal-dithizonate complex with HNO_3, and determination of the metals by IC. Determination of these metals was accomplished by separation on a guard (HPIC-CG5) and a separator (HPIC-CS5) columns followed by post-column reaction with 4(2-pyridylazo) resorcinol (PAR) to form metal complexes, and measurement of the absorbance of the metal-PAR complexes by a UV-VIS detector at 520 nm. Simultaneous determination of Cu, Zn, and Mn was achieved by using an eluent containing 4 mM pyridine, 2,6-dicarboxylic acid and 50 mM acetic acid-sodium acetate buffer (pH 4.8). Simultaneous determination of Cu, Zn, Ni, and Pb was accomplished by using an eluent containing 40 mM oxalic acid and 50 mM acetic acid-lithium acetate buffer (pH 4.8). Results by the IC agreed with those obtained by AA.

Chemistry D (Organic & Biological)

59. Effects of convection-oven and microwave-ove drying on degradation of alachlor residues in a fabric structure

C. J. KIM, L. K. ABRAHAM AND R. S. OSTDIEK

Department of Textiles and Clothing, Iowa State University, Ames, IA 50011

Effects of temperature and heat-exposure time in a convection-oven drying and effects of microwave intensity and exposure time in a microwave drying, on degradation of herbicide alachlor were examined

In convection-oven dried swatches reduction in alachlor residue differed significantly by the three exposure periods of 15, 30, and 60 min at 150°C. The 60-min exposure at 150°C and 15-min or longer exposure at 200°C left only trace amounts of alachlor residue. For microwave-oven dried swatches the residue amounts at low microwave intensity showed a decreasing trend as the exposur time increased; however, the difference between th highest residue amount and the lowest was only 11.0%. At the medium intensity the residue amount did not show a pattern. At the high intensity, however, the residue amounts decreased as the exposure time increased; after 200 sec the residue amount dropped to nearly half of that at 50 sec.

60. Mechanistic study of the palladium-catalyzed reduction of alkyl halides

K. YUAN AND W. J. SCOTT

Department of Chemistry, The University of Iowa, Iowa City, Iowa 52242.

We have found that 1,1'-bis(diphenylphosphino) ferrocenepalladium dichloride (dppf) $PdCl_2$ and (dppf) Pd(0) catalyze the reduction of alkyl halides in the presence of Grignard reagents producing alkanes in nearly quantitative yields. This was surprising since the same reaction

conditions were reported to give cross-coupled products in good to excellent yields. Accordingly, mechanistic studies of the reduction were undertaken.

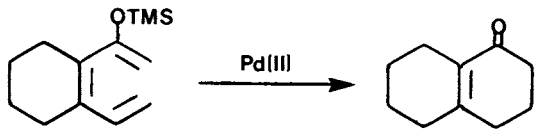
Deuterium transfer studies indicated that three or more separate pathways are in competition, all of which lead to reduction of the alkyl halide. Identification of the pathways and the conditions which differentiate between those pathways will be discussed.

61. Palladium catalyzed oxy-hexatriene cyclizations

C. M. Hettrick and W. J. Scott

Department of Chemistry, University of Iowa, Iowa City, IA 52242.

Cyclizations of electron-poor hexatriene systems have been well precedented in organic synthesis, while annulations of electron-rich moities have been less developed The use of various palladium(II) catalysts has been found facilitate cyclization in electron-rich trimethylsilyloxyhexatrienes. The scope and mechanism of these reactions will be discussed.



62. Metal-mediated synthesis of novel nucleosides

V. NAIR* AND TODD B. SELLS

Department of Chemistry, University of Iowa, Iowa City, IA 52242

The use of metal-mediated reactions in the synthesis of biologically-active nucleosides is part of a developing program in our laboratory. This paper will focus on new approaches to the functionalization of the base moiety of nucleosides using organometallic intermediates. The generality of these procedures will be mentioned. The biological importance of the modified nucleosides will be discussed.

63. The effect of metal coupling reagents on the stereochemistry of the pinacol coupling reaction

Rammelsberg, A., Baker, T., Lightner, M., Warnet,R.

Department of Chemistry, Simpson College, Indianola, IA 50125

Ketones can couple to form pinacols via metal mediated radical reactions. We have shown that the choice of the metal influences the stereochemistry of the coupling of R-(+)-3-methyl cyclohexanone. While the reasons for this difference remain unknown we wish to report the results of reactions using a series of commonly used metal coupling agents.

64. Inhibitors of nucleoside transport

V. NAIR* AND A. J. FASBENDER

Department of Chemistry, University of Iowa, Iowa City, IA 52242

The ribonucleoside, adenosine, is apparently involved in many physiological regulatory functions. Inhibitors of nucleoside transport potentiate the effects of adenosine in a variety of systems. The synthesis of thioalkylated adenosine analogues by thermal and photochemical methods will be described. The importance of the final products in inhibition of nucleoside transport will be discussed.

65. Novel congeners of dideoxyadenosine

V. NAIR* AND G. S. BUENGER

Department of Chemistry, University of Iowa, Iowa City, IA 52242

2'3'-Dideoxyadenosine (ddA) has been found to exhibit potent antiviral activity against type-1 human immunodeficiency virus (HIV) through inhibition of HIV-1 reverse transcriptase. However, the hydrolytic and enzymatic instability of ddA limits its usefulness as an anti-AIDS compound. The synthesis of analogues of ddA which are more stable than the parent compound will be described. Glycosidic bond stability studies by differential UV spectroscopy will be discussed. Results of the behavior of the target compounds towards adenosine deaminase will also be presented.

66. Isolation and Structure Elucidation of New Aflavinine Derivatives from the Sclerotia of Aspergillus Tubingensis

MARK R. TEPASKE and JAMES B. GLOER*

Department of Chemistry, University of Iowa, Iowa City, IA 52242.

Many fungi produce propagules called sclerotia which lie dormant in the soil for long periods of time. The factors which permit the survival of these key physiological structures are not entirely understood. Our previous studies have shown that the sclerotia of Aspergillus flavus contain unique secondary metabolites which deter feeding by fungivorous insects that encounter sclerotia in nature. The hexane extract of the sclerotia of Aspergillus tubingensis was found to deter feeding by the fungivorous beetle Carpophilus hemipterus. Analysis of this extract led to the isolation of several new indole alkaloids biogenetically related to the aflavinines. The structures of these compounds were elucidated utilizing MS and NMR techniques, and by spectral comparison with metabolites encountered in our studies of A. flavus. The isolation, structure determination, and biological activity of these compounds will be discussed.

67. The preparation of S-(-)-3-methyl cyclohexanone utilizing a stereospecific microbial reduction

McQueen, J.S., Lemon, P., Moody, J., Warnet. R.

Departments of Chemistry and Biology, Simpson College, Indianola, IA 50125

Organic chemists have begun to use micro-organisms to effect stereospecific chemical transformations. We wish to report the stereospecific reduction of racemic 3-methyl cyclohexanone mediated by several micro-organisms to give a diastereomeric mixture of 3-methyl cyclohexanols. This mixture was then separated by normal chromatographic methods and reoxidized to give S-(-)-3-Methyl Cyclohexanone.

68. Bioactive Metabolites from Coprophilous Fungi: New Antifungal Agents from Preussia and Podospora spp.

H. A. WEBER AND J. B. GLOER*

Department of Chemistry, University of Iowa, Iowa City, IA 52242

Antagonistic behavior among natural fungal competitors has been observed in several fungal ecosystems. Although this interspecies antagonism may involve several different mechanisms, one common factor appears to be the production of chemical agents by some species which inhibit the growth of their competitors. We have studied the chemistry of several antagonistic species of coprophilous (dung-colonizing) fungi in search of naturally occurring antifungal agents with potential pharmaceutical importance. The isolation and characterization of antifungal metabolites from members of the widespread coprophilous genera Preussia and Podospora will be discussed.

69. Hymenoscyphin A: A Novel Bioactive Natural Product from the Marine Fungus Hymenoscyphus Sp.

GREGORY K. POCH and JAMES B. GLOER*

Department of Chemistry, University of Iowa, Iowa City, IA 52242

Although the importance of terrestrial fungi as sources of useful natural products is well established, the potential value of marine fungi in this regard is relatively unexplored. Culture filtrates produced by the ascomycete Hymenoscyphus sp., isolated from a coastal saltmarsh, were found to exhibit antibiotic activity against B. subtilis as well as toxicity toward brine shrimp. Sephadex LH-20 gel chromatography of the ethyl acetate extract of the culture filtrate furnished a crystalline metabolite responsible for these activities. The structure was determined primarily through NMR studies, high resolution FABMS, and chemical degradation experiments. This compound, which we have named hymenoscyphin A, contains a hexa-(alpha-hydroxyisovaleryl) unit linked to an unusual monosaccharide, and is one of the first new natural products to be isolated from a fungus found in the marine environment.

70. The determination of the activity of analogs of secondary plant growth regulators

Pladsen, P., Singer, P., Warnet, R., Hess, K., Lynn, D.

Departments of Chemistry and Biology, Simpson College, Indianola, IA 50125 and Department of Chemistry, University of Chicago, Chicago, IL 60637

Dehydrodiconiferyl glycosides (DCGs) are a recently discovered class of what appear to be secondary plant growth regulators. Preliminary results indicate that these compounds are responsible for a subset of the activities assigned to cytokinin. A series of standard cytokinin activity assays on tobacco pith, tobacco leaf, radish cotyledon, and cucumber cotyledon tissue were run using synthetic analogs of the dehydrodiconiferyl glycosides to compare their activities to those of the natural DCGs and to those of the cytokinins.

71. The synthesis of dehydrodiconiferyl glycoside analogs

Brady, J., Delzell, D., Murphy, T., Warnet, R.

Department of Chemistry, Simpson College, Indianola, IA 50125

Dehydrodiconiferyl glycosides (DCGs) are a recently discovered class of what appear to be secondary plant growth regulators isolated from V. rosea crown gall tumor. We wish to report the synthesis of several methylated analogs of the naturally occurring DCGs utilizing a ferricyanide mediated phenolic coupling of the methyl esters of ferulic acid and p-hydroxy cinnamic acid followed by methylation and reduction to the diols.

72. Stereochemical modifications in deoxynucleosides

V. NAIR* AND A. G. LYONS

Department of Chemistry, University of Iowa, Iowa City, IA 52242

Purine nucleosides bearing modifications in the carbohydrate moiety are of considerable interest in our antiviral work. One such modification involves stereochemical inversion of the hydroxyl groups from α to β in deoxynucleosides. Synthetic approaches to these modifications will be described. The major emphasis of the presentation will be on direct, single-step conversions.

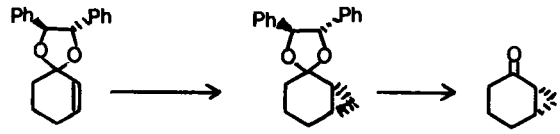
73. Homochiral ketals in organic synthesis

D. S. TOROK AND E. A. MASH

Department of Chemistry, University of Arizona, Tucson, AZ 85721.

2-Cycloalkene-1-one-(-)-erythro-hydrobenzoin ketals undergo efficient and diastereoselective cyclopropanation when treated with an excess of Simmons-Smith reagent. The resulting crystalline

products yield enantiomerically pure cyclopropyl compounds upon recrystallization. For example, 2-cyclohexyl-1-one-(-)-erythro-hydrobenzoin ketal gave, in 90% yield, a 19:1 mixture of diastereomeric cyclopropanes. Upon one recrystallization, diastereomerically pure cyclopropane was obtained in 78% recovery. Hydrolysis gave (+)-norcaranone of greater that 99% ee.



74. Adenosine analogues resistant to adenosine deaminase

V. NAIR*, D. F. PURDY AND M. J. REISING

Department of Chemistry, University of Iowa, Iowa City, IA 52242

The mammalian enzyme, adenosine deaminase (ADA, adenosine aminohydrolase) catalyzes the highly efficient hydrolytic conversion of adenosine to inosine. The therapeutic potential of many analogues of adenosine is limited by this metabolic conversion. The design and synthesis of adenosine analogues resistant to degradation by ADA would be of considerable interest in medical applications of nucleosides. This paper will focus on the synthesis of such purine nucleosides. Correlation of structure with hydrolytic activity will also be presented.

Conservation

75. Butterflies of Sac County, Iowa: Past and present

D. L. CUTHRELL

Box 714 Early, Iowa 50535

Four sites in Sac County, Iowa were surveyed for the presence of butterflies and skippers from May through September 1988. On nine collecting days 29 species were reported. Thirteen new records for Sac County, Iowa were recorded. Of special interest was a fairly large population of Erynnis baptisiae, which is a state ranked specie. Also included is a historic look at butterfly collecting in the area along with pre- and post-1960 records.

76. Butterflies of Plymouth County

T. T. ORWIG

Morningside College, Sioux City, Iowa 51106

Probably the most extensive tracts of prairie remaining in Iowa are found in Plymouth County, at the northernmost end of the Loess Hills. Prior to 1986, according to Downey and Schlicht, 39 species of butterflies were known from the county. Surveys over the past three summers have yielded 46 species, including 20 new county records. This total of 59 species falls short of the 99 total recorded from all 7 Loess Hills counties, indicating the need for continued surveying. But 11 of the species found in this survey are believed to be uncommon to rare in Iowa: Erynnis juvenalis, E. martialis, E. baptisiae, Hesperia ottoe, H. leonardus pawnee, Atrytone arogos iowa, Atrytonopsis hianna, Amblyscirtes vialis, Euchloe olympia, Mitoura gryneus, and Lycaeides melissa. Nine of these special concern species are found at Five Ridge Prairie, and 8 fly in Stone State Park North, the only two protected sites; more of this habitat and these populations need protection.

The survey has also added 24 new ten-day periods to our flight-time records, including documentation of probable additional broods for E. baptisia, A. arogos iowa, and L. melissa.

77. Rediscovery of the pawnee skipper (Hesperia leonardus pawnee) in the Loess Hills

T. T. ORWIG

Morningside College, Sioux City, Iowa 51106

Surveys of the northern Loess Hills have established that populations of the Pawnee Skipper are still present in Iowa. A prairie-restricted species, it was presumed extirpated from the state. The only published Iowa records for Hesperia leonardus are from 1917 and before, although Downey and Schlicht have an additional record by Lindsey from 1939.

A single male specimen, found in 1986, prompted this survey. In 1988 the Pawnee was collected at 10 sites in Woodbury and Plymouth counties, flying from August 20 to October 1., by Orwig, J. W. Fleckenstein and G. Selby. Only three of these populations are currently protected, at Nature Conservancy's Sioux City Prairie and Five Ridge Prairie, and the prairie remnants in northern Stone State Park. The Pawnee has not been found outside of the Loess Hills.

The leonardus species group is the subject of an ongoing reappraisal. Originally classified as separate species, pawnee and leonardus are often now considered subspecific, with a "blend zone" in southwestern Minnesota and northwestern Iowa. However, these specimens strongly resemble pawnee.

78. Monitoring populations of rare prairie butterflies

G. L. SELBY and D.C. Glenn-Lewin

Dept. of Botany, Iowa State Univ., Ames, IA 50011

Methodology for monitoring populations of rare prairie butterflies was developed and tested at Prairie Coteau in Pipestone County, Minnesota. Hesperia dacotae was the target species, but data

for other rare species flying at this time were also collected. Counts were made throughout the flight period along randomly selected transects. Preliminary data were collected on the relationship between sex ratios and average condition ratings, and the population curve so that a correction index can be developed to standardize all counts to those expected at the peak of the population curve. Further research will be done to quantify this correction factor, and determine its applicability to other species. Similar work was done in the Loess Hills of western Iowa, with Hesperia ottoe as the target species. Results from this work suggest the need to modify the design of the transects for this area.

Support for this research came from the Minnesota Chapter of The Nature Conservancy, The Nongame Section of The Minnesota Department of Natural Resources, and the Iowa Science Foundation (ISF-88-37).

79. Habitat preference of small mammals during winter in northwestern Iowa

D.J. HOFF, S.R. MOATS, and R.P. LAMPE

School of Science
Buena Vista College
Storm Lake, Iowa 50588

During the 1988 winter, a type II marsh and adjoining cornfield and grassy moraine were sampled to determine the relationship between weight of dry organic matter and number of small mammals. Insulated Sherman live traps were set in tar-paper cylinders that enabled access to ground surface. Four species were present. Blarina brevicauda and Peromyscus maniculatus occurred in each habitat. Sorex cinereus was present in the marsh and grass whereas Reithrodontomys megalotis was found only in the marsh. No relationship was found between patterns of occurrence and dry organic matter. Ongoing studies will be discussed.

80. A preliminary evaluation of roadside vegetation survey techniques in Iowa

BARBARA L. HANSEN

Cornell College
Mount Vernon, IA 52314

Today there is a new aspect to the maintenance of roadside vegetation. Rather than spraying or mowing, vegetation managers are surveying the roadsides and encouraging natural grasses. The aim of management is to reduce spraying costs, improve wildlife habitat and increase the aesthetic beauty of Iowa's roadsides.

The study analyzed nine Iowa county roadside survey methods on the basis of time requirement and information gained.

Each survey was done on a one-mile study area monitoring both road ditches. Surveys required 11-65 minutes each to complete. The Iowa/Poweshiek method took the least amount of time while the Lee County method was more detailed and required the most time. An efficiency rating was computed. The Iowa/Poweshiek method resulted in the highest rating.

81. The Iowa Presettlement Vegetation Mapping Project.

DARYL SMITH and TOM BLEWETT

University of Northern Iowa, Cedar Falls, IA 50614 and Iowa Department of Natural Resources, Des Moines, IA 50319.

The early Iowa landscape included vast areas of prairies and savannas with forests primarily in the northeast and along rivers. Due to intensive agricultural usage for 150 years the prairies and savannas are almost gone and the forests are greatly modified. Characterizing presettlement vegetation on the basis of remnants is difficult. The early land survey records are valuable sources of vegetation information. The project has two primary objectives. The first consists of transferring the original plat maps with vegetation types to U.S.G.S. county topographic maps of 1:100,000 scale. The second involves computer data logging of land survey records county by county. Natural features and bearing tree species, size and distance are compiled for easy retrieval. This information should be useful in analysis of presettlement vegetation and correlation with soils, topography and current vegetation. Research supported by State Preserves Advisory Board.

82. Water quality in the Floyd River and alluvial aquifer

K. THOMAS, A. MCMEEKIN, R. TONDREAU

Chemistry Department, Morningside College, Sioux City, IA 51106

Water quality of the Floyd River and its alluvial aquifer was studied under two distinct hydrological conditions: High moisture-high runoff and extended dry, low flow periods. Water samples were taken from the stream, tile drainages, and adjacent alluvial wells, both municipal and private.

Nitrate nitrogen levels exceeding the Iowa state water quality standard of 10 mg/l-N were found in 3 of 6 well sites from the alluvial aquifer. Twenty-eight percent of all well samples collected (both municipal and private) exceeded the nitrate standard.

Surface water quality was generally good throughout the extended dry, low flow periods. However, a period of heavy runoff did have a detrimental effect on the surface water quality, increasing nitrate and turbidity levels 7-fold and reducing dissolved oxygen levels by 50%. Ammonia nitrogen was detected at all river sample sites following the runoff event.

83. Coliform counts as an indicator of recreational water quality on the Mississippi

E. T. MULLIN and M. F. GUEST

A study, done in July, 1988, was made to investigate the possible relationship between physical and environmental factors and the number of coliforms found at any one place or time in a continuous body of water such as the Mississippi River. Five sites were sampled at three different times during a thirty day period. The hypothesis tested was that there would be no significant difference in the number of coliforms at the selected river sites. Data obtained, using the multi-tube fermentation technique for determining of the most probable number of coliforms present, showed that several factors contributed to a significant difference in the total coliform number.

84. Status of the brown bullhead, Ictalurus nebulosus, in Ingham and High Lakes, Emmet County, Iowa

G. S. PHILLIPS

Environmental Studies Program, Iowa Lakes Community College, 300 South 18th Street, Estherville, Iowa 51334

Field collections made in Emmet County, Iowa during the spring of 1984 revealed the presence of sizeable populations of the brown bullhead, Ictalurus nebulosus, in Ingham and High Lakes. While never a common species in Iowa, a decline in collections of the brown bullhead from bodies of water within the state in recent years had been observed. Because of the decline in observations of this species, consideration was given to including the brown bullhead in the state's list of threatened and endangered species. Because of this interest in the brown bullhead, a three year study was undertaken by Iowa Lakes Community College in cooperation with the Iowa Department of Natural Resources to determine the status of the brown bullhead populations in Ingham and High Lakes. Creel surveys were conducted in May and June of 1985, 1986 and 1987. Results indicate a stable population representing 10.25% of the total bullhead population in these two lakes. Sports fisheries statistics, brown bullhead growth data and water quality parameters of Ingham and High Lakes will be summarized.

85. Growth comparison between walleye and walleye x sauger hybrid reared in intensive culture

G. L. Siegwarth and R. C. Summerfelt

Department of Animal Ecology, Iowa State University, 124 Science II, Ames, IA 50011-3221

Growth rates of fingerling walleye (Stizostedion vitreum vitreum) and the half-sib walleye x sauger (Stizostedion canadense) hybrid were compared. Fingerling fish were reared in tanks at about 17° and 21°C and fed a standard walleye diet (W-16). Growth was faster and condition factor greater for both walleye and hybrids at the higher temperature At 21°C, there were highly significant differences between the walleye and hybrid in every comparison--the hybrids were longer, heavier, had higher condition factor, lower conversion factor and had a higher percent survival. At 17°C, the hybrid was longer, heavier and had a higher condition factor but the differences between the hybrid and the walleye were not statsically significant. At 17°C, however, the hybrids had significantly better survival and food conversion than the walleye. These results indicate that the aquacultural potential of the hybrid is better than the walleye and the differences between them are greater when cultured at 21° than at 17°C.

86. Uptake of chromium(III) and chromium(VI) by Cladophora algae

E.C. SHANE AND G. RUBEL

Chemistry Department
Morningside College
Sioux City, Iowa 51106

This study examines the effect of the variables- hardness, Cr concentration, and algae species- on the rate of Cr(III) and Cr(VI) uptake by algae. Cladophora crispata reached a maximum concentration of about 300 ppm Cr(III) after 2-4 days of Cr exposure; Cr(VI) was accumulated at a slower rate reaching 300 ppm Cr(VI) after 8-10 days and 380 ppm after 19 days. C. fracta also accumulated Cr(III) faster than Cr(VI).

Hardness had no effect on Cr(III) or Cr(VI) uptake by C.crispata or Cr(VI) uptake by C.fracta. C.fracta accumulated more Cr(III) as hardness was increased from 72 to 183 mg/l.

As background Cr(VI) concentrations were increased from 0.1 to 10 ppm, the Cr content of C.crispata increased from 100 to 1500 ppm.

87. Status of Black and Forster's Terns in north-central Iowa

N.P. BERNSTEIN

Department of Biology, Mount Mercy College, Cedar Rapids, Iowa 52402

Nesting surveys were conducted for Black and Forster's Terns in three wetland areas in north-central Iowa during the summer of 1988. Data were compared with similar studies conducted 20 years ago in two of these wetlands, Dan Green Slough of Clay Co. and Rush Lake of Palo Alto Co. Preliminary results show an overall decline in Black Tern nesters on both wetlands and an increase in Forster's Tern nesters at D. G. Slough with a decline at Rush Lake. Clutch sizes were similar to previous studies, although most areas showed a slight decline for both species. Increasing water depth is suggested as a contributing factor to these trends along with loss of habitat.

Earth Science Teaching

88. Inservice needs of earth science teachers

D.B. HOFF

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60 Garden Street, Cambridge, MA 02138

There are approximately 23,000 earth science teachers in the United States. Surveys indicate that the typical earth science teacher does not possess a strong formal collegiate background in the discipline. However, Iowa earth science teachers generally have better preparation for teaching this subject when compared to their counterparts nationally.

A survey conducted by the Harvard-Smithsonian Center for Astrophysics reveals that the lack of formal college preparation among earth science teachers is off-set by their interest in earth science as a hobby.

This survey also provides insight for the inservice needs of earth science teachers. This paper will also provide plans for a nation-wide program for developing a teacher-resource agent program patterned after the successful program sponsored by the American Association of Physics Teachers.

89. Astronomical misconceptions

P. S. LEIKER, D. B. Hoff

Department of Earth Science, University of Northern Iowa, Cedar Falls, Iowa 50614-0506

Many people have misconceptions about basic facts and concepts in astronomy. Surveys to test simple astronomy facts and concepts were given to 248 students in grades 9 through 12 in 25 schools on a national basis by Project STAR (Science Teaching through its Astronomical Roots). These tests were also given to 175 introductory astronomy students at the University of Northern Iowa. This paper will examine different misconceptions that these students have about astronomy.

90. An investigative laboratory in igneous petrology

M. D. STREIGLE, K. E. WINDOM AND K. E. SEIFERT

Department of Geological and Atmospheric Sciences, Iowa State University, 253 Science I, Ames, IA 50011

A petrographic and geochemical data base is being compiled for use in igneous petrology laboratories using samples collected from the Duluth Gabbro Complex. This pedogological tool was prompted by the need for a coherent set of laboratory exercises using internally consistent data from an igneous complex displaying a complete differentiation sequence. Lithofacies in the data base include troctolite, gabbro, anorthositic gabbro, ferrogranodiorite, and granophyre. Bulk rock major and trace element concentrations are determined by XRF; compositions of individual minerals are determined by electron microprobe. Laboratory exercises are designed to allow students to investigate igneous processes quantitatively. Extensive use is made of computer programs for calculating liquid densities and viscosities, changes of liquid compositions for various differentiation/mixing models, trace element fractionation, etc. Students will be able to compare calculations with petrographic observations of actual thin sections. It is hoped that copies of all the laboratory materials will eventually be available for distribution to other departments.

POSTER PRESENTATION

91. Sand grains examined using the scanning electron microscope

P.M. Fischl

Drake University
1202 28th Street, Des Moines, Iowa, 50311

Sands are formed through erosion of many different types of material, in different environments, at varying enery levels. Most people do not think of sand as being or looking different. Examination of the surface of sand grains using the scanning electron microscope can show extreme differences in the characteristics of various sands. Conclusions can also be made concerning the parent rock, age, and transportation history of the sand.

Elementary Science Teaching Section

92. Share it - on paper

C. W. BOLLWINKEL

Price Laboratory School, University of Northern Iowa, Cedar Falls, IA 50613

The presenter will **share** with the participants a simple but effective technique for separation of pigments using **paper** chromatography. Participants will use common household items (water, lemon juice, alcohol, coffee filters) to apply the technique to the separation of leaf pigments. Participants will write up the experiment sing the learning cycle (objectives, exploration, invention, application) as a model. The write-up will serve as a model for teachers to write-up their favorite activity so that they may then **share** it with others, on **paper**, in the pages of the Iowa Science Teachers Journal.

93. Investigating elementary science fairs

M. D. GUY and D. STALTER

Stuart-Menlo Elementary, P. O. Box 6, Menlo, IA 50164

Elementary science fairs can offer valuable experiences to students when the focus is on performing an investigation rather than displaying models or posters.

One approach to introducing and reinforcing the scientific method to 4th and 5th graders will be presented. Related issues of fair organization, student incentives, parental involvement and judging will also be discussed.

(Abstracts were not available for papers 94 through 98)

Engineering

99. The impact of granule diameter on the combustion/sintering of coal solid wastes

G. BURNET and P. BLUNDEN

Ames Laboratory and Department of Chemical Engineering, Iowa State University, Ames, IA 50011

Granule diameter has been found to be an important variable in a process developed at the Ames Laboratory for the stabilization of coal solid wastes by granulation/sintering. Granules prepared in a pan agglomerator from ground coal cleaning refuse or from refuse/FGD sludge mixtures are brought to sintering temperature by combustion of the fuel remaining in the refuse. The resulting granules can be disposed of safely as demonstrated by standard leaching and freeze-thaw tests.

An investigation of granules ranging in diameter from 6 mm to 15 mm has shown that granules of about 9 mm possess the greatest unconfined compressive strength, a reliable measure of resistance to environmental degradation. Smaller granules are inferior because of poor layering and limited compaction; larger granules perform poorly because of the formation of a sintered shell and an undersintered core. Variables investigated were temperature (1000-1150 C), sintering time (15 min.-3 hrs.), and combustion air flow rate (0-20 liters/min).

100. Value Analysis/Value Engineering approach to reduction of product process and design costs while maintaining quality

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Value Analysis/Value Engineering (VA/VE) is a systematic procedure whereby a team determines the functions of a product. A functional diagram is structured. Process and material costs of the product are attributed to the functions thereby focusing on functions dominating the cost. The procedure progresses through well defined phases, namely, informational, creativity, evaluation, planning, implementation and follow-up.

101. The inhibition effect of socium molybdate on the corrosion fatigue life of 1020 mild steel in aqueous solutions.

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The influence of sodium molybdate as an inhibitor on the corrosion fatigue behavior of 1020 mild steel has been evaluated. The corrosion fatigue tests were carried out based on a cyclic loading normally referred to as a high stress-low cycle on V-notched specimens under a plane bend fatigue condition. Furthermore, the tests were performed in tap, distilled, and brine water without and with addition of inhibitor at room temperature. A concentration of the inhibitor ranged between 0.05 M to 0.3 M was used in most of the solutions.

In general, the fatigue life of the steel was found to increase as the inhibitor concentration increased in all solutions. More specifically, the increase of the crack initiation life was much pronounced as compared to the crack propagation life. Also, the results have shown that specimens tested in the tap water have gained a substantial improvement in the fatigue life when using a concentration of the inhibitor up to 0.3 M. In contratry, specimens tested in the brine water with addition of the inhibitor up to 0.3 M have not shown any notice of improvement in the fatigue life. However, a concentration of 0.5 M has led to 4% increase of the fatigue life.

102. Anodic dissolution behavior of a high strength-nickel based alloy in H_2SO_4 solutions

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A corrosion study on a new high strength-Nickel based alloy, known commercially as Haynes Alloy No. 230, is being conducted. The aim of the study is to determine the corrosion behavior of the alloy in 25, 50, 75, and 98% concentrations of H_2SO_4 at different temperatures. The linear polarization method and Tafel plot are applied for measuring the corrosion rate in different concentrations of H_2SO_4 at a temperature range over 25C to 75C.

The corrosion rate is found to vary depending on the concentration and the temperature of the solution. For instance, the corrosion rate is higher at 25% than 50%, 75% and 98% of H_2SO_4 at 50C. But the opposite is true in cases at which the material tested at 25C and 75C. A qualitative description of the surface condition of the samples before and after the corrosion tests is obtained based on examinations of these samples in a scanning electron microscope (SEM) and X-ray microanalysis. Furthermore, the performance of the material in a particular condition is compared with other materials, i.e., Hase alloy 276C and 22C, that have been already investigated under the same

condition. The comparison assists us to evaluate the corrosion resistance of the alloy relative to other materials for a proper material selection under the same tested environment.

102a. Distributed structural design sensitivity computations on a network of computers

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Three different approaches have been used to compute derivatives of structural performance with respect to sizing design variables : finite differences, discrete, and continuum. For the two last two approaches, there are two alternative methods to compute the design derivative information: the adjoint variable method and the direct differentiation method. The advent of powerful graphics-based engineering workstations has created an ideal environment for interactive design. To support such an interactive environment, fast turnaround times are required in CAE related computations. However, an increasing number of engineering problems require significant computational resources for solid modeling and finite element analysis. Structural design optimization creates additional complexity by requiring a significant number of finite element structural reanalyses for function updates and design sensitivity computations.

In this paper the continuum approach of design sensitivity analysis is used since it permits accurate and efficient computation of design sensitivity expressions by only requiring post-processing data from established finite element codes. Workstation based compute servers, and expanded networking facilities are exploited to speed up design sensitivity computations. It is shown that by distributing design sensitivity computations over a network of computers it is possible to reduce significantly the turnaround time, while still retaining the power of the interactive graphics workstation based environment. Two algorithms are proposed and the associated numerical performances compared. Both the adjoint variable and the direct differentiation methods are considered for numerical implementation. To support the distributed computations, the Network Computing System from Apollo Inc. has been used.

102b. Role of design parametrization in the design process

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In mechanical computer-aided engineering (MCAE), traditional design methodology fails to provide the designer with information that is required for making design improvements. By augmenting existing finite element codes, recently developed methods of design sensitivity analysis can be put in the hands of journeyman engineers, thus providing them with information on dependence of structural performance on design parameters. Therefore, new steps must be added to the traditional design steps associated with creating a solid model, building a finite element model, carrying out finite element analysis, and graphically displaying analysis results. Recently, the processes of design parametrization and performance characterization have been proposed as distinct design steps in the design process. By assigning design parameters to geometric model primitives, rather than to a finite element model, a method is developed for design for manufacture.

This paper discusses the process of design parametrization and its impact on traditional computer-aided design (CAD) and MCAE design environments. Using standard geometric and finite element information, finite element model geometric properties are computed from user defined design parametrizations. To simplify the design parametrization step, predefined libraries of design components are developed. A recently developed menu driven system for structural design sensitivity analysis and optimization is presented. By exploiting multiwindowing capabilities of today's engineering workstations and the graphics capabilities of an established geometric modeler, a highly interactive methodology for design optimization is proposed.

Geology

103. Megafossils from the Cerro Gordo Member of the Lime Creek Formation (Devonian), Hackberry Grove, Iowa

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Megafossils were recovered from the Cerro Gordo Member of the Lime Creek Formation at Hackberry Grove to better document the occurrence and abundance of key species at this locality. Separate samples were taken from exposed beds and from float for each sample interval. All megafossils were then separated from the rock matrix, cleaned, and identified. The ranges and abundances of key species are discussed, with particular emphasis on brachiopods. Comparisons are made to similar faunas elsewhere. Epibionts are common on the megafauna at Hackberry Grove. The occurrences and positions of epibionts are discussed briefly.

104. Indicators of pesticides in shallow aquifers in Iowa

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Variables representing geologic, hydrologic, water-chemistry, soil, and well-construction factors were examined to determine the principal indicators of pesticide occurrence in shallow (within 61 meters of land surface) aquifers in Iowa. Linear and logistic regression were used to analyze data compiled from 373 municipal wells. In the initial model, the most statistically significant indicator of pesticide occurrence was the thickness of unconsolidated material (drift) overlying an aquifer. More accurate estimates of occurrence were possible when the data were divided into two groups on the basis of the thickness of unconsolidated material overlying the aquifer. Two new preductive models, the thin-drift model (less than 12 meters of drift), were generated. The larger number of factors (15) required to define the thick-drift model, more than twice that required by the thin-drift model, indicates that accurately predicting pesticide occurrence in more deeply buried aquifers may require understanding of more numerous or complex processes. Nitrate concentration in ground water is a factor which, by itself, can be used to estimate the occurrence of pesticides for an aquifer with thin overlying drift. No single indicator was able to predict the occurrence of pesticides in aquifers with thick overlying drift.

105.Quality of surface water discharged from the Big Spring basin, Clayton County, Iowa

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Discharge, specific conductance, water temperature, and pH were monitored from June 1, 1988 until November 22, 1988 at a site on Roberts Creek in order to determine temporal variation in the quality of surface water which is affected by agricultural chemicals. Discharge generally receeded during the study period. Daily mean discharge ranged from 0.02 cubic foot per second on September 18 to 6.0 cubic feet per second on June 1. Specific conductance ranged from about 390 to about 750 microsiemens per centimeter at 25 degrees Celsius. Specific conductance generally decreased during initial rises in discharge after rain storms. However, the smallest specific conductance value was measured during the period of minimum discharge. Water temperatures reached a maximum of 35.0 degrees Celsius on August 17 and a minimum of 0.5 degree Celsius on November 20. The pH ranged from 7.2 to 8.8. During periods of stable flow, the monitored properties varied diurnally. Water temperature and pH were greatest during the day and least during the night. Specific conductance varied inversely with water temperature and pH.

106. Basinal brine fluid source for Archean lode gold deposits, Atlantic City-South Pass district, Wyoming

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Metamorphic or magmatic fluids are generally considered to be the source of hydrothermal fluids responsible for formation of Archean lode gold deposits. However, fluid inclusion and stable isotope data from the Atlantic City-South Pass district suggest that the fluids there may have a different origin. Isotopically light carbon is found in graphitic schists associated with gold veins and carbon isotope values for carbonates are among the lightest recorded for an Archean gold deposit. Oxygen and hydrogen data from fluid inclusions in vein quartz are the lightest of any Archean gold deposit. All generations of fluid inclusions in quartz contain appreciable $CaCl_2$ in the aqueous phase. CH_4 occurs either dissolved in CO_2 or as single-phase gaseous inclusions. Light carbon in carbonates and CH_4 in fluid inclusions indicates interaction of the fluids with graphitic schists. The high $CaCl_2$ content of fluid inclusions may have formed by release of Ca to fluids during conversion of plagioclase in the graywackes to K-feldspar. Ore fluids were derived by lateral secretion from host graywackes during metamorphism.

107.Holocene history of the Mississipi Valley between Sabula and Burlington, Iowa

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During the last 10,500 years the Mississippi River has changed its regimen in response to variations in sediment and water discharge related to distant glacial conditions, climatic change, and land use changes. The river carried glacial meltwater until about 9,200 years ago, and changed its channel pattern from braided to one analogous to the pre-lock and dam pattern between 11,000 and 10,500 years ago. Between 10,500 and 6,000 years ago the river occupied a series of now abandoned paleochannels that presently support various types of riverine wetlands. By 5,000 years ago the river occupied the channel belt active during Historic times. Historic land use changes and construction of the lock and dam system dramatically altered the river's regimen as well as sedimentation patterns on the floodplain.

108. Sand wedges of the Iowan erosion surface

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Vertical sediment wedges are common features of the Iowan erosion surface in northeast Iowa. Referred to as sand wedges, these structures have received very little study. Their genesis and time of formation are unknown. A construction excavation in Cedar Falls exposed 17 sediment wedges which were examined in detail. The wedges occur in clayey pre-Illinoian till which is overlain by about 1 m of loamy sediment. A stone line exists between the till and the overlying loam. Maximum width at the top of the wedges is 130 cm, and maximum depth is about 250 cm. Infilling material is mostly sand, with pockets of silt and silty sand. Augering shows that all wedges have linear continuity and may form a polygonal pattern in plan view.

The characteristics of these sediment wedges suggest they could be of periglacial origin. If they are representative of the Iowan surface sand wedges, a periglacial environment with permafrost and growth of ice-wedge polygons may be envisioned. A climate cold enough for the development of such features could possibly have existed while Wisconsinan-age Des Moines Lobe ice stood just to the west.

POSTER PRESENTATION

109. The Geology of Spence Quadrangle, Northern Wyoming

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The folds in the Bighorn Basin are the result of pre-Cambrian basement faults reactivated during Laramide deformation events which caused the overlying Paleozoic and Mesozoic strata to drape over the fault scarps. An example of a drape fold created by Laramide mountain building processes is Sheep Mountain Anticline. Sheep Mountain Anticline is a breached, asymmetrical, doubly plunging, elongate structure which trends to the northwest. In the granitic basement, a Cambrian section composed of shales followed by a sequence of layered sedimentary rocks of Ordovician through Upper Cretaceous age shelf carbonates and sandstones drape the faulted basement. Thickness and facies changes

within the pelagic sediments of the basin are coincident with the plunge of this major anticlinoria. At the basement level faulting is the prevailing mechanism of deformation but in the post Cambrian sedimentary section, folding is the predominant mechanism of deformation and faulting is subordinate.

Linguistics

110. Personality patterns of terminal speakers of an obsolescent language

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Previous literature suggests that terminal speakers of an obsolescent non-dominant language will exhibit certain personality traits more commonly than will non-speakers of otherwise comparable backgrounds.

This paper reports on an attempt to test the validity of this hypothesis for speakers of Pella Dutch. The study relied upon the use of a questionnaire, personality inventory, and some direct interview.

111. Establishing a tape archive to Amana German for linguistic and ethnographic research

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Amana German (Kolonie-Deutsch) has now been acquired by the last generation to learn it as the dominant and preferred household language. The German of younger speakers will often be influenced more by instruction in the public schools than by conversations in private social contexts.

The Iowa Humanities Board has funded a project to collect a significant tape archive of language samples from speakers of different generational strata. The present paper reports on direct implications of this project for future sociolinguistic inquiry.

112. TA language functions in science labs

J. SEARLS

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Current courses for foreign TAs need to teach students to use English in a classroom teaching context. However, in order to do so, it is necessary to describe systematically the kind of language functions used by TAs in not only recitation sections but also lab settings where most of them will work. This paper will describe a study of language functions used by TAs in physics, chemistry, and engineering labs.

113. Making the study of language more than a spectator sport

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Modern linguistics courses take a descriptive (as opposed to a prescriptive) approach to the study of language. However, too often, students do not have the opportunity for hands-on experience in describing the language around them, and thus leave our classrooms with the view that linguistic description can only be done by the expert. In this session, several class research projects suitable for introductory linguistics courses will be presented. In each one, students test a theory, prior research finding, or prescriptive generalization about language to discover whether it is supported by present usage.

114. Designing a dot matrix IPA font for the Macintosh.

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In teaching phonetics and phonology, it is not easy to make legible phonetic symbols for use in pedagogical materials and tests. Hand drawn symbols look messy, unprofessional and hard to read unless one has special calligraphic skills. Customized typewriters are cumbersome and inflexible, and do not always have the letters needed. Most IPA fonts for dot matrix printers are ugly and not very legible.

I describe my efforts to design a custom IPA symbols font for the Macintosh™ which can be used for classroom materials or to prepare camera-ready copy for publication. I will discuss the problems I encountered in character design and keyboard layout.

Nursing

115. A comparison of selected demographic characteristics and academic performance of on-campus and satellite center RN students: Curricular implications

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The purpose of this study was to compare selected demographic characteristics and academic performance of RN-BSN progression registered nurse students enrolled on campus with those enrolled in courses in off-campus satellite centers. Subjects for this study were 72 RN students (37 on-campus, 35 in satellite centers). Data were obtained from academic records and by telephone interviews.

Demographic differences between the two groups revealed that students in satellite centers were slightly older, worked more hours, travelled farther to attend classes, had more children and projected that a longer time would be needed to complete the BSN than on-campus students. Academic information indicated that students in satellite centers achieved higher mean scores on ACT/PEP examinations and had higher GPA's on admission than on campus RN's. The preliminary analyses suggest that these data may be useful in curricular planning for RN's seeking the BSN in geographic areas beyond the main campus.

116. Comparison of two methods for assessing physical functional status

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Self-reporting by clients is the most frequent and inexpensive information gathering method used by health professionals. Although it is used extensively, its validity as an assessment method has not been established. This study compared the results of an interviewer-administered instrument assessing functional ability with the subjects' direct performance of selected functional tasks. Sixty subjects ages 65 through 85 were interviewed and performed selected tasks relevant to daily living. Data analysis revealed discrepancies between the subjects' perceived ability to perform tasks and their actual ability to perform these tasks. By beginning to establish validity for the self-report method, this research can help practitioners can be more confident that data collected are an accurate reflection of clients' functional ability generating valid data to plan health care.

117. Accuracy of infant emesis volume assessment

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The purpose of this investigation was to determine the application of information processing theory to accuracy in visual assessment of emesis.

Nursing students and Pediatric Nurses (N=109) participated in this non-experimental study in which twenty randomly selected volumes were presented as displays of formula on receiving blankets. Findings showed that subjects who have been taught to use a mental frame of reference in assessment were significantly more accurate, $F=4.07$, $df=1.06$, $p=.05$. Multiple regression data analysis showed that subject practice role ($R^2=.07$), nature of clinical practice ($R^2=.06$), and number of displays assessed for weight ($R^2=.06$) accounted for significant proportions of variance in relative error.

These findings suggest that nurses who are doing visual assessment should learn a processing method that presents a mental frame of reference with which they compare the observed volume.

118. Preoperative patient education and responses to postcardiotomy psychosis.

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The primary purpose of this study is to investigate providing preoperative patient education for cardiac surgical patients concerning the possibilities of experiencing the symptoms of postcardiotomy psychosis. Results of the findings related to the four research questions will be discussed.

1. Are there differences in State Anxiety scores between patients who had preoperative education and patients who did not have preoperative education?
2. Does preoperative patient education decrease psychosis postoperatively?
3. Is there a difference between associated adjective word pairs between patients who had preoperative education and those who did not have preoperative education?
4. Is there a relationship between Psychosis Behavioral Responses and Associated Adjective Word Pairs?

POSTER PRESENTATIONS

119. Learning styles, leader behavior and satisfaction among nurses and their supervisors

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Nurses have learning styles and exhibit leader behaviors. This paper identifies the existence of a relationship between learning styles of nurses and learning styles of their supervisors, and leader behavior of nurses and leader behavior of their supervisors which may influence satisfaction with the supervisor. Learning style and leader behavior of nurses are related.

120. A Comparison of the Effectiveness of Therapeutic Touch and Casual Touch in Stress Reduction of Hospitalized Children

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Children aged two weeks to two years old admitted for acute illness. Stress reduction was measured by pulse, peripheral skin temperature and galvanic skin response as observed on the GSR-II biofeedback instrument. Data were documented on the Physiological Measure of Relaxation in Response to Touch tool developed by the researcher. Stress experiences included painful and non-painful procedures. Stress was demonstrated by crying, restlessness, rigid posture, and aggressive behavior.

An ANOVA measured effectiveness of the interventions of casual touch and therapeutic touch at three and six minute intervals. The results demonstrated a significant difference with the critical value of $F = 4.18$ $(1, 29)$, $p<.05$. The computed value of $F = 26.98$ at three minutes and $F = 26.94$ at six minutes.

Physics

121. **Calculation of the lifetime of a Davydov soliton at finite temperature.**

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In the 1970's Davydov proposed a soliton model for energy transport in biological molecules. Recently there has been considerable controversy over whether the lifetime of the Davydov soliton is sufficiently long for biological purposes. The standard Davydov Hamiltonian can be partially diagonalized using a method due to Eremko, Gaididei, and Vakhnenko. The complete Hamiltonian in this partially diagonalized form, however, includes a term omitted by these authors. Using this term in a first order perturbation theory calculation results in an estimate of the lifetime of a Davydov soliton at finite temperatures. The lifetime at 300 K, for parameters appropriate for the alpha-helical protein molecule, is found to be too short for biological processes.

122. State to state reaction cross sections for the Mg $(3^1P_1^0)$ + H_2 system

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State to state cross sections for the reaction:
Mg $(3^1P_1^0)$ + H_2 (v,j) -> MgH (v',j') + H
were calculated using a semiclassical method. The approach used Monte Carlo averaging over initial conditions for many classical trajectories to calculate reaction cross sections on the $1B_1$, $1B_2$, and $2A_1$ potential energy surfaces. The state to state cross sections were then analyzed in terms of features on these surfaces.

123. Calculation of pressure broadening of rotational lines in carbon monoxide by helium.

Wm. R. Kearney and K.M. Sando

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A semiclassical method for calculating pressure broadening of rotational lines in atom-diatom collisions will be presented. The procedure uses Monte Carlo averaging of signals generated in each of many classical trajectories to approximate the dipole autocorrelation function. The autocorrelation function is then transformed to give a pressure broadened rotational spectrum. Results will be presented for the He + CO system.

124. Multiple inflation and density perturbations from a supersymmetric Flipped SU(5)xU(1) GUT

L. CONNORS, A.J. DEANS and J.S. HAGELIN

Maharishi International University, Department of Physics, Fairfield, IA 52556

We discuss the subject of chaotic inflation and baryogenesis in a new supersymmetric Flipped SU(5)xU(1) GUT derived from the superstring. We show that the presence of a "quasi-flat" direction in the scalar potential naturally allows for the production of density perturbations $\delta\rho/\rho = 10^{-4}$ during the initial period period of φ^4 chaotic inflation, which is followed by a second possible period of φ^2 chaotic inflation. The spontaneous generation of a net baryon asymmetry $n_B/s \sim 10^{-10}$ is also explained. This evolutionary process is illustrated by charts outlining the history of the universe as predicted by this highly successful model.

125. Is Flipped SU(5) the theory of everything below the Planck Scale?

JOHN S. HAGELIN

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The profound success of the Weinberg-Salam-Glashow unified electroweak theory led theorists in the 1970's and 80's to investigate Grand Unified Theories of the strong, weak and electromagnetic forces. Despite a number of initial successes, severe technical problems have since led to a standstill in grand-unified model building. In this talk directed toward the non-specialist, we present a newly discovered "Flipped" SU(5)xU(1) GUT which has caused a renaissance in GUT model building. This theory is simpler and far more successful than previous grand unified theories: it has a natural and economical mechanism for splitting Higgs doublets from Higgs color triplets (and hence no gauge hierarchy problem), a naturally long-lived proton, and a fully realistic low-energy spectrum and phenomenology. It is, in addition, the only viable GUT obtainable from any known string formulation, and at present provides the most direct link between the superstring and the observed structure of physics at low energies.

126. Sensitivity of climatological records to site location

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With the relocation of the Meteorological facility from Curtiss Hall to the third floor of the newly renovated Agronomy Building came an excellent opportunity to test differences in the micro-climate. Two national weather service cotton belt shelters were used: one in the original location south of the Agronomy building and the second on the newly created roof facility. Each day from mid-June through early October Max., and Min., 24 hour temperature measurements were made. For the 62 days examined, the mean roof top site was 0.4 ^{o}F warmer than the grass site some 200 meters south and 25 meters lower in elevation. However, for such a short sample this was not statistically significant.
A second four month series of 1988 summer climatological records was also examined: Ankeny, Des Moines, and Indianola. In this case, the records show a small but significant urban heat island effect.

127. Estimation of evaporation beneath convective cells.

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Three factors working together contribute to evaporation losses beneath summer rain clouds: the temperature dew point spread, the rain spectra at cloud base, and the wind velocity gradient between cloud base and ground level. Two of these factors, dew point temperature spread and initial cloud base rain spectra, were considered in this work.
An ordinary differential equation describing diffusional growth or evaporation of drops was employed as the nucleus of the evaporation model. Ambient air and dew point temperature were used to compute the cloud base height and cloud base temperature. A number of drop spectra were tested and the results compared with field measurements and photographic observations to determine the validity of the model. The results suggest that in a dry environment, rains of less than 6 mm/hr will be lost by evaporation when the temperature is greater than 25 degrees C. In fact, even with rains of 12 to 15 mm/hr, losses of up to 50% were produced under typical semiarid summertime conditions.

128. The suspected variability of τ Cassiopeiae

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Some literature seems to indicated that τ Cassiopeiae is a variable star. Observations made at the University of Northern Iowa fail to clearly show its variability. This paper will present blue and visual photoelectric data on τ Cassiopeiae from July 1986 to March 1988.

Physiology

129. The effect of sodium concentration on intestinal absorption

T.L. BLEILER AND C.V. GISOLFI

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Intestinal absorption during infusion (15 ml/min) of a 6% carbohydrate-electrolye (CE) solution containing 20 or 40 mEq/l sodium was measured by segmental perfusion with a triple lumen catheter in 6 (age 24.3±1.6) males at rest. Infusion of the two solutions was done in a balanced design on the same day separated by a 1-hr period of no infusion. A 45-min equilibration period preceded a 75-min test session. Water and solute flux were determined from differences in concentration of polyethylene glycol (PEG) and solute across a 40-cm intestinal segment including the distal duodenum and proximal jejunum. Mean flux values for 20 and 40 mEq/l sodium solutions, respectively, were: water -14.92, -12.92 ml•hr^{-1}•cm^{-1}, sodium -0.52, -0.75 mEq•hr^{-1}•cm^{-1}, potassium -0.04, -0.04 mEq•hr^{-1}•cm^{-1} and glucose -1.27, -1.41 mmol•hr^{-1}•cm^{-1}. A 2-factor repeated ANOVA indicated no differences ($p>0.1$) over time or between drinks for water, sodium, potassium or glucose flux. Plasma volume increased ($p<.01$) ≈ 5% over time with no difference between solutions. We conclude that sodium concentrations of 20 or 40 mEq/l in a 6% CE solution have similar effects on water, sodium, potassium and glucose absorption from the small intestine.

Supported by the Quaker Oats Company

130. The effect of exercise on intestinal absorption of water and carbohydrate-electrolyte solution.

K.J. SPRANGER, T.L. BLEILER AND C.V. GISOLFI

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Intestinal absorption was measured in 6, trained, male cyclists during rest, exercise and recovery periods using the segmental perfusion technique. Each subject passed a multilumen tube into the duodenojejunum and subsequently participated in two experimental sessions. The sessions consisted of 1-h bouts of cycling exercise at 25, 50, and 75% of VO_2 max separated by 1-h rest periods. The cycling was performed on a constant-load velodyne trainer.Water was constantly infused (15 ml/min) during one session and a carbohydrate-electrolyte solution (6% carbohydrate, 20 mEq Na^+, 10 mEq K^+) was infused during another. Fluid was sampled every 10 min from ports 10 and 50 cm distal to the infusion site. Water flux was determined by differences in polyethelene glycol concentration across the 40 cm test segment. Preliminary data analysis revealed (a) no difference in absorption rates between rest, exercise and recovery periods, and (b) no differences among the 3 exercise intensities. We tentatively conclude that exercise has no effect on water absorption in the distal duodenum and proximal jejunum.

Supported by the Quaker Oats Company

131. Structural changes seen in rabbit podocytes during and after induced serum sickness

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Serum sickness was induced in rabbits by multiple subcutaneous injections of bovine serum albumin (BSA) and Freund's adjuvant and I.V. injections of BSA alone over a 4 week period. After the fourth week, the renal corpuscles of the rabbits were examined with the scanning electron microscope. Most of the pedicels of the podocytes forming the visceral layer of the Bowman's capsule were shorter, very distorted and sometimes flattened. They did not show the very regular arrangement of the control podocytes.

In varying periods up to 7 weeks after the last BSA injection, 3 rabbits were allowed to recover from the serum sickness. When their podocytes were examined, none were found to have reassumed their normal shapes and arrangement, indicating there is very little podocyte recovery in serum sickness.

132. Arterial sinuses--mechanism for increasing blood flow through arterial branches

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Using Batson's corrosion technique for examining blood vascular structure, it was discovered that in many arteries examined (rabbit, dog) there were enlargements or sinuses at the bases of arterial branches. Significantly, the sinuses when present, were always seen on the central (heart) side of the arterial branches. Plaster of Paris models of arteries with branches were constructed--one with a sinus and the other without. These were perfused with a methyl cellulose solution under simulated mammalian arterial conditions. Of the total volume perfused, the percentage that flowed into the arterial branch was 20% in the model with the sinus and only 11% in the model without the sinus. The results suggest that the discovered sinuses serve as a circulatory aid to increase the flow of blood through the arterial branches.

133. Anti-nociceptive actions of the non-benzodiazepine anxiolytic buspirone

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The novel anxiolytic buspirone is a direct agonist at serotonin 5-HT1/A receptors and potentiates central noradrenergic (NE) function. Other 5-HT1/A agonists have been shown to produce analgesia, presumably by mediating interaction of descending 5-HT and NE systems. Therefore, the present study examined the analgesic efficacy of buspirone in tests of acute thermal, mechanical and formalin-induced chemical pain.
Rats were injected with 0(vehicle) 1,3,5 mg/kg buspirone s.c.; analgesia was assessed 30 min. post-injection.
Buspirone produced dose-dependent analgesia in all nociceptive tests, with greatest effect against chemical pain.
Equipotent analgesic effects were produced in thermal and mechanical pain tests. Locomotor ability and overt behavioral activity (e.g. grooming, rearing) was unaffected at any dose tested. These data suggest the potential utility of buspirone for management of concommittant pain and anxiety.

134. Patterns of analgesia produced by buspirone, antidepressants and benzodiazepine against acute inflammatory pain.

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The present study compared analgesic effects of buspirone(BUSP),amitriptyline(AMI),desipramine (DMI) and diazepam(DZ) in formalin-induced acute inflammatory pain. These drugs act at distinct neuropharmacologic substrates. Their differential analgesic potencies may characterize systems modulating acute inflammatory nociception. Rats were injected with BUSP,DZ(1-5mg/kg),AMI,DMI(1-20mg/kg) s.c. Analgesia was tested 30min. post-injection. BUSP,AMI and DMI produced dose-dependent analgesia; DZ was ineffective at all doses. When ranked by order of potency: BUSP $\geq$ DMI > AMI > DZ. Neither BUSP nor DMI produced overt behavioral changes at any dose; higher doses of AMI and DZ produced sedation. Similar patterns of BUSP and DMI analgesia may reflect interaction with the noradrenergic(NE) system. Unlike DZ, both BUSP and DMI increase NE function. Taken together these data suggest 5-HT1a receptor-mediation of NE function to be a likely mechanism of BUSP-induced analgesia against acute inflammatory pain.

135. Effects of naloxone on peripheral vascular resistance in the heat-stressed rat

C.D. SCHMIDT, AND C.V. GISOLFI

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Previous findings utilizing the rat as an animal model have demonstrated that severe hypotension during heat stress is preceded by a selective loss of resistance in the splanchnic vascular bed. Studies of hemorrhagic and other forms of shock in this animal model have demonstrated that naloxone (NAL), an opioid receptor antagonist, enhanced survival by elevating mean arterial blood pressure (MAP). To examine the possible role of endogenous opioids on circulatory dysfunction during the prodromal period of heat stroke, two groups of rats (9 NAL, 10 controls) were subjected to an ambient temperature of 45°C until MAP fell to 60 mmHg. MAP, heart rate, core temperature, and renal, superior mesenteric, and caudal artery blood flows were recorded each min. At a core temperature of 40°C, animals were infused (0.5 ml) with either NAL (3 mg/kg) or saline vehicle (controls). Analysis of variance failed to demonstrate significant differences between NAL and control groups during heat exposure, in MAP, time for MAP to fall to 60 mm Hg, or changes in vascular resistance following treatment.

Supported by NIH Grant HL38959

136. Preload tension does not alter contractile response in rat aortic ring preparations

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Rings of thoracic aorta were removed from young male rats, mounted in tissue baths, subjected to 0.5, 1.0, 1.5, or 2.0 grams of preload tension for 2 hours of incubation and isometrically contracted with 1 uM norepinephrine or 55 mM KCl. Responses to norepinephrine and KCl were not significantly different at the preloads tested. To determine if a change in tension subsequent to the 2 hour incubation preload might effect the contractile response, the tension on each ring was sequentially changed to 0.5, 1.0, 1.5, 2.0, 2.5, and 3.0 grams and immediately contracted at each level with norepinephrine or KCl. Earlier studies showed that no "waiting period" was necessary nor was the order of instantaneous preloading important. The responses within and between each of these instantaneous preloads did not differ significantly regardless of the incubation preload. Thus, within the ranges tested, neither initial preload nor instantaneous preload had any significant effect on magnitude of response.

137. Heat-shock protein synthesis by human leukocytes

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Cultured mammalian cells respond to heat stress by synthesizing a set of heat-shock proteins (HSP). The two most prominent HSP have molecular weights of 90,000 and 70,000 daltons and are highly conserved among organisms as diverse as Drosophila and man. Although the precise function of HSP is unknown, it is generally believed that these proteins may provide some degree of protection to the cell. To determine if human leukocytes have the potential to synthesize HSP, leukocytes were incubated at either 38.5°C, 39.5°C or 41°C for 120 min and subsequently labeled for 120 min at 37°C with [^{35}S]methionine. Newly synthesized proteins were resolved by one-dimensional gel electrophoresis and visualized by autoradiography. Incubation of human leukocytes at 37°C, 38.5°C or 39.5°C resulted in similar patterns of protein synthesis. However, incubation of leukocytes at 41°C resulted in synthesis of two new proteins with molecular weights of 90,000 and 70,000 daltons. We are currently investigating whether human leukocytes will synthesize HSP following prolonged exercise in the heat.

Supported by NIH Grants R29 HL40349 and HL38959

138. Validation of Applied Potential Tomography to monitor gastric emptying of liquid meals

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Gastric emptying of solid meals using Applied Potential Tomography (APT) has been validated by previous research. The purpose of this study was to validate the use of APT for monitoring gastric emptying of liquid meals. Nine subjects in the post-absorptive state ingested 500 ml of H_2O labelled with 1 mCi of technetium sulfur colloid. Due to the sensitivity of the APT system to pH changes, 300 mg of Cimetidine were administered to reduce acid secretion 1 hr prior to H_2O consumption. Gastric emptying was monitored for 75 min by APT and a scintillation detector. The geometrical mean of anterior and posterior views were determined for the scintillation detector and plotted over time. The APT system measures resistivity changes from a series of 16 electrodes distributed around the abdominal cavity. These changes were monitored for 30 sec periods at 3 min intervals and plotted over time. Regression lines were fit to both emptying curves and statistically compared. Results showed inconsistent correlations between techniques.

Supported by the Quaker Oats Company

139. The effect of dietary protein concentration and temperature on the ammonia excretion of walleye (Stizostedion vitreum vitreum) fingerlings

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Ammonia is the main nitrogenous excretory product of fish. When environmental ammonia concentrations become too high, fish are stressed, resulting in reduced growth, histopathology, increased susceptibility to disease, and increased mortality.

Weight-specific ammonia excretion rates are known to vary with protein consumption and temperature. In the present study, walleye fingerlings receiving diets of 41% or 61% protein did not have significantly different specific ammonia excretion rates. Although specific ammonia excretion rates of walleye fingerlings were higher at 25°C than at 20°C, the difference was significant in only one of three experiments.

140. Topical Application of Sesame Oil and In Vitro Inhibition of Human Colon Cancer Cells

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Maharishi Ayur-Veda, a holistic prevention-oriented system of health care, claims health benefits from sesame oil (SO) retention enemas on a seasonal basis. Sesame oil contains large quantities of the polyunsaturated essential fatty acid, linoleic acid (LA). The anti-neoplastic properties of (LA) are known.

We tested the hypothesis that LA, the primary component of SO, will selectively inhibit the in vitro growth of the human colon cancer cell line, HT-29. For each experiment 0.5×10^5 cells were seeded in dishes to which were added LA in concentrations of 10-100 ug/ml, or whole SO or lipase-digested SO in concentrations of 30-300 ug/ml. Cells were harvested and counted by hemacytometer after six days. Pure LA inhibited the growth of the HT-29 cell line up to 62%. The lipase-digested oil inhibited the growth up to 50% and the undigested oil also inhibited growth up to 51%. The results for LA were compared with a normal colon cell line, 33CO. No inhibition occurred with pure LA even at the high dose of 100 ug/ml. These results suggest that free linoleic acid as well as sesame oil may have important colon tumor inhibiting properties and warrant further investigation in vivo.

POSTER PRESENTATIONS

141. Effects of tricyclic antidepressants on acute and chronic inflammation-induced nociception.

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The tricyclic drugs amitriptyline(AMI) and desipramine(DMI) block re-uptake of serotonin(5HT) and norepinephrine(NE),respectively,and potentiate analgesia in thermal and mechanical pain tests. An unresolved issue is the role of these systems in mediating inflammatory pain. The present study examined analgesic actions of AMI and DMI against acute inflammatory pain induced by formalin injection, and chronic inflammatory pain induced by injection of Freunds adjuvant. Rats received vehicle, 5,10,20mg/kg AMI or DMI sc. Analgesia was assessed 30min. post-injection. In both tests,AMI and DMI produced dose-dependent analgesia. In the formalin test DMI was more potent than AMI; at highest dose both drugs produced equivalent effects. A similar pattern was seen against chronic inflammatory pain: AMI was less effective than DMI at lower doses. However,unlike DMI,higher doses of AMI produced sedation. The differential efficacy of these drugs may reflect distinct 5HT and NE mechanisms subserving analgesia against acute and chronic inflammatory pain. Ongoing studies in our laboratory are further characterizing these neural substrates.

142. Differential opioid receptor mediation of B-casein-induced analgesia in preweanling rats.

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Beta-casein(BC),a component of maternal milk,is a precursor for the endogenous opioid B-casomorphan. Administration of BC(10-30 mg/kg;s.c.)to 7 and 14 day old rats produced distinct patterns of analgesia in forepaw(FP) and tail(T) against thermal and mechanical pain. At 7 days BC produced dose-dependent analgesia in FP and T that was more potent in the mechanical test. At 14 days BC produced analgesia that was equipotent in both tests. While BC putatively acts at mu opioid sites,BC-induced effects in younger animals are inconsistent with ontogeny of mu-mediated analgesia. Administration of the opiate antagonist naloxone(NAL:.01-1mg/kg) to 7 day olds reduced BC-induced analgesia only at higher doses. At 14 days,however,all doses of NAL potently reversed BC-induced effects. This differential reversal may reflect the affinity of NAL at separate classes of opioid receptors. Taken together with ontogenetic and somatotopic patterns of BC-induced analgesia,these data suggest heterogeneous opioid receptor systems may subserve BC-induced effects at various stages of ontogeny.

143. Effect of osteopathic manipulative treatment (OMT) on the electromyogram (EMG) skin resistance (SR) and cellular enzymes

M. ROWANE, H. HORNE, M. WARNER, D. BOESLER, A. ALPERS, E.P. FINNERTY, M.A. KILMORE

University of Osteopathic Medicine and Health Sciences, Des Moines, Iowa 50312

The purpose of this project is to investigate total serum CK, total serum LD, LD isoenzymes and serum myoglobin to (1) indicate if tissue damage is produced by OMT and (2) serve as a parameter to indicate low back pain improvement. Twenty randomly selected subjects with no chronic pathological problem were equally divided with group 1 receiving high velocity/low amplitude OMT and group 2 serving as a control. EMG activity was recorded from the dorsal lumbar region on day 1 and 7. Blood samples were taken on days 1, 2, 5, and 7. OMT (given on days 1 and 7) reduced EMG activity during specified movements. There was no statistical difference in CK, LD, LD isoenzymes or myoglobin from groups 1 and 2. In seven subjects with low back pain, there was an average increase in serum CK, LD, LD isoenzyme 4 and serum myoglobin on day 1 as compared to non low back pain subjects. However there were significant individual variations. Those receiving OMT had subjective improvement as well as diminished EMG activity. Our work indicates that EMG activity can be used to quantitatively evaluate improvement in mobility and that OMT therapy does not inflict cellular damage in this process. (Supported in part by a Special Project Grant from the National Osteopathic Foundation)

144. Evaluation of the effectiveness of osteopathic manipulative treatment (OMT) to relieve menstrual cramps

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It is the intent of this project to affirm the effectiveness of OMT to relieve menstrual cramping, by using objective parameters. Ten subjects were used to record EMG activity and skin resistance from the dorsal lumbar region on day 1 of menstrual flow. OMT was administered after this initial recording. OMT consisted of high velocity/low amplitude and muscle energy techniques directed towards the entire axial skeleton and pelvis Blood samples were taken on day 1 and 2 of menstrual flow to measure total serum CK, total serum LD, LD isoenzymes and serum myoglobin. EMG responses reflect spontaneous muscular activity of paravertebral musculature at the level of the lumbar spine at the time of menstrual cramping. This EMG activity correlated with cramping and was abolished with OMT. The

abolishment of this spontaneous activity to specified movements was correlated with subjective improvement. There were no significant changes in CK, LD and LD isoenzymes. Most subjects had a serum myoglobin which was higher during menstrual cramping as compared to a time when cramping was absent.
(Supported in part by a Special Project Grant from the National Osteopathic Foundation.)

Psychology

145. Assessment of cognitive load under dual task conditions utilizing a visual tracking task

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The purpose of the present study was to investigate the effects of performing reaction time (RT) tasks under single and dual task conditions in order to carefully measure the cognitive requirements associated with increases in processing load in both the auditory and visual modalities.

Subjects performed simple RT and 2-choice RT alone (single task conditions) and while performing a tracking task (dual task conditions). The tracking task required subjects to keep a moving visual target centered between two points which they manipulated using a joystick.

Results showed that simple RT under dual task conditions remained faster than choice RT under single task conditions. Errors in the visual tracking task showed no systematic variations when performed along with the various RT tasks; however, variability of errors in the tracking task increased when subjects responded to the presentation of the test stimulus in the RT tasks.

146. Measuring dual task interference through time series data using a continuous tracking task

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A new dual task paradigm, designed to allow a more sensitive analysis of interference effects than previous dual task paradigms, was tested. Subjects performed various reaction time (RT) tasks and a simple visual tracking task simultaneously using a computer. The tracking task involved centering a randomly moving visual target between two scope points using a joystick. Each tracking trial lasted approximately 3 s with the distance between the target and the center of the scope being measured every 100 ms. During the middle of the tracking trial, subjects were required to respond to a test stimulus.

Using a time series approach, tracking accuracy showed consistent improvement prior to the onset of the test stimulus. At test stimulus presentation, tracking accuracy continued to be stable for about 300 ms, and then showed deterioration in performance. The disruptive effects continued for about 500 ms after the subject responded to the test stimulus.

147. The effect of noise processing during the movement of attention

M. B. TEPIN

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It is generally accepted that attention can shift location in the visual field independently of eye movements. The present study investigated the question of whether information processing occurs during those shifts by manipulating the occurrence of a noise letter. If processing occurs during the movement of attention, a noise letter in the path of the movement should interfere with the response to the target.

Twenty subjects were required to fixate a dot in the center of a computer screen. A peripheral cue indicating the location of a target letter (T or H) preceded the target by 16, 100, or 160 msec. Targets were assigned to either a right or left keypress and response latency was recorded. A neutral noise letter appeared between the fixation dot and the target on some trials. Latency was slowed by noise, especially at 100 msec. The results indicate that information processing occurs during shifts of attention.

148. Background auditory stimuli as a cue for recognition of memorized word lists in long term memory.

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Storm Lake, IA 50588

Reinstituting environmental stimuli that were present during study can enhance memory performance. Noise is usually treated as a distracting stimulus, but might improve performance if present during both study and test. This possibility was evaluated by presenting groups of college students with a list of 30 nouns, followed by a filled retention interval and a recognition test. Environmental noise was either present or absent during the study and test phases of the procedure. Data collection is not complete at the time of this writing, but preliminary indications suggest that noise may either enhance or interfere with memory performance, depending upon the experimental conditions.

149. The effects of the Transcendental Meditation Program on self-concept and EEG coherence in black college students

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*Department of Social and Behavioral Sciences, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601 **Department of Psychology, Maharishi International University, Fairfield, IA 52556

Fifty-eight students at a traditionally black university were pretested on measures of self concept and mental health (Tennessee Self Concept Scale), and EEG coherence. Fifty were matched for state anxiety, then randomly assigned to either the Transcendental Meditation program (TMr), Progressive Muscle Relaxation (PR), or cognitive therapy (C), while the other eight subjects self-selected TM (TMs). The groups were similar at

pre-test, except that TMs scored lower on Total Conflict ($p = .01$). At posttesting, after 2.5 months of treatment, ANACOVA planned contrasts covarying for pretest scores and regularity of treatment participation showed that the two TM groups improved significantly compared to the PR and C groups: increased Self Satisfaction ($p = .05$), Moral-Ethical Self ($p < .0005$), Personal Self ($p < .02$), Social Self ($p < .02$); Personal Perspective ($p < .10$,) trend); and decreased General Malajustment ($p = .007$), Psychosis ($p = .08$, trend), Personality Disorder ($p = .03$), and increased EEG theta coherence ($p = .02$). The contrasts between PR and C showed no significant differences at post-test. The contrasts between TMr and TMs indicated that TMs, who were more regular in meditation, improved more on Moral Ethical Self ($p = .005$), Social Self ($p = .008$), and EEG coherence ($p = .003$).

150. Cognitive development in children practicing Transcendental Meditation

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Forty-five children (mean age = 7.8) practicing the children's version of the Transcendental Meditation (TM) technique were compared to 47 control subjects (mean age = 7.7) from the same grades in school (kindergarten through 4th grade). The two groups were also similar in parental SES, gender distribution, and were drawn from schools in close proximity to college campuses. All subjects were given Goldschmidt and Bentler's standardized series of cognitive developmental tasks of increasing difficulty measuring "conservation" - - ability to recognize that certain attributes of an object remain invariant despite changes in other attributes. Conservation is considered a major landmark in the development of "concrete operational" thinking.

The TM subjects' mean total score on these cognitive tasks was significantly higher ($p<.01$) than for controls. Also, the proportion of TM children fully mastering the series of conservation tasks (82%) was markedly higher than for controls (43%) ($p<.0001$). Ordinarily, the conservation ability is consolidated over a 5 to 7 year period. The current results suggest that the TM program may lead to more rapid acquisition, and expecially consolidation, of cognitive-developmental abilities in childhood.

151. Sex roles, age, traditionality of department and stress among female adults

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Sex roles are a function of the gender-dominance pattern of the academic field. In turn, sex roles indicate the level of stress.

Female graduate students in traditionally male and female departments were administered measures of sex roles and stress.

Results were contrary to previous research. Subjects in female departments were masculine or androgynous; in male departments were undifferentiated. Also, an interactive effect of age and sex roles on stress was obtained.

Findings will be discussed in terms of age and psychosocial development; and the need for multidimensionality of variables in explaining stress.

152. The ethics of human and animal research: Some questions facing the Academy

D. LOPATTO

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In view of the recent scrutiny of the treatment of human and animal subjects in Psychology, it is surprising that we have not considered our role in the ethical and humane treatment of subjects, except as a possible "controversial issue". Some suggestions for greater involvement, including requesting information on ethical procedures from presenters, will be made.

POSTER PRESENTATIONS

153. The Transcendental Meditation and TM-Sidhi program and improved quality of life in the United States: A study of the first world peace assembly

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This study tested the predicted positive influence of collective practice of the Transcendental Meditation and TM-Sidhi program by a group of about 2,500 participants over a six-week period in 1979 (July 9 - August 20) on a wide range of quality of life indicators for the United States as a whole. As hypothesized, compared with levels expected for the same period on the basis of trends over the years 1973-1981, there were significant reductions for the U.S. during the 6 week experimental period in motor vehicle fatalities (6.5%, $p<.0001$),violent crimes (3.4%, $p<.02$), air transport fatal accidents (20.8%, $p<.05$), and for the 14 major independent categories of fatal accidents (e.g., from fire, poisoning), suicide and homicide (mean 4.0%, $p<.005$). Time series intervention analysis showed a mean daily increase in the Standard and Poor's Composite 500 index of .26 points per day during the 6 week assembly allowing for a 9-day lag ($p<.04$). Also as predicted, improvements in the state of Massachusetts, where the group was located, were significantly greater again than those for the rest of the US: motor vehicle fatalities were down 18.9% ($p<.05$ in comparison to the smaller improvements for the rest of the US), violent crimes by 10.1% ($p<.00001$) and air transport fatal accidents for the New England region, which includes Massachusetts, by 83.3% ($p<.001$). These consistent improvements across a broad range of independent indices of social order and across geographical areas during the experimental period are explained in terms of enhanced coherence in an underlying field of collective consciousness within Massachusetts and the US as a whole through group practice of this advanced technology of consciousness.

154. Improved in quality of life in Iowa as a result of the collective practice of the Transcendental Meditation and TM-Sidhi programs

D. L. REEKS

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Qualify of life in Iowa was found to improve significantly ($p<05$) with the increase in the numbers of participants in the group practice of the Transcendental Meditation and TM-Sidhi programs. A composite monthly index from 1979 to 1986 of four quality of life variables (crime,

traffic fatality, mortality, and unemployment rates) was studied in relationship to the size of the group practicing the TM-Sidhi program in Fairfield, Iowa. Individual rates of unemployment, crime and traffic fatality were also found to decrease significantly ($p<05$) in relation to group size. Analysis utilized Box-Jenkins transfer function time series analysis. Models were chosen objectively by employing the AIC (Akaike Intervention Criterion). These results are consistent with over 30 previous studies demonstrating improved quality of life on the city, state, national and international levels through the group practice of the TM and TM-Sidhi programs.

155. Improved US-Soviet relations as a function of the number of participants in the collective practice of the TM-Sidhi program

P. GELDERLOOS, M.J. FRID AND X. XUE

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Over 30 studies have demonstrated that the collective practice of the Transcendental Meditation and TM-Sidhi program enhances the quality of life and reduces war violence. The purpose of the present study was to investigate the possible impact of these programs on the US-Soviet relationship. The public statements of the US president on the USSR and its general secretary are widely regarded as one of the most sensitive and relevant indicators of the relationship of the superpowers. All 478 pertinent statements published in the *Weekly Compilation of Presidential Documents* from January 1984 to December 1987 were content-analyzed by two raters on a peace/war rating scale. Time-series analyses established that the quartile distributions of the number of participants in the collective TM-Sidhi practice had a significant relationship with the weekly averages of the ratings of the presidential statements at 3, 5 and 8 lags ($p = .0019$), with positive steady state gains beyond the 2nd and 3rd quartiles. Also the frequency of statements made on this subject was significantly higher at a 2-week lag when the numbers were above the 2nd quartile ($p = .0087$). Combining these variables into weekly summaries yielded significant impacts at 0 and 3 week lags ($p = .0007$), with a positive steady state gain when the number of participants was above the 2rd quartile, and an even higher gain when the numbers rose beyond the 3rd quartile.

156. Transcendental Meditation and business: A prospective study

C. N. ALEXANDER, G. C. SWANSON, M. V. RAINFORTH, T. W. CARLISLE and C. TODD

Center for Management Research, Carnegie Hall, Maharishi International University, Fairfield, IA 52556

A three month prospective study conducted in two occupational settings compared 45 managerial, staff, and line personnel who learned the Transcendental Meditation (TM) technique to 41 demographically similar controls in a cluster of manufacturing plants (site #1) and a distribution-sales company (site #2). Electrodermal activity (EDA), a measure of skin conductance generally associated with anxiety level, was used as a physiological indicator of stress reduction. Standard psychometric instruments of state-trait anxiety and job satisfaction along with a specially designed organizational inventory (CMRI) were chosen to examine general psychosocial, health, and behavioral indications of decreased stress and improved performance on the job. ANCOVA on change scores adjusted for pretest showed a greater reduction in EDA for regular TM meditators during two mental tasks ($p<.05$) as well as during TM practice ($p<.10$, trend) compared to eyes-closed-rest for controls. Regular meditators decreased more than controls on trait anxiety ($p<.006$), state anxiety ($p<.08$, trend), job worry ($p<.002$), and cigarette ($p<.04$) and alcohol ($p<.03$) use, while they increased more on intrinsic ($p<.05$) and general job satisfaction ($p<.04$), general health and reduced health complaints ($p<.007$), enhanced sleep and reduced fatigue ($p<.0025$), efficiency and productivity ($p<.02$), and work/personal relationships ($p<.03$). Results support the proposed model that TM practice produces a distinct psychophysiological state of 'restful alertness' that results in more stress-free and adaptive functioning in organizations.

Science Teaching

157. How can you make a duck sink?

E. L. REZABEK

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Glidden, Iowa 51443

Bubbles, science, technology, society--are there connections? In this session we will take a look at ways to have fun in science, teach the mandated curriculum, incorporate technology into the curriculum and involve people in issues confronting society.

158. Iowa's new educational standards and their impact on science teaching

J. GERLOVICH

Iowa Department of Education
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Des Moines, Iowa 50319

This session will focus upon a presentation of Iowa's new general educational standards for approved schools as well as the specific science components. The Iowa Guide to Curriculum Development in Science (paper as will as software versions) will be presented as a tool to assist schools in meeting the standards.

Discussion will follow.

159. Do teachers change their curriculum after attending workshops?

C. W. BOLLWINKEL

Price Laboratory School, University of Northern Iowa, Cedar Falls, IA 50613

Data verifying changes in the curriculum of teacher/participants in weekend environmental education workshops was gathered over a two to three year period for seven workshops. Workshops had a central theme, but presentations related to the theme were varied in format. Workshops had several to many presenters who provided objectives measurable in terms of time teachers spent with given activities or topics. Significant increases in time spent on objective-related activities and topics were reported by participants for the time period evaluated.

160. The Carver-Wallace connection in Iowa

Wm. H. Gilbert III

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A hundred years ago there entered Iowa two people destined to startle American agriculture out of time-worn paths. George Washington Carver walked into Iowa leaving strong disappointments behind in Kansas. Trudging toward the town of Winterset during the summer of 1888, Carver probably passed thru Adair County shortly before Henry Agard Wallace arrived there on the day of his birth. A few years later, Carver happened to meet young Wallace in a field near Ames, where mutual interest in plants led to a friendship that continued as each went on to national & international fame.

The story of this friendship between Carver and Wallace and of their subsequent contributions to agricultural science is well worth the re-telling to each new crop of science students in Iowa. It includes portraits of Carver, the university student, and young Wallace, son of a professor, sharing knowledge & enthusiasm about prairie plants. Such images from their lives and times will help to develop this story in a slide-illustrated presentation. Copies of bibliographies and requests for duplicate slides will be available for instructors wishing to tell this story in their own classes.

161. The "Columbo charisma" and STS: little things make the difference!

R.E. Mitchem

A positive classroom climate provides an opportunity for each student to take an active part in his or her academic planning, and does not involve elaborate techniques. It allows a teacher to excercise their unique skills and competencies.

Daily or weekly classroom changes, student support teams, and student recognition can help maintain high student interest and achievement. We must be cognizant of "talking down" to our students and be willing to solicit their ideas of interest that tie science to our daily lives; technology can be a key

Teacher time control is a vital factor and demands attention. The "Columbo Kiss" method for teacher record-keeping of student daily achievement might be an answer. The teacher's daily record book may not be given the attention it needs. Even one particular day may be the little difference that can make a big difference in an individual student's life. Let's give each student a chance to leave their "positive mark" for the day in our classroom.

162. Bees can't even read or write -- but they are useful in your lab

R. F. TRUMP

Entomology Department (retired), Iowa State University, Ames, IA 50011

Because honey bees exhibit unique modifications in both structure and behavior, and because they provide a continuing demonstration that is virtually self-teaching, they merit a place in the science laboratory. This presentation will demonstrate how a small colony can be maintained easily in a glass-walled observation hive with flight access through a wall or window. It will also describe challenging observations, including the rearing of a new queen.

163. Prairie restoration: a teaching tool

D. C. Herman

Biology Department, East High School
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East High School is situated on a campus which contains a remenant of the loess hills type of prairie. A one acre tract of ground was used infrequently by the school as an athletic field.

Permission was obtained from the school district, and with cooperation with the Woodbury County Conservation Board the project began in 1984. Techniques of prairie restoration will be discussed and how they were used to teach the basic principles of ecology. Photographic slides, sampling techniques, and data will be discussed as part of the Biology curriculum at East High School.

The East High Prairie is a source of data beauty and natural history both of the past and present.

164. Inexpensive computer software for science teaching in Iowa schools

J. B. COOK

AEA 6, 210 S. 12th Ave, Marshalltown, IA 50158

The number of computer software programs for science teaching has increased dramatically in the past few years. Many of these are relatively inexpensive, i.e. they are available in Iowa schools for less than $10 per copy.

While the quality of inexpensive software varies, some of it can provide a supplement to science instruction worth far more than its minimal cost. It can be difficult, however, for teachers to find good quality, appropriate software from among the many products available.

Sources of inexpensive software include public domain software; donated software; "shareware;" commercial software with AEA, state-wide, district or building-level duplication rights; and commercial software available on loan from AEA media centers.

Methods for finding appropriate software will be discussed, and lists of software and sources will be provided.

165. SWAP for high interest among disinterested junior high students

C. A. LEE, AND R. IVERSON

Department of Biology, University of Northern Iowa, Cedar Falls, IA 50614

The Surface Water Analysis Project reaches underinvolved junior high students in fourteen eastern Iowa schools. Teacher-directed teams of four to six students in each school collect surface water samples at selected sites. Water samples are analyzed using HACH water analysis kits and protocol. Data is then uploaded onto an electron bulletin board and communicated to all SWAP teams. Noteworthy changes have resulted in students who previously were underrepresented, not only in classroom participation, but in other student activities as well. Students develop a knowledge about technology and telecommunications and an interest in water quality issues in Iowa. These lead to an increase in self esteem which fosters an interest in science and a better understanding of science.

SWAP enthusiasm is very high.

166. Science is fun: recent physics literature

G.W. Quirk

University of Northern Iowa, Library, Cedar Falls, IA 50613

Liveliness and excitement surround physics today, and this mood is reflected in the literature.

A selected reading list of books and articles has been compiled for a general audience of informed readers and motivated students. Possible uses are browsing, casual reading, regaining contact with today's physical science, or selecting library holdings. Drawn from a variety of periodicals and monographs, its purpose is to point out recent materials in the major divisions of physics:

physics in general
mechanics and the science of motion
thermodynamics and the study of heat
acoustics and the science of sound
optics and the study of light
electricity and magnetism
condensed matter: solid and liquid state
nuclear and particle physics
quantum and relativistic mechanics.

The presentation will include comments on the literature, display of a number of the titles, and distribution of the bibliography.

167. Communication through Raman solitons in optical fibers

K. J. DRUHL

Department of Physics, Maharishi International University, Fairfield, IA 52556

The width of pulses in optical fibers, and therefore the transmission rate, has to be much longer than the response time of the fiber, or else pulse breakup will occur. This "response time barrier" for coherent pulses is about 0.1 psec. We propose to break this barrier by using a mechanism which is transient in nature, and therefore operates for pulse widths shorter than the response time. This would allow pulse widths of the order of 10 fsec, and correspondingly high transmission rates.

The mechanism employed is that of Raman solitons, in which short, localized pulses are sustained by a balance of gain and loss. We show that, in an optical fiber, the additional effects of self-phase modulation and dispersion can be compensated by cross phase modulation and Raman dispersion. We discuss stability of the corresponding solitary waves, and the influence of coherence decay.

168. Maharishi's Vedic Mathematics: A holistic approach to mathematics education

A.J. DEANS

Maharishi International University, Department of Physics, Fairfield, IA 52556

Maharishi's Vedic Mathematics offers a new approach to resolving the current crisis in mathematics education. Its computational techniques, which are derived from the Artharva Veda, have been found to be easier to learn, faster, and more enjoyable than conventional methods, and offer to develop the students' creativity and clarity of mind. The range of Maharishi's Vedic Mathematics extends from the most concrete values of numerical computation to the most abstract aspects of the dynamics of intelligence itself, thereby offering the most natural computational software for the hardware of the human brain physiology.

169. Heaven on earth: the role of science in a perfect society

K. J. DRUHL

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"Heaven on earth" is the phrase chosen by Maharishi, founder of MIU, to name the state of life in a perfect society. Only with reference to perfection in life can the role of science be properly understood. Historically, a limited understanding of science, man and society has focussed on the objective values of knowledge only and thereby created threats to mankind's welfare and very existence, along with limited benefits.

A complete understanding of science, man and society includes an understanding of the subjective values of the knower and the process of knowing along with the objective values of the known. This understanding has been presented by Maharishi in his Vedic Science. It provides both explicit bodies of knowledge for the individual and society to rise to a perfect state of life, and general techniques which can be integrated into the study of any particular discipline.

In this way any branch of science can fulfill its role, which is to develop the full potential of the knower as well as provide useful information.

Zoology

170. Survival rate of Excherichia coli in sewage effluent.

P. D. LEMON

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Water quality in streams receiving nonchlorinated sewage effluent is currently being evaluated throughout the state of Iowa. The survival rate of fecal coliforms was used as an indicator for determining the quality of water in Cavitt Creek. Cavitt Creek is a small unclassified stream receiving nonchlorinated effluent from the Indianola Waste Water Treatment Plant. Fecal coliform counts forty-five minutes down-stream from the effluent discharge were reduced thirty percent. Therefore, fecal coliforms remain viable for long periods of time after being discharged into streams.

171. Stomach eversions in Mustelus canis and Squalus acanthias

D. D. PETERSON and F. A. ROGERS

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In two populations of Mustelus canis and Squalus acanthias used in a comparative anatomy class, three sharks with stomach eversions were examined. The tongue like eversions were 10 cm in length lying in the oral cavity but not protruding through the oral opening. Each projection had a 0.5 cm orifice in the distal portion which opened into a non-everted pyloric stomach/duodenal intestine area. The pockets created by the eversions contained appropriately attached accessory glands, mesenteries, and blood vessels. Based on the capture methods, embryological development, histological tissue slides, and literature survey, this eversion was determined to be either a voluntary or an involuntary action to remove undigestible material which could not pass through the digestive system.

172. Seasonal survey of Chironomidae (Insecta) in 5 south-central Iowa farm ponds

M.A. GILBERT

Wildlife International, Ltd., Milo, Iowa 50166

During the spring, summer and fall (April through September) of 1988, extensive surveys were made of 5 farm ponds located near Milo, Iowa (south-central), as part of a multi-year study on the effects of agricultural chemicals on farm ponds. Parameters measured included many aspects of water chemistry as well as surveys of animal life. Insect traps collecting the emergent adults from 1 square meter of pond surface were emptied on a weekly basis and every insect found was counted and identified as least to family. Overwhelmingly dominant were members of the chironomid family, accounting for at least 95% of numbers and represented by over 35 different species. Aspects of selected species will be discussed focusing on patterns of adult emergence and habitat specificity.

173. Chorusing Insects of Iowa

K. C. SHAW

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An insect chorus is an aggregation of conspecific males which sing during the same time period. Mike Greenfield and I have classified chorusing insects as follows: 1) synchronizers, 2) alternaters, 3) overlappers, 4) unison singers, and 5) unison bout singers. The first three chorusing types involve consistent temporal relationships between song units of two or more males. The song units of unison and unison bout singers do not show consistent temporal relationships; unison bout singers sing and are silent in bouts of irregular length. In this paper, I will describe the songs of Iowan species representing the various categories of chorusing. Based on my and other's research, I will discuss some of the apparent proximate mechanisms (e.g., excitation, inhibition) and the apparent adaptive significance (e.g., predator avoidance, sexual selection) of chorusing.

174. Direct competition and mechanisms inhibiting reproduction between different species of collembola

D. Gobaleza and M.J. Kahlert

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Experimental data suggests mutual inhibition of reproduction via substrate conditioning between Xenylla grisea and Folsomia candida. These results concur with Margaret Doyle's (1988, unpublished) experimental results. Doyle showed evidence that substrate conditioning caused mutual reproduction inhibition between Sinella caeca and F. candida.

The possibility of an allomonal population growth inhibitory effect was tested. The data suggests a allomonal mechanism exists between S. caeca and X. grisea.

Finally, studies involving direct interspecific competition between F. candida and Pseudosinella violenta showed that F. candida strongly inhibited population growth of P. violenta.

175. Purineolytic capacity and urate accumulation in Carcinus maenas during hypoxia.

J.A. DYKENS

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Oxygen affinity of crustacean hemocyanin (HCN) is increased by hemolymph effectors such as lactate and urate which accumulate during hypoxia. Urate is produced in the purineolytic pathway from oxidation of (hypo)xanthine by xanthine dehydrogenase (XDH). C.maenas hepatopancreas contains XDH activity sufficient to account fully for all the urate which accumulates during hypoxia. Ample urate production begs the question of why C.maenas uricase activity, which consistently exceeds XDH activities in the hepatopancreas by 7-fold, does not open the purine ring thereby negating urate's effectiveness as a HCN modulator. Unlike mammalian uricase, C.maenas uricase is not inhibited by substrate concentrations well in excess of those found in vivo. Nor is C.maenas uricase activity irreversibly impaired following prolonged hypoxia (P_{O2} < 25 mmHg, 12 h). However, C.maenas uricase has a low O_2 affinity (K_m = 68 mmHg) indicating that the most parsimonious explanation is also the most likely: because uricase requires O_2 as a cofactor, diminished O_2 availability during in vivo hypoxia correspondingly impedes uricase activity thereby allowing urate to accumulate.

Supported by Bang and Markey Fellowships.

176. Salmonella in Iowa's reptiles

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Salmonella has been isolated from several species of reptile throughout the world but only a few from the United States. Most of these studies have been concerned with commercial turtles as carriers of human infection. In this study, feces from turtles, snakes and lizards collected from a variety of habitats were cultured. Of 71 reptiles sampled, 13 (18.3%) were found to harbor Salmonella representing six different serotypes. Incidence of Salmonella was greater in lizards (72.7% tested positive) than snakes (13.6%) or turtles (5.3%) (P=.01). Upland reptiles had higher carrier rates (25.0%) than river-associated reptiles (7.4%) (P=.06). Mississippi Valley reptiles cultured positive more often (64.7%) than reptiles from other areas (3.7%) (P=.01). Iowa's reptiles serve as a reservoir for Salmonella but at a level below those reported in the United States and other parts of the world. Lizards and snakes taken from the wild are more likely to be carriers than are wild turtles.

177. Magainins, natural antibiotics from two different frog families

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Natural antibiotics were discovered in the skin of African clawed frogs (Xenopus laeves) and named by Zasloff in 1987. We have duplicated his results both by using crude extracts and somewhat purified compounds separated by cation exchange column chromatography. Using the same techniques we have demonstrated antimicrobial activity in extracts of the skin of the North American bullfrog, Rana catesbeiana. Work is underway to determine whether this activity is due to the same polypeptides identified in Xenopus and to see how widespread magainins are among the amphibia.

178. Turtle use and succession in a pool created in the bottom of a dry lake*

MARK R. WATTS AND JAMES L. CHRISTIANSEN

Department of Biology, Drake University, Des Moines, Iowa 50311

Spring Lake, a Mississippi River Oxbow has been drying by midsummer for the last three years and except for a small pool in the southwest end, was dry for all of 1988. As recently as 1985 it has supported a large population of turtles including the endangered Yellow Mud Turtle. This study showed that an artificial 7-foot deep hole held water throughout the 1988 drought and attracted mud turtles and painted turtles in the same proportions as was typical of the lake in times past. Natural succession provided adequate food for good growth of young mud turtles but low snail populations may have contributed to a calcium deficiency resulting in soft shells.

*Funded by Monsanto Co.

179. The status of Iowa's endangered yellow mud turtles; impact of the 1988 drought

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Iowa is now known to support six populations of the endangered yellow mud turtle. The largest of these, located on Big Sand Mound in Muscatine County, is the only Iowa population believed to have enough individuals to be self-sustaining. This population appears to be growing following the temporary removal of racoons in 1979 and now may consist of as many as 3,000 turtles excluding hatchlings. The 1988 drought may have reduced that number but the reduction is believed to be much more severe with hatchlings and turtles of other species. Large numbers of mud turtles were captured terrestrially and released during the summer of 1988 while virtually all other aquatic species had disappeared.

180. The tephritids (Diptera) of Iowa.

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In Iowa there have been 55 species of Tephritidae (Diptera) found so far. Host plants are know for 51 of these species.

Most tephritids from Iowa attack plants of the sunflower family (Asteraceae). One Genus, however, attacks the rose family and another the carrot family. Host plants are known for 51 of the 55 species. Twenty six species feed in flower-heads and seeds, one species is a leaf miner, six are stem borers, and eight feed on fruits.

Three tephritids are pest: the apple maggot, the cherry maggot, and the sunflower maggot. Most of the rest are probably beneficial for reducing the vigor of their host plants.

POSTER PRESENTATIONS

181. Survey of intestinal helminths in the deer mouse, Peromyscus maniculatus.

T. J. SCHLINES, B. KNAACK, AND M. N. LEIDA

Department of Biology, Morningside College, Sioux City, Iowa 51106

Forty-one deer mice, Peromyscus maniculatus, were collected from areas near the Port Neal Field Laboratory about twenty miles south of Sioux City, Iowa, and examined for the presence of intestinal helminths.

Necropsy produced six species of internal helminth parasites, including two species of tapeworms which are infective to humans. Possible transmission of these parasites from deer mice to humans was assessed as negligible.

Forty-six percent of the mice contained one or more species of intestinal helminths. Incidence of infection by each parasite species and parasite burdens of individual infected mice were relatively low.

182. Assessment of tick hazard in the Sioux City area.

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Reports of Lyme disease in Iowa prompted an assessment of ticks present in the Sioux City area. Members of the Family Ixodidae were collected, identified and appropriately preserved.

First, individuals who used local parks were interviewed about contact with ticks. Second, field sweepings were performed to collect ticks. Third, live-trapped rodents were examined for ticks. As the study progressed, voluntary contributions of ticks from outside sources were also analyzed.

A total of 270 ticks were identified, all belonging to the genus Dermacentor.