Abstracts of Papers, 92nd Session, Iowa Academy of Science, April 18-19, 1980, Simpson College, Indianola, Iowa
## ABSTRACTS OF PAPERS

### 92nd Session
**Iowa Academy of Science**

### April 18-19, 1980

**SIMPSON COLLEGE**

**Indianola, Iowa**

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### SECTION CODE LETTERS:

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- **B**: Physics  
- **D**: Chemistry: Org. and Bio.  
- **E**: Geology  
- **F**: Zoology  
- **G**: Botany  
- **H**: Anthropology  
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- **O**: Physiology  
- **Q**: Science Teaching  
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ANTHROPOLOGY

H-1 Site catchment theory: applications to Iowa archaeology

JOSEPH A TIFFANY and LARRY R. ABBOTT

Office of the State Archaeologist, The University of Iowa, Iowa City, IA 52242.

Site catchment and settlement models have been developed and used at several locations in Iowa. This model, unlike many others, uses the relatively standardized data of the published soil survey and vegetation ordination to construct the environment within a locality. Other published data are also used to construct mineralogic/hydrologic and landform models for the study area. Site catchment models have been used to predict site locations, demonstrate site-ecotonal relationships, and analyze site distributions. Three applications of this approach from Iowa archaeology will be presented.

H-2 Loess deposition, soil development, and archaeological sites

LARRY R. ABBOTT

Office of the State Archaeologist, The University of Iowa, Iowa City, IA 52242.

Archaeological manifestations on upland and high terrace sites have been found incorporated into some portion of the soil profile provided they have not been cultivated and/or eroded away. The pedologic activities that produce these soils is the primary factor resulting in the burial of the cultural material. Secondary additions of earth materials have been added by the constant incremental rain of loess. The loess deposition, insignificant by geologic standards, has been of greater importance along the loess producing streams such as the Missouri. This paper presents examples demonstrating how the combination of pedologic activities and loess accretions through time has allowed stratigraphic ordering of multicomponent sites.

H-3 The McKinney Oneota village site

RICHARD SLATERY

Office of the State Archaeologist, The University of Iowa, Iowa City, IA 52242.

The McKinney site is an important Oneota component located in southeastern Iowa near the mouth of the Iowa River in Louisa County. It is significant in that attention was first attracted to the site in 1861 by the reported remains of an octagonal earthen enclosure. Without further exploration, the site was mentioned frequently in the literature from this early date until 1970 when the first limited subsurface testing was conducted. This report is a brief overview of this excavation and a more extensive test conducted during the summer of 1979.

H-4 A study of use-wear patterns on stone tools from the Rift, Valley, Kenya.

J. R. F. BOWER and S. ABUTU

Department of Sociology and Anthropology, Iowa State University, Ames, Iowa 50011.

A choice sample of obsidian tools has been collected from a rockshelter in the Central Rift Valley, Kenya, whose deposits span virtually the entirety of Holocene time. Macroscopic patterns of use-wear have been observed and correlated with variation in tool form and in the general character of cultural debris over a substantial span of the rockshelter's depositional sequence.

H-5 Human use of prairie lakes and marshes in Iowa's prehistoric past.

S. C. LENSINK

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

Most sites of prehistoric human activity in North America are associated with aquatic features. Previous research in the northern plains has concentrated on riverine settings while largely neglecting the numerous prairie lakes and marshes of greater interest. A surface reconnaissance and limited test excavation was conducted on 77 sites located in controlled survey on the relation between prairie wetlands and central Iowa. Data on the site distribution, age, and life history of these marshes was collected and analyzed.

H-6 Oneota subsistence in northwest Iowa: the Milford site (1JUK1)

L.S. Tatum

Dept. of Anthropology, The University of Iowa, Iowa City, IA 52242.

French trade goods and Allemanee style pottery from the Milford site indicate that the village people used by the prehistoric site to the area of northwest Iowa. Data on the site distribution, age, and life history of these marshes was collected and analyzed. The site was a complex village community, as evidenced by the diversity of activities exhibited by the site.

H-7 Some thoughts on the meaning of the Effigy Mounds.

D.C. Anderson

Office of the State Archaeologist, The University of Iowa, Iowa City, IA 52242.

The Effigy Mounds of the upper midwest have been interpreted as burial mounds, territorial markers, and symbols of the corporate groups who built them. The most recent interpretations by R. C. Mallam and D. W. Benn accept the effigy mounds as totem symbols and equate each with a kinship unit (lineage). They believe the effigy mounds were built to (1) reaffirm group solidarity, (2) create a totemic repository for deceased members of the group, (3) renew ties with mythical ancestors. In their model, the timing of the mound building event coincides with the coalescence of related groups into a broad area during the late summer when corporate collection of naturally abundant resources is expected. While accepting many aspects of the Mallam-Benn model, this paper proposes that the effigy creating and its purpose (1) to symbolize the group's relationship to the natural environment, (2) to mark the boundaries of the group's territory, and (3) to reinforce the group's identity.
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H-8  An assessment of the archaeological resources at Coralville Reservoir.
D.C. Anderson*, J. Zalesky and D. Zieglofsky
Office of the State Archaeologist, The University of Iowa, Iowa City, IA 52242

Archaeological investigations were initiated at the proposed site of Coralville Reservoir in 1969 by River Basin Surveys, Smithsonian Institution. As the dam neared completion in 1956, another project was undertaken by River Basin Surveys resulting in additional reconnaissances and testing of 10 of 29 known sites. Limited salvage was accomplished at one site in 1968-69, and further surveys were launched in 1970 and 1974. Unfortunately, by the time federal legislation was enacted to facilitate in-depth study of such areas, the reservoir was operational and ineligible for study. The results, however, have already been significant. The current state of knowledge is outlined in the following paper.

S. B. Williams
American Studies Program, University of Iowa, Iowa City, Iowa 52240

The Ft. Atkinson site in Winneshiek County contains the ruins of a United States Army post garrisoned by regular troops and volunteers from 1840 to 1849. The site was subsequently sold to various private individuals who dug the ground under pressure to reconstruct the fort. The State of Iowa began purchasing the land and what remained of the buildings in 1921 and by 1939 owned the site of the original stockade and the remains of the 9 buildings within. Still in private hands today are the sites of 15 buildings which stood outside the stockade. Two separate archaeological investigations have been conducted at the Ft. Atkinson site. Between 1939 and 1940 Sigurd S. Bering located and identified the foundations and other remains within the stockade. In 1966, investigations by the Office of State Archaeologist under the direction of Marshall N. N. Poblenz uncovered a variety of artifacts, principally china and glassware, from officers' privies, and located the line of buildings that stood outside the stockade. These early investigations have only partially explored the site. Before further development of the site takes place, new investigations of the subsurface remains should be conducted.

H-10  Cultural variations in the use of personal space
G. N. Gibson
Iowa State University, 213 Beadle Annex, Iowa State University, Iowa 50010

For over two decades social scientists have been studying the ways people use and structure the space around them. Very little study has been concerned with making cross-cultural comparisons. That is the purpose of this study. Students from a number of cultural backgrounds were asked to complete a personal space simulation exercise. This depicted a variety of interpersonal situations. In the exercise paper silhouette figures were used to represent people. Stacked measurements were made between the silhouette figures for the purposes of comparison. Comparisons were made across cultures as well as situations.

H-11  Local government reform in Scandinavia
R. W. Wessel
Department of Political Science
Iowa State University
Ames, Iowa 50011

Local government reform has been a continuing area of study and effort in the United States and specifically in Iowa. Many suggestions have been made to improve the structure and function of local governments with little success. Similar efforts in Scandinavia over the past two decades have resulted in significant reorganizations in the three Scandinavian states—Norway, Sweden and Denmark. This study will seek to describe the reorganizations particularly in Denmark, the reasons for the success of the efforts and describe the resulting governmental structure. The study will also attempt to evaluate the effects of the reorganizations in Denmark. The study will relate the changed system to efforts in the United States to reorganize local government, the success or failure of such efforts and post reorganization variations in the levels of success in Scandinavia and the United States.

H-12  Urban Danish women: Formal equality and everyday ethic within the welfare state.
J. M. Schirmer
Anthropology Department, Box 141, University of Pennsylvania, Philadelphia, PA 19114

There has long been concern in the social sciences about how governmental policy affects social relations. The nature and problems of women's position in Denmark with its social welfare program providing paid maternity leave and daycare, and its legal reforms such as equal pay, offer a good opportunity to examine this issue more closely. It has been argued that these changes will automatically occur in both the public and private spheres of women's daily lives as a result of legislative changes in the labor market and within educational institutions. Ethnographic research in Copenhagen indicates, however, large discrepancies between the institutionally-created reforms and the informal realities of urban women's everyday lives at home and work, both for the factory worker as well as the professionally-educated government employee. It is argued that the ideology of the social welfare state neither challenges patriarchal patterns in the home, but assumes women's double load nor does it challenge the class bias of capitalist society. These discrepancies between ideology and reality stem from economic constraints, as well as social and ideological ones, whereby the Danish welfare state is able to present a false sense of security and tolerance, while legitimating state growth and intervention.

H-13  The Viking ethnic revival
M. B. Mc Kusick
Anthropology, University of Iowa, Iowa City 52242

Although Scandinavian scholars and American archaeologists have long discounted the fraudulent Viking Age antiquities in North America, there is a persistent belief in runestones and other relics reported from Maine to Oklahoma and even beyond. This revival of Viking mythology represents part of the long ethnic tradition still actively promoted by some Scandinavian-American organizations: partly nationalistic, partly seeking deeper roots in the New World.

H-14  Community models and leadership networks in Norway
D. C. Caulkins
Dept. of Anthropology
Grinnell College, Grinnell, IA 50112

Three models of community social organization are current in the literature. The decline-of-community model is associated with L. Wirth, the persistence-of-community model with H. Gans, and the subcultural model with C. Fischer. Students of community power, including the social pluralists and elite theorists, have developed variants of these models. Each model predicts a different configuration of interlocking directorates of local community organizations. The configuration of 220 families in 80 local organizations in a Norwegian town was explored through an hierarchical agglomerative cluster analysis technique. Hypotheses derived from each model were tested. The results, which support the subcultural model, challenge some orthodox explanations of social integration in complex societies.
D. R. FINK

Anthropology Department, East Hall, Iowa State University, Ames, Iowa 50011

Differing viewpoints have been advanced on the subject of women's status and its change in Western society over the past 100 years. Some analysts cite suffrage and legal rights to argue for women's increasing diversity of choice; others stress informal perogatives in the community and home which were lost with industrialization. This paper addresses the debate by looking at Danish farm women, their access to land, and the change in inheritance patterns in this century. Based on historical data from interviews with women of a southern Danish island, this study shows a decline in women's inheritance of farm land. Whereas 25% of the pre-1970 cases of land inheritance involved female heirs, not a single woman within my study sample had inherited farm land after 1970. Not a single farm in operation in the 1970's was slated to go to a female heir. While it may be argued that new opportunities were opened to women in the 1970's, these did not offset women's loss of the land, a critical resource in this rural community.

BOTANY

G-1 Some unusual and unique features of the leaf anatomy in the legume tribes Psoraleae and Amorphae.

GLdN W. TURNER

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

Ryberg (1919-20; 1928) elevated the subtribe Psoraleinae of the legume tribe Galegeae to tribal status giving it the name Psoraleae. Since then, the Psoraleae has been subdivided into two tribes. As defined by Barneby (1977), the Psoraleae consists of the large genus Psoralea and the tribe Amorphae (eight genera and about 250 species that were previously included in Ryberg's Psoraleae). Stirton has recently subdivided the genus Psoralea into 3 genera. I am currently investigating some features of the leaf anatomy of both the Psoraleae and the Amorphae for their possible taxonomic significance—especially the distribution of various types of secretory cavities. Trabecular cavities (cavities traversed by elongate cells) are unusual secretory cavities that are common in the Psoraleae. Other secretory cavities exist in both tribes that are similar in appearance but lack trabeculae. Some preliminary findings of this study will be presented and their possible taxonomic significance discussed.

G-2 Increased DNA content of raphide crystal idioblasts in young leaves of Typha angustifolia (Typhaceae).

A. P. KAUSCH

Molecular, Cellular and Developmental Biology
Dept. of Botany, Bessey Hall, Iowa State Univ., Ames, IA 50011

Observations were made on the development of raphide crystal idioblasts in young leaves of Typha angustifolia L. Two wavelength Feulgen cytophotometry was used with squashed leaf preparations to determine the mass of DNA in crystal cell nuclei relative to nuclei of surrounding cells. Crystal idioblasts become larger than surrounding cells, developing enlarged nuclei and nucleoli during crystal formation. The mean density of DNA from interphase and mitotic nuclei of surrounding cells fits a 1:2.011 ratio. Average DNA content of developing crystal idioblasts is 2.41 times that of adjacent interphase cells. This larger number reflects DNA content during different periods of the S phase from several stages of idioblast development. Measurements also show that increasing idioblast length is commensurate with increasing nuclear diameter and DNA density. This data indicates gradual replication of the crystal cell genome.

G-3 Staminial vascular architecture in five dicot species.

L. D. HUFFORD

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

Staminial vasculature is usually depicted as a single unvaried bundle extending through the filament and ending simply at some level in the anther. However, a few published accounts of staminal vasculature suggest that the conventional view is oversimplified. Five dicot species were chosen for study: Asarum canadense, Brinys winteri, Isopyrum bistratun, Prunus Virginianam, and a cultivated Prum sp. Clearings and micromot sections were prepared from stamens of each species, except D. winteri, for which only clearings were produced. Basilified anthers in A. canadense, D. winteri, and I. bistratun have only a single vascular strand, but it is dilated in the connective; internal bundle architecture varies with the form of the anther among these species. The dorsifixed anthers of Prum and P. Virginianam exhibit branching of the filament bundle after entry into the anther. The extent of this branching and the internal architecture of the bundles varies with the form of the stamens. None of the five species had vasculature as simple as is generally assumed.

G-4 The trachied bar and vented pits in seeds of papilionoid legumes (Papilionoideae: Leguminosae).

N. R. LERSTEN

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

A survey of seed coat anatomy of papilionoid legumes is in progress, using scanning electron microscopy of whole and razor-sectioned seeds, mostly provided by U.S. National Seed Herbarium (U.S.D.A.) courtesy of Dr. R. R. Gunn. One or more species of about 250 genera, representing 28 of 31 tribes currently recognized, have been examined. The ubiquitous trachied bar consists of a linear array of vertically oriented (with respect to the hilar groove) trachied-like cells with bordered pits. Circular to lanceolate in transverse section, the trachied bar extends the length of the hilum below the trachied bar. Trachied pits in most tribes are vented; this is the first report of this feature in vascular plants from other than treachery elements in wood. In certain tribes, e.g. Viciaeae, ventures are virtually absent whereas in others, such as Phaseoeae, ventures are elaborated. Pit membranes may be lacking or torn in all trachied pits. Pitting patterns may provide another taxonomic character.

G-5 Stomata in the seed coat of some Bauhinia species (Leguminosae: Caesalpinioideae).

SEANNA R. HUGENSTEIN and NELS R. LERSTEN

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Seed coat stomata have been reported as rare, occurring in single species scattered throughout several angiosperm families (Kolbly, 1962; Shidawri and Bhatnagar, 1979). Jernstedt and Clark (1979) found stomata on the outer and inner fruit walls and on the outer seed surface of several California Eschscholzia species (Papavaroaeae). Corner (1931) described stomatal openings in the outer fruit surfaces of a few legume species but postulated that legume seeds lacked stomata. The pores present in the seed coat of Olneya tesota, a papilionoid legume, appears to be the only previous report of anything resembling legume seed stomata. I am conducting a survey of Bauhinia seeds using light and scanning microscopy. This tropical caesalpinoid legume has several species with what appear to be complete stomata in the seed coat; other species have pores which resemble those found in Olneya tesota. This report on Bauhinia stomates is the first one to deal with the caesalpinoid legumes. It is a character which promises to be of taxonomic usefulness.
G-6 The natural forest communities of Iowa: a resource in trouble
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Based upon the original United States Land Office survey, it has been estimated that 18 percent of the total state land area was covered by forest at the time of first white settlement. Today, less than 4 percent of Iowa landscape remains in woodland. In essence, Iowa's forest lands have a value underrated and misunderstood by most of her citizens. Threatened with destruction of our natural forest heritage, it is imperative that the citizenry of this state at least awaken to the necessity of protecting what is left. Principle research objectives were 1) to establish a public awareness for a threatened forest resource and to express a concern for its health and survivability for the present and future use and enjoyment by the citizenry of Iowa; 2) to present a photographic portrait of the forest geography of Iowa with specific reference to the natural communities found within the state; their geographical distribution, visually healthful appearance, habitat, and floristic composition, and 3) to serve as very simple models which may assist in the sensitive preservation, restoration and management of our remaining natural forest landscapes.

G-7 Citrus and Citrus relatives pollen grain morphology and taxonomy.
J. L. JORDAN and D. A. GUZON

The scanning electron microscope was used to survey the sculptur- ing patterns of the pollen walls of Citrus L. and Citrus relatives to determine their phylogenetic and morphogenetic relationships. Generally, the pollen grains of Citrus and Citrus relatives were found to have four colp (conspicuous, longitudinal apertures of the exine), a spherical shape, and a plicate tectum (smooth sexine). Notable exceptions are the following: *Murraya koenigii* has 3 colp; *Citrus latipes*, *C. karnsianus*, *Asiopoea chevalieri*, and *Citrus pentagona* have 5 colp; and *C. limettoides* has 6 colpt. The exine patterns vary considerably with the size, shape, and design of the holes and surrounding structures. Citrus *javanica* is an example of a pollen with an elaborate figured type of exine pattern; however, it also appears to lack holes in the tectum.

G-8 Dormancy and seed coat morphology of prostrate spotted spurge (Euphorbia supina Raf.)
J. L. JORDAN and D. A. GUZON

Prostrate spurge (Euphorbia supina Raf.) seeds were harvested randomly from plants growing in a citrus orchard at Riverside Calif. on Aug. 2, Sept. 1, Oct. 18, and Nov. 11, 1977. Dormancy ranged from 50 to 95%, 80 to 85%, 80 to 85%, and 90 to 92% respectively on each harvest date. Seeds were allowed to imbibe water for 24 hrs. at 24 C in the dark. The average percent weight increase for each harvest date was approximately 120% (Aug.), 90% (Sept.), 60% (Oct.), and 30% (Nov.). The function of the seed coat morphology in the dormancy state was investigated by scanning electron microscopy techniques. The porosity of cryofractured seed coats decreased from August to November. The seed coat had less surface area as time progressed. Also, the exterior of August, September, and October seeds contained holes; whereas, the November seed coats did not have any holes apparent on the surface. Finally, the number and size of wax extrusions varied and was correlated to water imbibition and seed dormancy.

G-9 Further evidence for a dual auxin response.
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Recent evidence indicates that auxin elicits two responses in elongating stem segments: an initial, transient response and a later phase of long-term steady-state growth. These two responses are especially obvious when the data are plotted as rate versus time. A criticism of this theory states that the measurable responses are an artifact due to shoot reduction caused by rapid cell extension. A set of experiments was performed in which the elongating segment was placed under varying amounts of tension in an attempt to cancel this supposed shoot reduction. In all cases, two distinct responses were present. This indicates that the two responses are real.

G-10 Glyphosate for citrus and avocado weed control.
J. L. JORDAN and L. S. JORDAN

Glyphosate ([Phosphonomethyl]glycine) is effective, safe, and economical for controlling weeds in citrus and avocado orchards. Glyphosate is a foliar-applied systemic herbicide which is translocated to underground roots or stems. Response depends upon plant species, age, size, and weather conditions. Translocation causes eventual destruction and deterioration of the roots and underground stems. There is little activity through the soil. Effect of glyphosate on tree foliage depended on treatment rate. Injury to leaves was characterized by a marginal burning. Twig dieback and branch injury occurred only at high rates. Young tissue was damaged more than mature tissue. New growth was often malformed exhibiting an anti-auxin-like effect with widened, breaking dormancy. Movement was toward the end of the treated branch. Fruit from the treated trees was normal in respect to size, shape, and quality.

G-11 Results from three years of double cropping in south central Iowa.
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Double cropping systems involving no-till corn and soybeans following spring oats for silage and grain were examined over the 1977, 1978, and 1979 seasons. The effects of varying row widths and population densities on grain yield of soybeans, and grain and silage yields of corn were investigated. A prolonged period of moisture stress in 1977 resulted in poor growth and production of the second crop but not in severe effects in 1978 and 1979 which were generally favorable. Double cropped soybeans yielded highest in narrow rows (19 cm) and at 776,000 plants/ha, producing the same grain yields as full season soybeans in 1978 and 1979. Silage and grain yields of double-cropped corn were approximately one-third to one-half the full season yields, and no consistent differences among systems within years were found. A comparison of the economic return of the monocropping and double cropping systems showed that two double crop systems utilizing soybeans in narrow rows and high populations gave 11% and 94% greater net returns than the full season crop.

G-12 Inheritance of oil quality in oat caryopses.
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Few oil seed crops exhibit sufficient variation for oil composition to permit satisfactory genetic analysis of fatty acid inheritance. Oats is an exception and it shows considerable variation for thistrait. Therefore, it is possible to study the inheritance of oil composition in oat caryopses and the relationship between fatty acid content and total oil content. This information should be of value to workers with other oil seed crops. It will indicate whether oats can be used for specific oil composition while breeding for high oil content. As examples, oats has from 14 to 24% palmitic acid and from 30 to 54% oleic acid. An oat cultivar with oil high in palmitic acid would be desirable for margarine manufacture. A high oleic acid cultivar would yield an oil with good stability.

We studied inheritance of oat oil composition in six matings between oat genotypes of varying fatty acid content. The standard unit method was used to estimate heritability values between F₂ plants and their F₂-derived lines in F₃.
G-13  
Cytoplasmic effects for quantitative traits in interspecific Avena crosses.  
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Five Avena sterilis L. lines were investigated for cytoplasmic effects by crossing them reciprocally with two A. sativa L. lines to form ten matings and their reciprocals. The matings and their reciprocals were backcrossed two times to the cultivated parent of the cross to form 60 populations. Each population was evaluated by 20 P0-derived lines in the F2 generation in an experiment with six replications in 1979. Data was collected on grain yield, straw yield, harvest index, heading date, plant height, and growth rate. Cytoplasmic effects were tested by comparing the reciprocals of a mating. There were significant differences in cytoplasm in all generations for all traits. Generally, the differences were in favor of the A. sterilis cytoplasm. These differences showed specific interactions of nuclei and cytoplasm.

G-14  
Aerial pathogens in a central Iowa poplar plantation.  
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A 144-ha plantation of 4 hybrid Populus clones (5262, P. candolleana X P. balsamifera; 5271, P. dillenii X P. deltoides; 5272, P. nigra X P. laevispila; 5311, P. balsamifera X P. tremuloides) was planted at the 4-H Camp, June 1977. The 1440-tree plantation, 1 m x 1 m spacing, contains 4 replications of 10 spray treatments. Spray treatments were established for determining their effectiveness in management of a leaf disease caused by Septoria musiva. The clones were chosen for their range of Septoria susceptibility. The leaf disease caused by Marssonina brunnea was also observed although these clones generally have resistance to this disease. Stem cankers caused by S. musiva developed during the dormant season, 1978-79. Vaseline™-slide spore traps were established approximately 25 cm from the ground in 8 plantation locations during 1979. The trees were over 300 cm in average height. Septoria spores were found beginning 2 June with 7 spores and peaking 21 July with 968 spores. Marssonina spores were found in much lower numbers beginning in early July. Leaf-disease ratings for August 1979 were high, and Septoria stem cankers were common on susceptible hybrids during 1979. Highest spore counts for S. musiva were associated with the SM-plot spore trap, the location most exposed to prevailing winds during summer.

G-15  
Notes on Iowa Fungi III.  
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During the 1979 field season, a number of rare and unusual fungi were observed. Possibly the generally favorable moisture conditions, accentuated by even more frequent rains throughout August, contributed to the display.  

One of the groups which seemed unusually abundant and diverse was the rust fungi, the Uredinales. Several species were noted on hosts on which they had not previously been reported in Iowa. There were other species that had not been recorded since J. C. Arthur's reports on Iowa rusts during the early 1900's.

G-16  
Observations on some Hypocreales in Iowa.  
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The Hypocreales are a large and diverse order of Ascomycetes. The taxa of the order are typically bright walled fleshy perithecia containing un节icate ascii. Worldwide they comprise over 2000 species assigned to 104 genera. Although predominantly tropical in distribution, a number of interesting saprophytic and parasitic species occur in Iowa. Since the last state survey completed 30 years ago, at least 20 new species have been added to this Iowa list. Included among these are members in the genera Colossosporum, Hypocrea, Hypomyces, Hectria, Ecoloconispora, and Thyelothecia.

G-17  
Taxonomic considerations of the genus Radiocyes.  
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During a survey of virulence of Radiocyes species for rice, an avirulent isolate of R. embreei was discovered. Further studies were initiated to examine strain variation of ten isolates of R. embreei and four isolates of R. spectabilis. The effect of temperature on hyphal growth and sporangiospore germination was determined. Morphological studies of the Radiocyes strains involved the use of scanning electron microscopy. It was noted that the sporangiospores of the avirulent strain were smaller than those of the other R. embreei strains, and additional studies were undertaken to determine the effects of both temperature and medium on sporangiospore size. Antigenic relationships between Radiocyes isolates were examined by immunodiffusion techniques. Results will be discussed in terms of taxonomic considerations of the genus.

G-18  
Bryophytes from north of the Arctic Circle in Northwest Territories.  
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G-19  
Iowa prairie bryophytes.  
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A prairie in northwestern Iowa was examined for the occurrence and distribution of bryophytes, and field and lab experiments were conducted to characterize some physiological and ecological adaptations of several typical prairie species. A total of 33 species of bryophytes was found. A transect study of prairie slopes indicated the mosses were distributed in zones, apparently in response to gradients in moisture, temperature and light intensity. Lab experiments compared the photosynthetic response of two of the most common prairie mosses, Hypnum controversum and Bryum cerebratum Tayl., with two common forest mosses with respect to temperature and light intensity. Bryum and the forest mosses responded similarly with decreased photosynthesis at temperatures of 39 to 40°C, but Jesiella photosynthesized maximally at these temperatures. Both forest mosses had lower light compensation points than the prairie mosses, and Bryum had the highest of the four. A field experiment to determine whether prairie mosses could reduce soil erosion was conducted. Field observations indicate these species may hold soil in agricultural fields where they commonly occur, as well as on rives.

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G-20 Studies on the algal genus *Synura Ehrenberg* from Iowa using electron and light microscopy.

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*Synura* (Synuraceae, Chrysophyceae) is one of the more common and conspicuous planktonic algal forms in Iowa. This genus with its covering of characteristic overlapping silicious scales is representative of the *Synuraceae*. Since 1955 published identifications to the species level in this family by specialists have not been considered accurate unless they are based on electron microscopy. However, little effort has been made to correlate light microscopy with electron microscopy. In this paper scales are illustrated with transmission and electron micrographs as well as light micrographs. Four of the most common *Synura* species are discussed. Three of them, *S. uvella* Ehrenberg, *S. echinulata* Korshikov and *S. spinosa* Korshikov have not previously been identified from Iowa material on the basis of electron microscopy. The fourth species, *S. petersonii* Korshikov has been reported only previously.

G-21 Seasonal variations in relative abundance of benthic diatoms in the Cedar River Basin, Iowa

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Counting 500 diatoms in each of 36 benthic samples collected 24 May 1976 from 14 stations in the Cedar River Basin indicated several differences in species relative abundances compared to samples from the previous October and February. The 5 most common taxa in the May counts ranked as follows in the previous fall and winter: (1) *Nitzschia acicula*rius* (6th in Oct, 7th in Feb), (2) *Nitzschia pyriformis* (16th, 7th), (3) *Nitzschia ulna* (32nd, 11th), (4) *Stephanodiscus subtilis* (40th, 6th), (5) *Navicula sanguinolenta* var. *intermedia* (4th, 12th). Comparisons of water conditions suggest related factors may include temperature, turbidity, and nutrient levels. Spring flooding ended just prior to sampling and appears to be a major factor affecting periphyton development here as elsewhere. Seasonal patterns of benthic diatoms in alkaline hard waters draining farmland differ from those in the softer waters usually described in the literature.

G-22 An early postglacial diatom flora from northwestern Iowa.

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Diatoms in the bottom meter of a 10.5 m core of Lake West Okoboji are reported. Permament slides of each of 20 x 5 cm subsamples were examined critically. In the deepest subsample 29 of the 46 taxa encountered were rated as common and all 20 have been reported elsewhere in similar floras. The most common species, *Cymbella diluviana*, does not occur in the modern flora of Iowa. The total count from the entire meter was 194 taxa in 32 genera and 69 of these are not known from the modern flora of the lake. Of the known forms in the modern flora, 35% were present in the early flora. Some importance may be attached to the absence of species of *Ampahplus*, *Cymbellomitschka*, *Ampilpora*, *Diatoma*, *Pruftula*, *Gephyrosits*, and *Propilides*. The time during which these sediments were deposited is estimated at 12,500-10,500 BP during which pollen records indicate the presence of a rich mixed forest of hardwoods and conifers in the surrounding terrain.

G-23 The vascular flora of Starr's Cave State Preserve.

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Starr's Cave State Preserve is a 140 acre tract of wooded bottom-lands and limestone bluffs along Flint Creek, in Des Moines County, southeastern Iowa. The vascular flora of the preserve was inventoried in 1975-79. This flora consists of 335 species in 75 families. Several rare species of southern and Ozarkian distribution occur here, including four species whose status in Iowa is threatened: blue ash (Fraxinus quadrangulata), winged monkeyflower (Mimulus alatus), winter grape (Vitis cinerea), and papaga mint (Busphila ciliata). Twelve plant communities are found within the preserve, including 5 forest communities, 3 disturbance communities, 2 limestone exposure communities, a prairie opening community, and a streambank community. A quantitative comparison with the floras of 3 physiographically similar preserves in northern Iowa showed a 40-45% similarity among these northern preserves, and a 35-37% similarity between each of these and Starr's Cave.

G-24 Progress on the computerized flora of Iowa (Biobank System)

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1. The BIObank EDP System for the vascular flora of Iowa now includes the MAPINF program which extracts stored data for generating species distribution maps of Iowa plants using the SYMAP procedure.

2. A computerized working index of Iowa vascular plant taxa has been assembled and can be printed out at any time. The total of 1891 taxa is composed of 63 pteridophytes, 6 gymnosperms, 1230 dicots and 524 monocots.

3. The HP/2000 interactive computer at UNI is now used for data input. The editing facilities of the interactive computer can then be utilized before a tape is made for entry into the BIObank System resident in the IBM 370/168 computer at Iowa City.

CELL BIOLOGY

N-1 Functional postnatal development of rat hippocampus (HC).

J. R. WEST and A. C. BLACK, JR.


Using computer-averaged evoked potentials, we plotted the development of monosynaptic evoked potentials in HC and dentate gyrus (DG) following stimulation of commissural and ipsilateral entorhinal pathways. A polysynaptic potential in DG resulting from commissural stimulation and involving both commissural and entorhinal pathways was also monitored. Monosynaptic commissural responses in HC field CA1 and the polysynaptic and monosynaptic entorhinal potential in DG occurred as early as postnatal day 13. The amplitude and waveform were variable but never as developed as in adults. The latency (onset of evoked potential) was about 3 times slower than in adults. The potentials developed over the next 12 days and appeared mature by about day 25. The commissural projection to DG was much slower to develop. The evoked response in the molecular layer was recorded first as a "notch" around day 20 and did not mature until days 29-30. The delay in the development of this response does not appear to be due to immaturity of late-developing granule cells, since the polysynaptic and entorhinal synaptic potential could be recorded from these same cells. (Supported by Grant AA03884 from the N.I.A.A.A.).
N-2 Histochemical evidence for an infrapyramidal mossy fiber projection to stratum oriens of the rat hippocampus (HC).

C. A. HODGES, J. R. WEST, and A. C. BLACK, JR.


Mossy fiber axons projecting from the granule cells of the dentate gyrus were first described as traversing the stratum lucidum of the infrapyramidal bundle terminating on the proximal apical dendrites of the large pyramidal cells of HC subfields CA3a and CA3b. Using a sensitive modification of the TSM80 silver sulfide stain for heavy metals, we found indications of a small infrapyramidal area that stained in a manner characteristic of the mossy fibers. The projection appears to terminate in a zone of stratum oriens of subfield CA3a, and to a lesser extent in subfield CA3b, that is parallel to the supragranular projection. The infrapyramidal projection does not extend quite as far toward field CA1 as the supragranular bundle. It is prominent in the rostral one-third of the HC and tapers along the septo-temporal axis until it is quite sparse at the more temporal HC regions. Whether this infrapyramidal projection terminates in the characteristic manner on the apical dendrites of pyramidal cells or instead on basal dendrites in stratum oriens is unknown. (Supported by Grant AA03884-01AI from the N.I.A.A.A.)

N-3 Evidence for an infrapyramidal mossy fiber projection to fields CA3a and CA3b of the rat hippocampus.

D. BENJAMIN, J. R. WEST, and A. C. BLACK, JR.


Using the anterograde HRP procedure, we report a projection of mossy fiber axons from the granule cells of the dentate gyrus to the infrapyramidal (IP) region of hippocampal subfields CA3a and CA3b in the rostral hippocampus. Like the suprapyramidal (SP) mossy fibers, the IP mossy fibers are characterized by large axonal ex cesses. The IP mossy fiber bundle traverses stratum lucidum and is distinguishable from the SP mossy fiber bundle until it reaches stratum pyramidale of CA3a and CA3b. Mossy fiber axons often cross stratum pyramidale as sparse, narrow bands of fibers. Axon terminal labeling is apparent near the deep pyramidal cells of that layer. Axons cross in proximity or tangential to the displaced pyramidal cells that are scattered in stratum oriens, but the final destination of these fibers is unclear. The IP mossy fibers do not extend quite so far toward regio superior as the SP mossy fiber bundle. Although the IP terminals invade part of stratum oriens, most of the labeled axons still could make contact with proximal apical dendrites of the dentate pyramidal cells. (Supported by Grant 03886 to J.R.W. from the N.I.A.A.A.)

N-4 Long-lasting impairment of hippocampal neuronal function by acute exposure to ethanol, as measured by the cyclic GMP (cGMP) response to muscarinic cholinergic stimulation.


The pyramidal cells of the rat hippocampus receive a cholinergic innervation derived from the medial septal nucleus. Stimulation causes release of acetylcholine, which binds to postsynaptic muscarinic cholinergic receptors, causing increased cGMP synthesis. Rats were given 6 gm ethanol per kg body weight by gastric intuba tion. Hippocampi were incubated with 500 μM betahanechol under conditions which produce maximal cGMP synthesis. Samples were analyzed by radioimmunoassay. The cGMP response to stimulation by betahanechol drops sharply 15 min after ethanol, is almost totally abolished within one hour, and remains depressed for at least 5 weeks. The effects of a single large dose of ethanol on hippocampal function may be prolonged. We speculate that the diminished response may be related to aberrations of memory observed in alcoholic. (Supported by Grant AA03884-01AI from the N.I.A.A.A., and by grants to J.R.W. and A.C.B. from National Council on Alcoholism.)

N-5 Derangement of the cyclic GMP (cGMP) response of the rat hippocampus (HC) to muscarinic cholinergic stimulation by maternal exposure to ethanol during gestation.


The rat HC receives a cholinergic innervation derived from the medial septal nucleus. Stimulation of septal neurons causes increased cGMP synthesis in postsynaptic HC neurons. Rats were given 6 gm ethanol per kg body weight as a 10% (v/v) solution by gastric intubation on days 1-5 of pregnancy. Controls received isocaloric sucrose. Pups were decapitated at 25 days of age. HC were incubated in vitro with betahanechol under conditions producing maximal cGMP synthesis. Samples were analyzed by radioimmunoassay. Pups exposed to ethanol produced 0.27 ± 0.05 pm cGMP per mg protein compared to 0.45 ± 0.06 for controls (n = 16). The difference was statistically significant (P<0.001), suggesting that ethanol may have a deleterious effect on brain development, as observed in humans suffering from the "fetal alcohol syndrome". (Supported by AA03884 from the N.I.A.A.A. to J.R.W., by NS-11650 to T.H.W. from the N.I.H., and by grants to A.C.B. and J.R.W. from the National Council on Alcoholism).

N-6 Aldehyde fixation and the Tim's sulfide silver method for demonstrating heavy metals in the central nervous system.

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The Tim's sulfide silver staining method reveals the localization of heavy metals in tissue. The widest use has been in the central nervous system, and in particular, the zinc-rich hippocampal formation. Investigators employing this procedure have stressed that exposure of tissue to aldehyde fixatives weakens the heavy metal stability. Thus, the need for unfixed tissues has precluded its potential usefulness and obviated its use in ultrastructural studies. We have investigated the use of aldehyde fixatives, on the sulfide silver staining of nervous tissue from several species (monkey, cat, rat, mouse). Animals were perfused with a sodium sulfide solution, followed by a solution of 1% paraformaldehyde, 1% glutaraldehyde in phosphate buffer. Tissues were post-fixed for varying intervals in 3% sucrose-fixative. Sections were cut, mounted and reacted. No evidence of a decrease in stability after exposure to aldehydes during perfusion or in a post-fixative solution was observed. Moreover, cytological detail was preserved. The use of this procedure should enable investigators to demonstrate heavy metals without compromising important morphological details and greatly enhance the types of tissue and microscopy that can be employed.

N-7 Vitamin-E and BHT produce giant ciliates.

E. C. BOVEE and DAVID C. LENNARTZ.


For certain ciliated protozoa, e. g., Blepharisma aerophilum and Blepharisma americana, there is a well-known conversion from a smaller, microstomous, bacti­liform form to a carnivorous-cilioblastic, macrostomous giant. This occurs, usually, in older cultures. The micro­sensory trigger for this change has been previously unknown, but has been attributed to a mysterious substance termed "stomatin", of unknown chemical constitution. We have found that this morphogenetic change is triggered by critical concentrations of Vitamin-E (alpha-tocopherol succinate) or by BHT (butylated hydroxytoluene = 2,6­Bis(4-methylcyclohexyl)-1-methyl-1H-1,2,3-Benzotriophenoxazine-5-succinate), alone, has no effect. At 1 x 10^-3 alpha-tocopherol-succinate 85-90% of a culture of Blepharisma americana become giants in 6-9 hours. Similar results were obtained when the giants were washed free of the anti-oxidant, they revert to the previous form in 3-5 days through successive divisions that produce 6-10 normal microstomous individuals from each giant. Experiments are underway to determine if BMA (butylated hydroxylamine -2,6-di-tert-butyl-4-hydroxynilamine) and other anti-oxidants have similar effects.

Supported by the Graduate Research Fund, Department of Physiology and Cell Biology, University of Kansas.
N-8 Observations on the immobilization antigen in Paramecium.
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During a study of the protein composition of cilia of the protozoan Paramecium, it was discovered that the "fuzz" which covers the cell surface could be removed via a gentle treatment with a generalized protease. When whole cilia from treated versus untreated cells were resolved on one-dimensional SDS-polyacrylamide gels, the "fuzz" was identified with a band known as the "immobilization antigen". Gels of ciliary membrane preparations confirmed the location of the protein as the membrane. This protein is responsible for antibody production by laboratory animals upon injection. The antibodies in turn are able to immobilize paramecia. The function of this protein in nature, however, is unknown.

CHEMICAL EDUCATION
S-1 The synthesis and analysis of hydrazinium sulfate. A sequence of experiments for the general chemistry laboratory.
S. A. REIDMAN and W. HUTTON
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This sequence of experiments introduces the student to several laboratory techniques and involves the application of a variety of chemical concepts. The experiments include the synthesis of hydrazinium sulfate, a gravimetric analysis for sulfate, a volumetric gas analysis for nitrogen, and a titrimetric analysis of the acid, hydrazinium sulfate. Typical student results and problems will be discussed.

S-2 A Quantitative Analysis Course for Pharmacy Majors
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Drake University Department of Chemistry offers two courses in quantitative analysis: a standard 4 semester hour course for chemistry majors and a somewhat unique 2 semester hour course, required for all pharmacy majors. The experiments in the two hour course consist of two parts. One part is the analysis of an instructor provided unknown and the other is the analysis of a substance of the student's choosing such as a vitamin tablet. Thus, the students may analyze substances which are of interest to them and are appropriate for their career choice. Student interest in this required course, which is outside their major field, may be increased by the flexible arrangement of the experiments.

C-1 The Kinetics of Acceleratory Decompositions
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Poly (vinyl chloride) PVC and numerous inorganic solids decompose by acceleratory decompositions giving typical S-shaped curves when a, the fraction decomposed, is plotted as a function of time. The kinetic model developed for PVC based on the assumptions of the Zipper Mechanism represents a new non-steady state kinetics and appears to reproduce effectively the acceleratory decomposition of inorganic solids. Many theoretical and empirical equations have been described in the literature for representing acceleratory decompositions. In this paper the new kinetic model will be compared with existing kinetic equations.

C-2 The Kinetics of the Thermal Dehydrochlorination of Poly(vinylchloride) PVC
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The Zipper Mechanism (Z.M.) was suggested for the dehydrochlorination of PVC many years ago. Yet all kinetic studies have ignored the implications of the Z.M. A new kinetic model which assumes first order initiation of decomposition at chain ends followed by a constant rate of unzipping of each chain gives excellent agreement of data. This key point concerns the entire decomposition range if estimates of premature chain termination are included. The kinetic model and the mechanism of PVC decomposition will be discussed.

C-3 Products of the aquation of trans-bromohis(ethylenediamine)-nitritochromium(III) cation.
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The products of the aquation of trans-bromohis(ethylenediamine)-nitritochromium(III) cation were found to be a mixture, in contrast to the report of Fee et al. Chromatographic separation of the components of the aquation solution was achieved on a Sephadex column at ca. 2°C. It was found that both nitrite and bromide ions were present in the anions released, suggesting a mixture of aquabromo and aquonitrito complexes as primary aquation products. Only trans-aquabromobis(ethylenediamine)chromium(III) cation was found in the primary product fraction, but free nitrite ions were also found in this fraction. It was concluded that both aquobromo and aquonitrito complexes were produced in the aquation of trans-bromo­his(ethylenediamine)nitritochromium(III) cation, but the aquonitrito complex produced decomposed during the aquation and the chromatographic process. The rate constant for the aquation to the aquonitrito complexes, i.e., release of nitrite ions, in 0.010 M HClO4 (pH = 0.10) at 2°C, estimated in this work, agreed fairly well with that calculated from the acid-dependent rate constant reported by Fee et al.

C-4 Combined Acidic Alumina Column Chromatography and High Performance Liquid Chromatography for the Analysis of Polynuclear Aromatic Hydrocarbons and Neutral Nitrogen Heterocyclics
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The carcinogenic properties of fossil fuels and their combustion products are well known. These materials are complex mixtures containing polynuclear aromatic hydrocarbons (PAH) and polyhetero­cyclic compounds of oxygen, nitrogen and sulfur. We have used a new separation scheme, combining UV and Fluorescence spectrometry and acidic alumina column chromatography to separate and identify the two groups of compounds PAH and nitrogen-containing heterocyclics from the neutral fractions of shale and coal derived oils. Final analysis of these compounds was achieved by high performance liquid chromatography (HPLC), utilizing a 5 micron particle size reversed-phase column.
C-5  A mass spectrometer which generates and analyzes neutral fragments.

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Positive ions, negative ions, and neutral fragments are produced when electrons interact with molecules in the ion source of a mass spectrometer. Development of mass spectrometers to study the neutral fragments produced has been an ongoing project in this laboratory for 15 years. The most recently designed and built mass spectrometer is described. The results of tests with well characterized organic compounds are described.

C-6  Hydrogen bonding self-association studies of some phenyl-substituted methanols.

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Simple alcohols are known to self-associate in inert solvents by the formation of hydrogen bonds involving the OH proton. The behavior of alcohols can be studied using near infrared and nuclear magnetic resonance spectroscopy to monitor the \( \nu \) vibrational stretching frequency and the OH proton chemical shift. By replacing the methyl hydrogen in methanol with phenyl groups, a great deal of steric hindrance to hydrogen bond formation can occur that leads to the possible formation of O-H\( \cdots\)H hydrogen bonds instead of O-H\( \cdots\)O bonds normally occurring in aliphatic alcohols. A series of phenyl substituted methanols have been studied with the results indicating that bond energies are consistent with O-H\( \cdots\)H bond formation.

CHEMISTRY: Org. & Bio.

D-1  NMR Spectra of 1-methyl-2-acetyl-3-phenylperhydrodiazocine.

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NMR studies of 1-methyl-2-acetyl-3-phenylperhydrodiazocine(1a) and 1-methyl-2-acetyl-3-phenylperhydrodiazocine(1b) found a normal behavior for the former and the presence of three conformers for the latter. Inversion of these conformers to one form occurred at 87\(^\circ\). Structures based on a crow conformation are proposed for the three stable conformers. This behavior parallels that observed earlier with 1-methyl-2-acetyl-3-phenylperhydrodiazocine.

D-2  Dual Mechanisms for Photosubstitutions by Chloride Ion on Bromonitrobenzenes.

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The three isomeric bromonitrobenzenes are each converted to the corresponding chloronitrobenzene when irradiated in concentrated solutions of chloride ion. The photosubstitution efficiency of the ortho isomer depends upon \( \text{H}_2\text{O}^+ \) concentration, but that of the meta isomer does not. 2-Propanol does not decrease efficiency of meta photosubstitution, but it suppresses ortho photosubstitution by diverting the process to photoreduction. It is concluded that the ortho photosubstitution involves an exciplex intermediate which is promoted by \( \text{H}_2\text{O}^+ \) concentrations above 1 M, but that the meta photosubstitution involves direct formation of the \( \text{O}^- \) complex without an electron transfer step.

D-3  The utility of purinyl radicals in synthesis of base-modified nucleotides.

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Purines modified at the 6-position are interesting due to numerous biological activities. Although inexpensive 6-aminopurines (adenines) may be used as sources for synthesis, the more expensive 6-functionalized purines are also available. Generation of purinyl radicals in halocarbon solvents (e.g., \( \text{C}_2\text{H}_4\text{Br}_2 \), \( \text{C}_6\text{H}_4\text{Br}_2 \) and \( \text{C}_6\text{H}_4\text{Cl}_2 \)) has permitted facile preparation of corresponding 6-halo derivatives from both 9-ethyladenine and 2',3',5'-triacetyl-adenosine. 6-Chloropurines are key intermediates in the synthesis of virtually all other 6-substituted-modified purines.

D-4  Analysis of genetically abnormal hemoglobin in mice.

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By X-irradiation, a mutation had been caused at the hemoglobin locus of mouse which was found to mimic the human condition of \( \alpha \)-thalassemia. The ratios of total \( \alpha \)- to total \( \alpha \)-chains present and the percentages of the three \( \alpha \)-forms - \( \alpha \text{B}_{\text{K}} \) \( \alpha \text{B}_{\text{M}} \) \( \alpha \text{B}_{\text{A}} \) - as determined by electrophoresis were compared for varying times of incubation and of 
in vitro and in vivo incubation of completed products. Data showed that the stability of the normal vs. \( \alpha \)-thalassemic hemoglobin mRNA's did not comparatively differ to the extent which would cause the observed changes in assembled product. The half-lives or rates of degradation of the three electrophoretically distinguishable hemoglobins also did not conflict with normal. The results pointed to differential competitive affinities of the \( \alpha \)-chains for the limited \( \alpha \)-chain produced in the \( \alpha \)-thalassemics.
CONSERVATION

J-1 through J-8 not available.

J-9 Iowa forest restoration; land use planning challenge for the 1980's
G. L. NIGHTSHADE
Department of Landscape Architecture, Iowa State University, Ames, IA 50011

Since early settlement much of Iowa's original forest heritage has been cut, cleared, or grazed, leaving only remnants. It is only this small proportion of the state that can provide suitable environment for our wildlife, recreation, aesthetic and spiritual needs. Unfortunately, these are the same attributes that attract incompatible land uses such as residential, commercial and agricultural development. Not only must our remaining forest lands be protected, but replanting plantings could be encouraged in areas thinned or denuded by development. Is it possible for men to rebuild these disturbed habitats, and their livelihoods and restore the ancient fertility and healthfulness which took nature centuries to create? The restoration of whole forest communities is our contemporary challenge. Using our knowledge of the different kinds of Iowa forest communities as models, it may now be possible to match those forest community with the physical resources of the restoration site. The appreciation, preservation, restoration, and wise management of our remaining forest resources now play a critical role in our all future planning at state, county, and local decision-making levels.

J-10 An initial investigation of changes occurring in an intensively cultivated soil taken out of production for forty years.
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Agriculture Department, Central Missouri State University, Warrensburg, MO 64093.

A Moshburg soil was sampled at two sites a short distance apart. One site has been in continuous cultivation for about 100 years but the second site was taken out of production in 1942 and allowed to revert to native vegetation. Both sites were analyzed for bulk density, infiltration rate, percent sand, silt and clay, percent pore space, shear strength, organic matter, plastic limit and penetrometer penetration. These soil parameters were analyzed using multiple regression analysis to determine their relationship to the strength of the soil structure at each site. Strength of soil structure was measured as time necessary for randomly selected peds to slack in N sodium hexametaphosphate solution. Individual soil parameters were also compared across sites using t-test analysis.

J-11 Subnivean activity of small mammals in northeastern Iowa.
M.C. LEWIS*, and D.K. MILLER
Dept. of Biology, Buena Vista College, Storm Lake, Iowa 50588

Subnivean activity of four species of small mammals was monitored from November, 1979 - April, 1980. Twenty-eight insulated Sherman traps were placed inside tarpaper chimneys arranged in a grid; twenty traps were located on five assessment lines which radiated from the grid. Twice daily during a twenty-six-day sampling period, captured animals were marked, weighed and released. Weather conditions and temperature were recorded during each sampling period. Activity patterns of all four species were nocturnal with individuals of each species occasionally active diurnally.

J-12 Bats of Iowa
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Pella, Iowa 50219

Bats are a significant component of the fauna of Iowa yet, except for the work of Kunz (1973), little is known about the distributional status and habits of most. Only two species are relatively common around buildings, the remainder being scarce, rarely occur around buildings, or primarily live in or near wooded habitat. Five species hibernate in caves and mines of eastern Iowa. The evening bat and Hooper's myotis are considered as threatened species in Iowa (Roeser, 1977). Current studies on the federally endangered Indiana bat indicate that females over-winter in central Missouri and migrate to wooded watersheds and rivers in southeastern Iowa where they have their young.

J-13 Home ranges of north american badger in northwestern Iowa.
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During summer, autumn, and winter of 1979, a home range study of north american badger, Taxidea taxus, was conducted in Buena Vista county, Iowa. Four badgers were caught in leg-hold traps, tranquilized with ketamine hydrochloride, fitted with a harness bearing a 165 mHz radio transmitter, and released. Subsequent movement and activity of these individuals was recorded over various periods of time by use of a peak-null directional antenna mounted atop a pickup truck. Patterns of home range use varied with season. Home range size tended to decrease during autumn and winter. Incidental observations of activity periods and food habits will be noted. Comparisons with badger movements in Minnesota will be made.

J-14 Game animals of Africa: a photographic safari
H. S. KUPPER, D. M. HUFFMAN, and J. B. BOWLES
Vermeer Science Center
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Pella, IA 50219

African game animals in many cases face almost certain extinction, due largely to environmental disruption of habitats by agricultural incursions into previously uncultivated areas, and by the traditional hunting activities of native cultures and game safari activities. A recent alternative to the safari is a photographic safari which incorporates the "thrill of the hunt", but captures the image of the animal on film rather than destroying the game animal for skin, meat, or tusks, etc. The photographs presented were taken by the senior author in the Serengti Plain and Ngorongoro Crater of Tanzania, and the Maasai Mara Game Area and Samburu Game Reserve of Kenya. This collection of game animals is available for use by any educational or naturalist organization in Iowa by requesting them from either of the authors of the paper.

J-15 Inventory and relative abundance of Catostomids in the Maquoketa River
VAUGHN L. PARAGAMIAN, Manchester

The objective of this investigation was to determine the importance of Catostomids to the species composition of fish populations in two segments of the Maquoketa River. Fish were captured with electrofishing gear during August of 1977, 78 and 79. Sampling was conducted by traversing the river margin and the elapsed time used to compute catch per effort hour as an index of relative abundance, captures were limited to fish 125 mm. Electrofishing accounted
for 2,397 fish from 25 species while total catch in weight was 806 Kg. Non-sport fish dominated the species composition by comprising an average of 75% by number and 92% by weight. The total catch was predominantly Catostomids, 65% by number and 62% by weight, with golden redhorse (Moxostoma erythrum) the most abundant, 15% by number and 18% by weight. The samples of longnose gar (Lepisosteus osseus) and white sucker (Catostomus commersoni), 24% by number, shortnose redhorse (M. macrocephalum), 23% by number, and bigmouth buffalo (Ictiobus cyprinellus), 6% by number. Selective horizontal distribution of some Catostomids was evident during sampling, however some species were not associated with riffle-pool transitions, bigmouth buffalo were common only in deep pools, white sucker were common in sandy regions of pools, carp suckers and golden redhorse were associated with pool regions but appeared less restricted to a specific habitat.

J-16 Aldrin and DDT residues in carp from impounded and riverine segments of the Des Moines River, 1979
W. A. HUBERT
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Concentrations of dieldrin, DDE, DDD, and DDT in muscle tissue of carp, Cypinus carpio, from the Des Moines River were compared over four sampling sites and three collection periods. Residue concentrations were related to sampling site with higher concentrations generally occurring at two impounded locations. Variation due to collection period was not observed.

J-17 Comparison of two aging techniques for yellow perch
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Estimating fish population parameters from age and growth data is dependent upon the precision of age determination. Assessment of the precision of aging techniques utilizing body scales and cleithral bones was conducted on a sample of 100 yellow perch, (Perca flavescens), from West Okoboji Lake, Iowa. Regressions on total length using scale and cleithral measurements were compared and backcalculation of annual mean lengths were computed. Aging methods agreed on 95 percent of the sample. Cleithral bones were useful in substantiating scale readings from acetic impressions, but did not significantly increase precision of aging. Extra time needed for collection and preparation of cleithra and the necessary sacrifice of sampled perch probably limits applicability of the cleithral method.

J-18 The snails of Lake West Okoboji, twenty years later
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A survey of the snails of Lake West Okoboji done in the late 1950's (Proc. la Acad. Sci. 1960) was duplicated 20 years later. Fifty three stations were revisited and snails were collected using identical techniques and with equivalent effort. Approximately 4,700 snails were collected then and 5,000 now. Species composition remained but some differences in relative density appeared. The two physid species declined greatly, from 62% to 17% of the total. They were concomitantly increased in the densities of three amnicolids, Valvata tricarinata and V. parvus. The four gilled species of snails increased and all but one of the seven species of pulmonates decreased. The earlier crash of the mollusk faunal of the lake has been arrested and the altered densities of certain species could possibly reflect some improvement in water quality during a 10 year period which saw the completion of a sanitary sewer line encircling the lake. The work was done at the Iowa Lakeside laboratory.

J-19 Tow passage and nutrient availability on the Mississippi River.
M. J. WAGONER, T. E. PERRY, and J. L. TOSTEEN
Dept. of Biology, Luther College, Decorah, Iowa 52101
Water samples were collected from the main river channel at Lansing, Iowa, five minutes before passage of each barge, and 3, 60 and 120 minutes after passage. The Selenastrum capricornutum Algal Assay Bottle Test was used to analyze for nutrient limitation and/or growth inhibition. Results indicate no probable long-term effects of barge traffic. Short-term effects seem apparent. Turbidity increased somewhat immediately after passage of a barge and phosphate levels were elevated at the 60 minute sampling. Biological growth potential was severely inhibited immediately after the barge passage. Growth inhibitor substances such as heavy metals or materials which chelate trace elements may account for the observed inhibition.

J-20 Use of algal assays to evaluate algal biomass in regulated streams.
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Assessment of water pollution problems in the Des Moines River basin is complicated by the presence of two mainstem dams, Saylorville and Red Rock. This project is concerned with measuring algal growth potential of the Des Moines River before and after passing through these dams in an attempt to show water quality changes and their effects on planktonic algae. The Algal Assay Procedure Botel Test developed by the U.S. EPA, using Selenastrum capricornutum Printz as the test alga in being used to assay the algal growth response of the river samples. Four sampling sites represent the varying types of water quality with respect to the impact of the reservoirs: Station 1, upstream from Saylorville Reservoir; Station 2, downstream from Saylorville Dam; Station 3, upstream from Red Rock Reservoir; and Station 4, downstream from Red Rock Dam. Each site will be sampled once during each season beginning December 1978 and ending in October 1979.

J-21 Seasonal characteristics and benthic productivity of Mississipi River backwater lakes.
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Samples of benthic macroinvertebrates were taken from seven backwaters over a four year period. Between year and between lake variations were substantial, but there were four dominant benthic taxa: oligochates (29.9% of numbers and 8.3% of biomass); Chironomidae (33.5% of numbers and 23.8% of biomass); Hexagenia sp. (13.8% of numbers and 40.9% of biomass); Sphaerium sp. (20.7% of numbers and 24.6% of biomass). The burrowing mayflies (Hexagenia bilineata and H. limbata) were studied in more detail during 1979. They were most abundant in Lauonam Lake where population densities ranged from 490/m² in spring to 925/m² just before mass emergence of subimagos; a removal-summation estimate of secondary production for Hexagenia sp. during this 73 day period was 3.7 g/m² with a 5:2 ratio of production to mean biomass. Discrete cohorts of Hexagenia sp. were not easily identified and males were most abundant (57% of individuals sexed).

J-22 Comparison of two backwater lakes of the Mississippi River.
T. E. PERRY, M. J. WAGONER, and J. L. TOSTEEN
Dept. of Biology, Luther College, Decorah, Iowa 52101
Water samples were collected from Green Lake and Lauson Lake, both within Pool No. 9. The Algal Assay Procedure: Bottle Test, using Selenastrum capricornutum, was used to evaluate water with N, P and/or phosphorous (P) limitations. Trends show possible N-limitation for Green Lake, a lacustrine system and co-limitation of both N and P for Lauson Lake, a fluvial system. Other biotic and abiotic factors will be discussed in relation to N and P limitations in these two lakes.
J-23 Effects of winter aeration on water quality parameters

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Four axial flow pumps and four helixor aerators were installed in Black Hawk Lake in November, 1978. Twelve additional axial flow pumps were added in the autumn of 1979. Both aerating systems were operated continuously during periods of ice cover. DO concentrations decreased systematically during the 1978-79 winter. DO levels fell close to the critical level, dropping below 1.0 mg/l by late January and returned to 1.0 mg/l until spring. Mean DO concentrations in the aerated portion of the lake dropped below 2.0 mg/l by early February, although concentrations of 2.0 mg/l were found in localized areas around the aerating units. DO concentrations in the aerated portion of the lake were significantly (p<0.05) higher than in the control area. Mean pH values were significantly (p<0.05) greater in the control area than in the aerated areas, and mean suspended organic matter was significantly higher in the aerated areas than in the control areas. There were no detectable effects on water clarity (STU), water temperature or suspended inorganic matter attributable to the operation of the aerators. Findings on the effects of aeration during the 1979-80 winter are incomplete.

M-3 Thermotransport of carbon in niobium.

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An investigation of the thermotransport characteristics of carbon in niobium was carried out using radioactive tracer techniques. Very dilute Nb-C alloys were used because of the relatively low solid solubility of carbon in niobium, and the experiments were made in an ultra high vacuum system under a pressure of about 5.0 x 10^-7 Torr. The results of the thermotransport studies showed that carbon migrates towards the hotter regions, and the heat of transport, Q, of carbon in niobium is -13.110.6 kcal/mole. An extensive study of the effects of various experimental environments on the carbon content of the sample was made. The studies showed that experiments made under partial pressure of inert gases, and those made in conventional pumping systems at pressures as low as 1.0 x 10^-7 Torr can lead to anomalous results. Under these environments it was observed that the sample can pick up carbon from or lose carbon to the system.

M-4 Teaching dynamic programming using APL

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Easy access to general purpose linear programming (LP) computer codes has greatly enhanced student learning as motivation is improved by the ability to analyze more complex models with realistic data. Unlike LP, however, no general purpose code for dynamic programming (DP) exists, and coding even a simple DP algorithm is a nontrivial task for the novice programmer, who becomes frustrated and easily loses sight of the primary concepts of DP. In this paper we recommend the use of the APL language in teaching DP, as well as for other situations where a "quick-and-dirty" code may be acceptable. APL is attractive in this context because of its interactive mode, mathematical syntax, flexibility in array manipulation, and recursive function capability. We use several examples to illustrate the nearly one-to-one correspondence between the code and the recursive definition of the optimal value function which characterizes DP.

M-5 Precision analysis of a distributed watershed model

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In a previous thesis, a superposition model was developed which uses a detailed geometric description of the watershed and incorporates the kinematic wave approximation of the equation of motion, superposition, and time-lag methods to analyze overland and channel flow paths along lines of steepest slope called "streamtubes" which begin at tributary divides and end at the channel. Each streamtube is then represented by a cascade of planar elements with constant topographic parameters called streamtube "segments". A special node numbering and coding scheme was developed to organize the computational flow in the model. The purpose of this paper is to compare this finely subdivided watershed, of 539 segments, with the same one, which is refinanced and coarsely refined to consist of 225 segments. The comparison of the flow and sediment hydrographs calculated, from testing on Ralston Creek, Iowa City, Iowa, reveals little difference in hydrograph shape, but inconsistencies in time to peak of both flow and sediment hydrographs. Also, the coarse refinement cost one-third the computer time and money. These results will be presented and implications discussed.
M-6 Field study of sediment transport characteristics of the Mississippi River near Buzzaard Island (R.M. 349.55).

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The field investigation was conducted for the purpose of obtaining detailed information concerning the flow and sediment transport characteristics along the Mississippi River near Buzzaard Island (R.M. 349.55) between Keokuk, Iowa and Canton, Missouri. The field data collected during the study were obtained to help explain and lead to a better understanding of the river processes that create a shoaling problem in the area off the downstream tip of Buzzaard Island. There are three general features along the shoaling reach that decrease the sediment transport capacity of the flow and elicit the shoaling problem. First, the main channel flow bifurcates at two locations near the shoaling reach. Second, the river widens in this reach. Finally, the shoaling area is within a cross-over reach which generally lacks the strong secondary currents produced by bends in the river. Power-law relations formulated for both bed load and suspended load discharges from the data estimate that the closure of the side channel sections where the flow bifurcation is occurring would increase the sediment discharge significantly in the main channel, and would therefore help alleviate the shoaling problem.

M-7 High density use of septic systems—Avon Lake, Iowa

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Avon Lake is a rural-residential subdivision located southeast of Des Moines in Polk County. The community was started in the early 1910’s and the buildings were mostly summer cabins built around an 18 acre gravel quarry. Presently the community has about 130 full time residences in a 58 acre area with lot sizes ranging from 42 by 80 feet to 100 by 200 feet. Each of the homes has a sand point for a water supply and an on-site system for sewer treatment. In order to determine the effectiveness of on-site wastewater treatment in an area with a high population density, systems were examined for evidence of failure. House-to-house surveys were performed and well water samples were taken. Of 68 well water samples taken only 1 contained fecal coliform bacteria. Thirty-six samples exceeded the nitrate standard of 10 mg/l. The highest nitrate level found was 25.6 mg/l. The nitrate concentration appeared to change in space but not with well age. From the surveys it was also possible to make some estimates of system longevity. Some systems still seemed to be operating satisfactorily after more than 50 years.

M-8 The dissociation kinetics and toxicity of various 0.01 M hexacyanoferrate ([III]) solutions maintained in a dark environment

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Water quality criteria development for cyanide has historically been predicated on a safe concentration of total cyanide. Total cyanide refers to the sun total of all the free cyanides, simple cyanides, complex cyanides, organic cyanides and oxidizable cyanides within a water column. Two major challenges which have been aimed at the cyanide water quality criteria are: molecular hydrogen cyanide (HCN) is the toxic species to aquatic organisms and should be used as the cyanide toxicity index instead of total cyanide. Secondly, metallo-cyanide complexes with very high stability constants, e.g. hexacyanocobaltate([III]) and hexacyanoferrate([III]), are innocuous because they don't dissociate to form any appreciable concentration of toxic HCN. Keeping in mind that hexacyanoferrate([III]) solutions photodecompose to produce HCN, this research project was designed to examine the innocuous nature of 0.01M hexacyanoferrate([III]) solutions maintained in a dark environment. Analytical and bioassay results demonstrate increased toxicity of dissociation products as a factor of time and pH.

GEOLGY

E-1 New Bouguer Gravity Map of Iowa

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The Iowa Geological Survey is producing a new bouguer gravity map of Iowa. The map is based on 2000 gravity stations with an average station spacing of 5.6 kilometers and in contours at a 5 milligal interval. These data in large part from the U.S. Department of Defense Gravity Laboratory with several hundred additional stations obtained by the Iowa Geological Survey to complete the coverage. All gravity stations have accurate locations and elevations and have been digitized for ease of retrieval. The most prominent feature visible on the map is the Midcontinent Geophysical Anomaly (MGA), a series of Keweenawan natick extrusives which appear as a pronounced gravity high with values up to 467 milligals. Clastic-filled basins with gravity values as low as -113 milligals flank the MGA producing gradients up to 8.8 milligals per kilometer. Other basement features are evident in northeast Iowa, several of which have been studied in detail and geophysically modeled.

E-2 A geophysical/geological interpretation of the Plum River fault zone in east-central Iowa

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The Plum River fault is a zone of closely-spaced faults trending east-west, extending from north-central Illinois into east-central Iowa. A total of 13 gravity and 10 magnetic traverses were run perpendicular to the fault zone along 121 km of the fault from Spragueville to Anama, Iowa. An anomaly of up to 1.6 mgals and 25-50 gammas is recognized as the geophysical signature of the fault zone. Detailed geologic mapping in Jones and Jackson Counties, with interpretation of the geophysical data reveal a series of localized horst and graben features. Geophysical and geologic data reveal how faults not previously mapped, which extend the width of the fault zone. This is indicated by geo-physical anomalies and surficial mapping of cataclastic rocks bordering the fault zone (width varies from 300 m near Maquoketa to 700 m near Olin, Iowa). A maximum vertical displacement of 200-290 m is suggested between Maquoketa and Preston, Iowa, with the north side being downthrown.

E-3 Laboratory simulation and characterization of loess "mush"

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Field observations by others indicate that boreholes in loess tend to "squeeze" within a discreet depth zone under certain conditions, namely when the loess overlies a relatively impermeable paleosol or glacial till such that a perched water table exists, the loess in-situ bulk density is low, and the minimum loess thickness is 3 m (10 ft.). Cores from such boreholes have indicated a zone near the water table where the water content is equal to or greater than the liquid limit. Informally, this material has been labeled "loess mush." This material is a hazard for foundations and stability of cut slopes.

Proper undisturbed sampling of the mush layer was impractical due to its extreme softness. A laboratory column was therefore set up to simulate the observed field conditions. A silo mold column contained in a plastic tube was subjected to a water table, and the water was allowed to rise due to capillarity for several days. The column was dismantled, and the soil water content and shear strength were measured throughout the length of the column. The model reproduced the "loess mush" zone, and a hypothesis utilizing capillary stresses was developed to explain the phenomenon.
During the last 14,000 years, several episodes of downcutting followed by aggradation have occurred in small stream valleys of western Iowa. These episodes vary in their duration and intensity and are recorded as a sequence of alluvial fills informally referred to as the DeForest formation. A few radiocarbon dated sequences suggest that periods of degradation and aggradation were roughly contemporaneous throughout the Missouri Drainage in Iowa. Investigations conducted near Smithland in southern Woodbury County, Iowa provided detailed information on the distribution and character of the DeForest formation in a small stream valley. The extent of Holocene downcutting and alluviation is traced through the main valley into upper portions of the drainage net. It is suggested that much of the western Iowa landscape is less than 3000 years old.

Changes in the channel area of the Missouri River in Iowa, 1879-1976

G. R. HALBERG, J. M. HARRAUGH, and P. M. WITKIN

Using maps, aerial photographs, and hydrologic data the natural and man-made changes in the channel of the Missouri River were quantitatively evaluated from 1879, 1890, 1923, 1947, and 1976. For quantitative comparison river mileage, sinuosity, channel area, and the water, island, and bar area with the channel were measured. Between 1890 and 1923 dramatic natural changes took place but a natural balance also occurred: the channel decreased in length by 7% (14 miles), but the channel area increased by 7%. This is in marked contrast to the artificial changes in the river, which occurred during construction of the design channel after 1923. From 1923 to 1976 the Missouri was artificially changed from a broad semi-braided stream, to a narrow, single, smooth channel, with a well stabilized bank. The river was shortened 18 miles; the channel area was reduced 83%, or about 62,000 ac.; the surface area of water in the channel area was reduced 66% or 30,228 ac. This is equal to the water surface area, at normal pool elevations, of the Coralville, Saylorville, Red Rock, and Rathbun reservoirs combined. Bars and islands have been eliminated.

The Iowa landscapes of Orestes St. John

J.C. Prior and C.F. MILLIGAN

Five original sketches of Iowa landscapes drawn in 1868 by Orestes St. John were found among the effects of Dr. Leo Hertlein, geologist with the California Academy of Sciences in San Francisco. The pencil sketches were meticulously drawn, dated, and signed and included detailed landmark annotations. St. John, whose career paralleled significant developments within the field of geology, was Assistant Geologist with the Iowa Geological Survey from 1866 to 1869. Return of the sketches for our archives revealed that these drawings corresponded to five of the thirteen lithographs which illustrate the 1870 Report of the Geological Survey of the State of Iowa. The precise nature of the sketches enabled the authors to relocate and redraw the sites as they appear today. The comparative drawings, which document 110 years of change, form the basis of an exhibition with a unique multidisciplinary focus on landscape art and history. The viewer has the opportunity to observe and reflect on changing patterns of landscape, to examine St. John within the 19th Century tradition of the documentary artist, and to study the effects of bedrock, glacial history, stream erosion and geologic time in shaping the Iowa landscape.

An unusual calcite alteration of the Hopkinton Dolomite (Silurian) in Plum River fault zone, eastern Iowa.

G.A. LUDVIGSON

An unusual calcite alteration of preciaceous and dolostones of the Hopkinton Dolomite (Silurian) is exposed along the Plum River fault zone in eastern Iowa. Petrographic comparison of unaltered and altered dolostones shows that the alteration is manifest by the introduction of quartz, later dolomite, goethite, jarosite, and ferroan calcite. The pseudomorphic cubic habit of goethite and the presence of jarosite suggest that pyrite was a major constituent in the altered rocks at some time. Field relations and cross-cutting microscopic textures suggest that the quartz, later dolomite, and pyrite were early alteration minerals, and were then extensively altered by subaerial weathering prior to deposition of the abundant non-ferroan calcite. The altered rocks are viewed as a paleo-gossan reconstituted by meteoric-phreatic calcite during subsequent burial. The areal distribution of the altered rocks, their petrology, and their spatial relation to the fault zone all suggest the presence of a large body of unoxidized sulfides at depth.

Subsurface Silurian stratigraphy of east-central Iowa

R. J. WITZKE

Rock cores from Johnson, Linn, and Benton Cos. compare with the Silurian sequence exposed to the east, although thickness and facies variations occur. The oldest Silurian rock units in Iowa are not rocks of the outcrop belt, where instead, a thinned (20 ft.) Blanding fm. unconformably overlies Maquoketa shales. The lower Hopkinton is thinner in Johnson-Linn Cos. (50-85 ft.) than the same interval in Jackson-Dubuque Cos. (125 ft.). The upper Hopkinton Fm. (post-Favositis Beds) is represented by a dense, cherty sequence in Linn-Johnson Cos. (30-150 ft.); the top part is, in part, equivalent to porous, crinoidal beds assigned to the Gower Fm. The Lower Gower Fm. includes three facies: mound-encased, flat-laying crinoidal banks, and dense, often cherty inter-reef beds. Laminated Anamosa beds grade into reeval Brady facies and overly lower Gower rocks. In Benton Co. Silurian dolomites grade into cherty limestone of the LaPorte City Fm. (formerly assigned to the Lower Devonian).

Upper Cambrian lithostratigraphy of northwest Iowa

R. M. McKay

Upper Cambrian rocks range in thickness from zero feet in the extreme northwest counties to 613 feet in Webster county. Cambrian formations and lithologies include from oldest to youngest: Mt. Simon Fm. -sandstone; Bonnette Fm. - dolomite; Elvins Group-shale, siltstone, sandstone, and silty and shaly dolomite; St. Lawrence Fm. -silty and argillaceous dolomite; and Jordan Fm. - argillaceous sandstone. Extension of the Missouri lithoterminal of Bonnette Fm. and Elvins Group into northwest Iowa seems more appropriate than applying northeast Iowa's lithostratigraphic terms Eau Claire and Lone Rock formations. Convergence towards the west of distinct and conformable formation contacts which confine condensed lithologic sequences suggest the shoreward wedging of units to a common depositional strand zone upon the Transcontinental Arch. Post-Lower Ordovician erosion of Cambrian strata prohibits shoreline reconstruction. Similarities between units of northwest Iowa, northeast Iowa and Missouri indicates comparable depositional environments. The dominance of fine clastic and carbonate units in northwest Iowa suggests that the Transcontinental Arch was not a prominent source region.
E-10 Alteration of the gypsum-anhydrite precipitation kinetics by organic solutes.

A. B. HULL, AND R. D. CODY


The effect of organic macromolecules upon the nucleation, growth, and stability of gypsum, hemihydrate, and anhydrite was studied within artificial clay-water systems which simulate natural muddy sediments. In the absence of these additives, only gypsum nucleated and grew in diffusion-controlled U-cell experiments at a temperature of 60°C, a NaCl concentration of 5%, and CaCl2·2H2O and (NH4)2SO4 nutrient concentrations of 1N. Anhydrite did not precipitate although it is thermodynamically stable relative to gypsum under these conditions. Anhydrite precipitated only after certain types of organic solutes were added to the U-cell experiments, all other variables remaining constant. We have concluded that chemisorption on initial gypsum nuclei effectively reduced the number of active growth sites and prevented its subsequent growth. Presumably, chemisorption altered the kinetics of precipitation so that anhydrite could form. This mechanism appears to be similar to that responsible for the precipitation of aragonite in place of calcite in the presence of small amounts of Mg2+.

E-11 New complexities of the High Terrace of Lake Calvin

S. P. ESLING, G. R. HALLBERG, T. J. BICKI, AND T. E. FENTON

Dept. of Geol., U of Ia., Ia. Geol. Surv., Iowa City, 52242, Dept. of Agron., I.S.U., Ames, Iowa 50011

The origin and age of the loess mantled High Terrace along the Iowa River in the Lake Calvin area has long been an enigma. Schoene (1924) originally called the terrace Illinioinian in age as part of his pro-glacial Lake Calvin; a resultant of the westward advance of Illinioinian ice into Iowa. Preliminary work by Ruhe, et al., using C-14 dates and geomorphic evidence suggested the High Terrace was Wisconsinan. Ongoing work by the authors however, has produced several sections in deep core-holes and outcrop where Wisconsinan loess, eolian sands, and basal loess predominate (22,000 RCYBP), overlie a strongly developed paleosol developed in a thick sequence of fluvial deposits. The paleosol ascends to, and is continuous with the late-Sangamon surface and paleosols in adjacent till uplands. Similar, but previously unrecognized, terrace remnants occur south of "Lake Calvin" in the Nappello area, inset below the Illinioinian till plain. Elsewhere, loess and eolian sand overlie fluvial sediments with no intervening paleosol. The High Terrace appears to be a complex of late Illinioinian and middle Wisconsinan deposits. Work is continuing on these problems.

E-12 Soil/landform/sediment relations on the Story City Flats area, Des Moines glacial lobe.

H.R. JAMES, T.J. KEMMIS, A.J. LUTENIEGER, G.R. HALLBERG, T.E. FENTON

Dept. of Agronomy, Ia. State Univ., Ames, IA 50011

The Story City Flats are a triangular-shaped area of approximately 60 sq. km, near Story City, Iowa. Classically, the Flats have been mapped as groundmoraine between the Benis and Altamont moraines, although the area has remained an enigma because of its shape, low relief, and abrupt topographic change, when compared to adjacent areas. Soil mapping and coring traverses indicate surficial sediments that are different from classic groundmoraine deposits. Soils consist of the Bode-Ottosen-Kossuth association developed in clay loam sediments, 61-152 cm. thick, overlying till-like materials. These materials contrast sharply with typical-till derived Clarion-Nicollet-Webster soils of adjacent areas. Elevation of the Flats decreases approximately 24 m. from NW to SE along the axis of the Flats. The surficial clay loam sediments mantle this landscape, maintaining fairly constant thickness. Although neither surficial sediments nor topographic relations on the Flats are indicative of a groundmoraine, the origin of the Flats remains problematic. The surficial sediments appear to have been dominantly water-deposited, however, superglacial, ice-contact, pro-glacial lacustrine or postglacial sub-aerial processes are possible alternative explanations.

E-13 Ice stagnation origin of the Altamont moraine in Boone County, Iowa

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Boone County contains both the Altamont and Benis end moraines of the Des Moines Lobe Drift Sheet. Analysis of soil maps, aerial photographs, and topographic maps indicates that deglaciation was more complex than the existing model postulates. Evidence for an ice stagnation origin of the Altamont includes (1) moderate to very high relief, hummocky knobs composed of superglacial debris, (2) division of the Altamont ridge into two ridges east of the Des Moines River, enclosing a broad area of hummocky topography (Squaw Creek Salient) and (3) low relief ice stagnation forms juxtaposed with subglacial forms behind the Altamont ridge. Contradictory evidence occurs west of the Des Moines River where an outwash plain extends south along Beaver Creek in front of a two-level stepped surface which rises to the moderate relief ridge of the Altamont. However, the drainage lines extend without offset through the Altamont. The evidence indicates that an ice margin was present west of the Des Moines River two or three miles south of the Altamont moraine. There is no evidence for an active ice margin north of the Des Moines River, where the Altamont moraine is probably a stagnate ice feature.

E-14 Pleistocene relict snails from the Driftless Area, northeastern Iowa

T. J. PREST AND L. P. FAY

Department of Geology, The University of Iowa, Iowa City, IA 52242

Several species of land snails are endemic, or nearly endemic, to the Driftless Area of northeastern Iowa. Three (Vertigo huheichri, V. briarensis, and Discus macclintockii) are Pleistocene relics long believed extinct. One (D. macclintockii) is on the Federal Endangered Species List. These snails survive as very limited colonies on so-called cold air slopes. Cold air slopes provide a unique buffered climate (cool summers (~46°F), winters no more severe than at present) and serve as refuges for a number of otherwise boreal or northern plants as well as snails. They probably formed as a result of periglacial processes during Wisconsinan (Late-Glacial) time, and may have persisted virtually unchanged for the last 12,000 years. Less than 20 cold air slopes are known. They are confined to steep, relatively undisturbed north-facing slopes on the periphery of the Niagara and Magnesian Escarpments. Most are fragile, and can tolerate little human disturbance. The small taxas can provide otherwise unobtainable data on Pleistocene climates, and cold air slopes are a unique part of Iowa’s natural heritage. Only a few are now protected in any way.

E-15 Recent changes in Iowa agriculture land use and implications for potential soil loss.

G. A. MILLER

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

During most of the 1900's 75% of Iowa's land has been in cropland. Since 1940 20 to 25 million acres have been planted each year to corn, oats, soybeans, and hay. Cropland pasture and cover crops have accounted for the remaining cropland acres. The acreage planted to row crops, corn and soybeans, has increased steadily since the early 1990's. 1970 row crop was 16.2 million acres, up 5.5 million acres from 1950. Between 1972 and 1979 an additional 4.4 million acres were planted to row crops. The largest increase occurred in 1975 when an additional 2.4 million acres of row crops were planted. The major increase in row crop acreage occurred in west-central, southwest, and northeast Iowa. In 55 Iowa counties the row crop acreage increase was greater than the acreage decrease to row crops from other cropland uses. The additional row crop acreage was taken from permanent pasture, newly drained areas, and woodland. The highest percentage of land, by county, occurring on 32 or steeper gradients occurs in western and across southern Iowa. The greatest increase in row crop acreage occurred on soils of 32% slopes or steeper.
E-16 Management practices for controlling soil erosion.

M. AMEMIYA

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

Degradation of Iowa's soil resources due to erosion is a major problem. Control of soil erosion will maintain the integrity of soil resources and prevent or minimize the movement of sediment and associated pollutants into surface waters to enhance the use of such waters for domestic, industrial and recreational purposes. Soil erosion is the detachment and movement of soil particles through the action of water and wind. Soil erosion by water is a function of rainfall, soil, topography and management practices. For a given tract of land, an operator has little direct control over rainfall, soil and topography. However, the effects these factors have on soil erosion can be modified by management techniques including, but not restricted to, crop rotations, conservation tillage, contouring, strip cropping, terraces, grassed waterways, fertility management and row spacing. Some of these measures are agronomic and cultural in nature, while others are structural. These practices are not necessarily mutually exclusive. Where the erosion hazard is minimal, the use of a single practice can provide adequate control. However, a combination of measures is often used to obtain the desired level of control.

E-17 Field to stream processes in sediment transport

H. P. JOHNSON and J. L. BAKER

Department of Agricultural Engineering, Davidson Hall, Iowa State University, Ames, IA 50011

The sediment delivery ratio is defined as the change in quantity per unit area of the downstream movement of sediment from the source to any given point in a stream. The ratio is useful in making estimates for planning dams and water control structures, however, generalized delivery relationships are not available. Estimations are based on sediment transport measurements and soil erosion calculations. Field studies of watersheds up to 20 square miles indicate attenuation of sediment, nutrient and pesticide loads as the material moves from the field to the stream.

E-18 Use of soil survey and land use data for identifying and evaluating potential soil losses

T.E. FENTON

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The original intended application of the universal soil loss equation was to aid in the selection of conservation practices for specific sites. Other applications for which the equation was designed and field tested include predicting average annual soil loss under specified conditions and evaluation of the effect of alteration of other variables in the equation. The equation can also be properly used to calculate the total average annual soil loss from sheet and rill erosion within a particular watershed. Increased concern about non-point pollution has stimulated interest in this approach. However, a major problem in working with larger areas is the selection of representative values of the C, L, and R factors in the equation. In identifying, evaluating, and ranking areas of potential soil loss, soil survey and land use data are important parameters. Computerization of this information and integration of other factors in the soil loss equation can be efficiently accomplished using a computer. Recent studies in Iowa that have utilized this approach will be presented and discussed.

E-19 A geologic perspective on erosion

B. E. HOYER

Iowa Geological Survey, 123 N. Capitol St., Iowa City, Iowa 52242

Minimum erosion rates computed over the past 10,000 years from a 62 acre basin near Cherokee, Iowa are generally greater than natural erosion rates predicted by the Universal Soil Loss Equation. This reminds us that erosion is a natural process which must be considered in evaluating our environmental problems. Erosion, sediment transport and deposition, each of which may be associated with non-point environmental problems, are all a part of the sedimentation process. The Holocene sedimentation record reveals that the process is complex and episodic rather than simple and steady. Thus what, when, where and how soil erosion problems are measured will influence the results. Based on the sedimentation record, environmental problems such as gully erosion and high sediment loads in Western Iowa may be increased by the heavy, silty alluvial flats pre-existing in small valleys. These accumulated over the past 2000 years following an earlier episode of scour. Natural, complex processes make these deposits readily available to be eroded and moved at the present time.

E-20 Wind and water soil erosion climatology

P. J. WHITE

Iowa Department of Agriculture Room 10, Municipal Airport Terminal Des Moines, Iowa 50321

A description of wind and precipitation thresholds associated with soil erosion, including probabilities, summaries, analyses and examples of applied soil erosion climatology.

HISTORY & PHILOSOPHY OF SCI.

L-1 Systems Philosophy: useful and compatible to scientists.

H. D. SWANSON

Dept. of Biology, Drake Univ., Des Moines, IA 50311

Science is sometimes called "natural philosophy", but scientists are often indifferent or hostile to comprehensive philosophers. This estrangement developed when modern science had to struggle against the philosophies dominant at its inception, and continues when scientists consider even modern philosophies irrelevant to their interests. "Systems Philosophy" is now developing as a formalization of the modern scientific world view, using language familiar to scientists and incorporating the scientific understanding of the universe; it can profit from the insights and criticisms of all scientists. Systems Philosophy holds that we know and understand only by pondering our experience with reality. It views the universe as though through a zoom lens, seeing any system and its properties in terms of subsystems and super-systems. Classical philosophers looked through a panoramic lens, putting primary emphasis on classifying and naming. In systems thought, even unusual systems with especially interesting properties (cells, trees, people, societies) are understood in terms of composition and participation rather than of "essential nature." Acquaintance with Systems Philosophy facilitates grasping and expressing how one's own field relates to other sciences and to all other fields of intellectual endeavor.

L-2 'Mechanism, vitalism, and organicism.'

J. B. HAGEN

Cornell College, Mt. Vernon, IA 52314

The development of biology has often been viewed as a long debate between so-called mechanists and vitalists. According to this historical scheme modern biology emerged at the turn of the century when mechanism bolstered by "common-sense" materialism and sophisticated
experimental techniques became a credible form of biological explanation. The discredited vitalism continued in attenuated form as organicism. Under scrutiny this account of the development of biology does not stand.

Neither mechanism nor vitalism were coherent schools of thought. Mechanism in particular consisted of a large number of ideas, rarely well-defined and never universally held by mechanists. Organists such as J.C. Haldane, E.S. Russell, and J.H. Woodger were careful to dissociate their ideas not only from mechanism but also from vitalism. A close look at early twentieth century biology indicates that the terms vitalism, mechanism, and organicism inadquately delineate whole constellations of ideas. Ideas which were not forged into a unified form of biological explanation.

L-3 Albertus Magnus and modern science
W. E. CARROLL
Department of History, Cornell College
Mt. Vernon, Iowa 52314

Albert the Great (1200-1280) is a monumental figure in the history of western thought: in metaphysics, ethics, and theology, as well as in the natural sciences. His commentaries and paraphrases on the recently translated works of Aristotle set the stage for the revival of Aristotelian thought, and in particular Aristotelian science, throughout the Middle Ages - especially through the influence of his student, Thomas Aquinas. Albert's significance in the history of science is twofold: 1) he establishes the autonomy of the natural sciences with respect to mathematics and metaphysics on the one hand, and with respect to faith and Christian theology on the other; 2) he is a first-rate empirical scientist, investigating questions in physics, botany, biology, geography, mineralogy, ornithology, and the like. His observations of nature, carefully recorded throughout his voluminous writings, were made on his frequent travels on foot all over Western Europe. On the 700th anniversary of his death it is particularly fitting to discuss his importance in the growth of western science.

MATHEMATICS

No abstracts available for papers A-1, 3, 4, 5, 6.

A-2 Estimating remainders by geometry
D. E. SANDEYSON
Iowa State University, Mathematics Department
Ames, Iowa 50011

The estimates of remainders of series given by R. P. Boas (Math. Mag. 51(1978) 83-89) can be (im)proved using no more than the geometry of triangles, rectangles, trapezoids and chords or tangents of convex curves.

A-7 Interdisciplinary approach to programming courses
H. M. WALKER
Department of Mathematics, Grinnell College
Grinnell, IA. 50112

Over the past several years, we have developed an introductory programming course at Grinnell College that serves an extremely diverse audience through problem sets in a wide variety of areas. Furthermore, the course format resolves potential staffing problems by allowing one instructor to teach effectively with many students in a reasonable length of time. Programming material, including basic syntax and semantics, is presented in a lecture format to all students, with examples being of general interest. However, each student can work on programming problems in any one of several areas, and these exercises can be coordinated with other courses. Thus, general programming techniques are practiced in areas oriented to each student's interests. Finally, the course uses one-hour labs to supplement the lectures, providing students with the opportunity to ask questions about programming or about the material in their specific problem packages.

A-8 Recruiting a Center for Iowa (with calculus)
S. R. PORTER
Grinnell College, Grinnell, Iowa 50112

The location of the 'center' of Iowa has been disputed by the two towns, State Center and Iowa Center. The Bea Monea Register sponsored a project to answer the question: where is the center of Iowa? A computer analysis has been developed to resolve the issue. Data were collected from 1:240,000 series U.S. Geological Survey maps with a digitizer and a procedure was developed to splice together the pieces of the border. The calculation also took into account the curvature of the earth. The actual 'center' calculated from this model lies west of both towns. An error analysis yields an east-west error radius of .100 ft and a north-south error radius of .7 miles. This result will be compared with results obtained independently by two other groups.

Invited:
Mathematics and Computing Science in an Industrial Research Laboratory

N. L. SCHWEER
Bell Telephone Laboratories, Murray Hill, New Jersey 07974

In a large industrial research laboratory, mathematics and computing science have central roles and perform many diverse functions. This provides a very rich and stimulating environment. The organization of such a laboratory will be outlined with an eye to the way such organization affects the environment for mathematics and computing science. Finally, the resulting environment for such work will be illustrated by several real life examples.

PHYSICS

B-1 Utilizing Solar Energy to Convert Biomass into Energy Products: Alcohol from Farm Crops

ARTHUR C. MEYERS III
Solar Energy Division, Navarro College, Corsicana, TX 75110

Current United States crop production techniques require three units of energy to provide one unit of food. In addition to transportation of materials, considerable amounts of energy are consumed in the form of fertilizer, seed, and farming activities. Oil, natural gas, and their by-products presently provide almost all agricultural energy needs. The increased costs and limited availability of petroleum requires the development of alternative fuels. Also, considerable crop waste in the form of unused biomass exists. Methods of energy production, based on these materials, would reduce both farm energy needs and net food production energy requirements. Alcohol is an energy by-product that can be produced...
from biomass. Alcohol production requires a specific sequence of steps: conversion to sugars, fermentation, and distillation. Without supplemental energy sources, alcohol must be used to provide process heat. Metabolic alcohol production can be maximized by using solar heating, distillation, and drying techniques. This paper reports on a solar energy powered alcohol production and distillation system developed in response to a D.O.T. training and workshop grant.

B-2 Computer generated hologram production.

L.J. VISSER
Physics Department, University of Northern Iowa, Cedar Falls, IA 50613

Computer generated holograms formed by an HP2000 host computer and a Tektronix 4026 graphic terminal will be demonstrated, including a simple optical system for “reading out” such holograms. The only equipment needed is a graphic terminal, a CRT or an X-Y plotter, a camera and two inexpensive lenses. Copies of basic language programs for forming such holograms will be available. The holograms formed were for stick letters and were calculated using the method of Marsh and Smith [1] which involves analytic closed form Fourier transforms. The advantage of this method is that it can be carried out on desk top computers with relatively small memories. Results of diffraction efficiency measurements for computer generated holograms will be shown.


B-3 Computer generated holograms in a holography course.

D.W. OLSON
Physics Department, University of Northern Iowa, Cedar Falls, IA 50613

The use of computer generated holograms as a teaching device in a holography course heavily populated by physics majors will be described. Formation of a computer generated hologram of a stick letter object is demonstrated for the class. Students are then encouraged to modify the computer program to produce holograms of other stick letters and also to form sine gratings. The activity appears to have value for introducing students to the use of Fourier transform theories and to the Fourier transform model of diffraction, holography and optical systems in general.

PHYSIOLOGY

O-1 Left Ventricular Assistance: experience with 92 patients

S.E. BERNHARD, M.D., R.H. JEFF, M.D., C. FOURTELSON, M.D., F. PHILLIPS, M.D., L. IANNONE, M.D., B. GORDON, M.D. and T. BROOK, M.D.

Iowa Heart Center
944 - 18th Street, Des Moines, IA 50314

Seventy-two men and 21 women had circulatory assistance for ventricular failure. Balloon Pumping (IABP) was used in 89 patients; a Pulsatile Assist Device (PAD) in 2, and a Permanent Parallel Aortic Pump (PAP) in 2. Of 89 pts., 62 had IABP for infarction (MI). Sixteen died during IABP, 2 after IABP removal and 10 within 1 week of emergency cardiac surgery (29 deaths-46%). IABP was used with cardiac surgery in 27 pts. Three pts had IABP prior to nitral valve replacements; all survived. Twenty-three pts. had IABP following surgery. Seventeen (74%) survived. A PAD was used in 2 pts. with MI when IABP could not be inserted. One pt. survived (50%). The PAD was connected to the femoral artery. Blood was withdrawn during systole and reinjected during diastole. Two pts. with chronic left ventricular failure had a PAP inserted. The PAP was attached from the ascending to the descending aorta. The air hose was exteriorized via the iliac crest. Both patients expired. The PAP and skin button were functioning normally and well healed.

O-2 Changes in blood glucose, insulin, and lactate levels in response to carbohydrate consumption prior to endurance exercise.

FRITH, J. M., C. V. GISOLOFI, R. M. COOKES, E. B. BURKE, and C. M. TIPTON

Exercise Science Program, University of Iowa, Iowa City, IA 52242

In double blind experiments, 5 competitive endurance cyclists each consumed either a fructose, glucose (1.5 g/kg BW, 12% soln), or saccharin (control) solution 2 hrs prior to 90 min of exercise at 70% VO2 max. We followed by an exhausting bout of exercise at 90% max VO2 on a bicycle ergometer. Glucose ingestion resulted in significant (p<0.05) mean (±SE) elevations in blood glucose (149±12.1 mg/dl) and insulin (48.5±7.9 μU/ml) levels compared to control values (87.5±3.6 mg/dl and 4.2±0.6 mg/dl, respectively) 30 min after consumption. At the onset of exercise, blood glucose and insulin values had returned to control levels, but blood glucose concentration declined significantly during the first 30 min of work to 71.2±7.4 mg/dl compared to 95.0± 3.95 mg/dl for the control. Fructose consumption did not significantly influence blood glucose or insulin levels at rest or during exercise, but it did significantly elevate blood lactate values at rest. Mean times to exhaustion at 90% max VO2 were 5.2±1.3, 5.1±1.2, and 5.1±0.9 min for glucose, fructose and saccharin trials, respectively. Compared with glucose, fructose consumption did not produce an insuline response and did not result in a decrease in blood glucose values during exercise.

Supported by the Iowa Corn Promotion Board.

O-3 Development of an exhaustion test for untrained rats using muscle glycogen values.

F.L. KERSHNER, K.A. BOWLETT, A. VATLAS, and C.M. TIPTON

Exercise Science Program, Univ. of Iowa, Iowa City, IA 52242

Depletion of muscle glycogen has been used to evaluate the strenuousness of an exercise test. However, treadmill tests (TMT) designed for this purpose in rats have been used only for trained (T) groups. Since T animals use glycogen differently than nontrained (NT) ones, we developed a TMT for NT populations that would exhaust them in 2 hours. Several days before the exhaustion test, VO2max was determined for 9 rats. The exhaustion test was administered between 1-4 p.m. and involved 9 different stages with the TMT. These included a warm up, grades between 15 or 25%, speeds ranging from 1.6-4.5 km/min and a combination of interval and steady state conditions. VO2 measurements during the TMT revealed that the animals were exercising between 80-91% of their maximum capacity. Group run time was 102.27 min. Muscle glycogen was 5.50±0.6 and 4.67±0.2 for the controls and 1.90±0.4 and 1.87±0.6 (mg/g) for the vastus and soleus respectively after TMT. It was concluded that this test was suitable for NT rats. (Supported in part by funds from GM-7045-06 and Iowa Corn Promotion Board).

0-4 Influence of early exercise training on the development of hypertension in SHR groups.

K.D. MARCRES, R.D. MATTRES, and C.M. TIPTON

Exercise Science Program, Univ. of Iowa, Iowa City, IA 52242

Previous studies with adult hypertensive (SHR) groups indicated that exercise training was associated with lower resting systolic blood pressure (SBP). These studies were extended to determine whether exercise after 2 weeks of age would result in lower and normalized values before 3 months of age. Rats were assigned into nontrained (NT) and trained (T) groups and exercised 5-6 days/week at work loads to exceed 65-70% VO2max. SSP results were as follows: X, * significant at 0.05 level)

<table>
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<th>Age (Days)</th>
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<th>Group</th>
<th>SBP</th>
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<td>56-58</td>
<td>M</td>
<td>13</td>
<td>NT</td>
<td>14.0±6</td>
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<td>M</td>
<td>11</td>
<td>T</td>
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</tbody>
</table>

These findings suggest that training can delay the time course of hypertension and indicate that further studies are needed to elucidate the responsible mechanisms. (Supported in part by NEH-21245-03 and GM-7045-02).
O-5 Some effects of selenium, vanadium and zirconium on the swimming rate of Tetrahymena pyriformis.

E. C. BOVEE and T. L. O'BRIEN

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By stroboscopic photography, the swimming rate of Tetrahymena pyriformis strain WM was measured in aqueous solutions of each of three metallic substances: selenium as selenium acid (H₂SeO₃); vanadium as vanadyl sulfate (VO₃⁺); and zirconium as zirconyl chloride (ZrO₂Cl₂·6H₂O). Swimming rate was measured over 45 min, monitored each 15 min, in concentrations of each metal, singly, at 0, 5, 10, 20, 30, and 50 parts per million. Significant decrease was found for each metal at concentrations of 20 ppm or more. Selenium decreased the swimming rate less than 20% at 5 or 10 ppm in 45 min, 63% at 20 ppm; 99% at 30 ppm; and stopped the swimming in 40 min at 50 ppm. At 0 or 10 ppm, vanadium had no effect; at 20 ppm, rate decreased 30%; at 30 ppm, 81%; at 50 ppm, 97%. At 5 ppm, zirconium had no effect; at 10 ppm, rate decreased by 18%; at 20 ppm, by 63%; at 30 ppm, by 98%; and stopped swimming in 24 min at 50 ppm.

Supported by Kansas Water Resources Grant B-040 to E. C. Bovee.

PSYCHOLOGY

I-1 Combat readiness as determinant of support for the draft

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The study examines the attitudes of two groups expected to be polar groups in terms of support for reintroduction of a draft system. The survey of 136 college students and 325 civilian or military staff of a major federal arsenal was designed to assess current attitudes in regard to U.S. Military preparedness and subsequently to determine the connection between this respondent perception and the respondent's support for the draft and/or a registration system. Additional data related to support for possible policies for a draft system, including treatment of women, conscientious objectors, college students, and marrried persons. Results showed the majority of both groups perceived various personnel shortages significantly damaging combat capacity. Both groups showed support for drafting of women. As expected, college students had less support than arsenal staff but only in degree (e.g., 60% of the students supported a draft). Factor analysis showed a high linkage between perceived military capability and support for the draft, suggesting a logical rather than emotional response.

I-2 Major recipients of National Science Foundation funds for psychological research (1954-1978)

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This study identifies those psychologists awarded the most research funds by the National Science Foundation during the 1954-1978 period, and then determines the relationships between money received and: a) perceived importance of individuals (based on a recent survey study); b) membership in the National Academy of Sciences, and c) receipt of the Distinguished Scientific Contribution Award. The major projects funded are also identified and discussed.

I-3 Effects of actor-relevant vs. other-relevant information on observers' causal attributions for a performance outcome.

CHERI CHRISTENSEN and DANIEL ARKKELIN

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This study assessed the relative effects of information pertaining to an actor versus information pertaining to other people on the causal attributions observers make about the actor's performance level. Sixty vignettes were written in which the levels of the following informational cues were presented in various combinations: a student exam grade (B, C, or D), the average grade in the class (B, C, or D), the student's GPA (B or D), the average GPA in the class (B or D), and how much the student had studied for the exam (extensively or very little). Ten subjects rated the extent to which they attributed the student's exam performance to each of the causal factors of ability, luck, effort, and test difficulty after reading each vignette. Stepwise multiple regression analyses revealed that the student's exam grade and how much she had studied for the exam were the major determinants of the extent to which subjects attributed the student's performance to ability, luck, and effort. However, the average grade in the class was the major determinant of attributions to test difficulty.

I-4 Effects of being a chairperson vs. being interviewed on subjective reactions to conditions of group density.

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A simulation technique was employed to assess the effects of three levels of number of people (4, 6, or 8) and interpersonal distance (1, 4, or 7 feet), and the sex of the people (same or opposite as the S's) on self-reported comfort and effectiveness. These variables were factorially combined, yielding 18 simulated settings to which each subject responded. Twenty subjects were asked to imagine that they were the chairperson of a committee in each setting and twenty others imagined that they were being interviewed for an important job. Repeated measures ANOVA's yielded a significant interaction between interpersonal distance and activity type on both dependent measures. Post hoc analyses revealed that chairpersons reported feeling significantly more comfortable and effective at 4 feet than at either 1 or 7 feet interpersonal distance. "Interviewee"s also reported feeling more comfortable and effective at 4 feet than at 1 foot distance, but they did not differentiate between the 4 and 7 feet distances. The results are discussed in terms of the desire to maintain control for chairpersons and the desire to avoid stress for interviewee's.

I-5 Sex differences in assertiveness.

H. A. ERDMANN

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With the advent of successful assertive training programs, many self-report assertiveness scales have been developed and tested. However, very few precise definitions of assertiveness have been presented and the minimal research that is available has shown that sex differences in assertive behavior may be confined to specific behaviors. This study measured sex differences in assertive behavior within a college population using the College Self Expression Scale (Galassi et al., 1974). The data was examined for 1) positive, 2) negative, and 3) self-affirmation assertions. It also measured assertiveness in a variety of interpersonal contexts. It was hypothesized that men and women would be more assertive within the social norms of their sex defined roles, although it was predicted that the assertive sex differences within the population would not be as pronounced when compared to population differences. The results, however, were not as decisive as had been expected.
I-6 Cross-sex behavior in childhood and adult sex role orientation.

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Limited longitudinal data suggest that childhood participation in stereotypically cross-sex behavior is predictive of later sex-reversed orientation in men, but not women. In the present study, 22 male and 22 female college students completed Bern's Sex Role Inventory, and ranked 12 stereotypically masculine, feminine, and neutral groups in terms of how much they participated in, and enjoyed, each as a child. As predicted, men's ratings reflected greater avoidance of cross-sex games than did women's ratings. Sex-reversed women (defined as masculine on Bern's Inventory) recollected greater enjoyment of masculine games than did sex-typed (feminine) women, or androgyous (combination of masculine and feminine) women. Contrary to prediction, sex role orientation was unrelated to men's recollected enjoyment of feminine games; this appeared to represent a floor effect associated with the games in the study. No evidence that childhood cross-sex behavior is associated with later androgyne was obtained for subjects of either sex.

SCIENCE TEACHING

Q-1 A long-range science plan for science education in Iowa.

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Numerous studies and much national, state, and local level discussion has noted that science education is currently experiencing a decline in emphasis as a legitimate discipline in our elementary and secondary school systems. Financial problems in education, the "back to basics" movement, a predicted science teacher shortage, and student, teacher, and administrator apathy towards science education specifically have created many conflicting and confusing problems in today's science education circles. In an attempt to try and provide some positive directional order and to establish some realistic goals for science education in Iowa, the Department of Public Instruction, in conjunction with the Iowa Council of Science Supervisors, has established a long-range science planning committee representative of science education at all levels. This committee has established some preliminary guidelines and priority problems and concerns have been delineated for immediate attention. Input is currently being sought by all concerned individuals.

Q-2 Science anxiety: what can we do about it?

G. R. DAVIS
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Science anxiety is a new name for a phenomenon that all science teachers, regardless of experiences are familiar with. It's a fear held by many bright and capable students that science is not understandable, regardless of the effort. Insights into science anxiety will be covered along with a method of assessment. Techniques of dealing with science anxiety will also be presented.

Q-3 Presenting two models of origins.

H. B. WAGONER, JR.
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During the last few years science teachers have become aware of the scientific concepts of the Creation model. Many teachers feel that giving two viewpoints of scientific concepts is a fairer approach in educational programs. It allows students a choice between two competing viewpoints. Slides will be shown which were presented last August to D.P.I. personnel, legislators, science teachers and organizational representatives. Graceland held a three hour credit program on the Creation model in January 1980, which included these topics: A Young Earth, A Young Universe, Evolution and Geology, Biological Origins and Entropy, The Fossil Record and Theories on the Origin of the Universe. Many national publications have had articles on this new approach in education including a Wall Street Journal report from Cedar Falls, Iowa. Materials will be displayed and a survey will be taken at the conclusion of this presentation.

Q-4 A case history of a controversy.

A. C. HAMAN
Dept. of Biology, Univ. of Northern Iowa, Cedar Falls, IA 50613

A case history of the events surrounding the rejection of a paper on Creationism submitted to the Iowa Science Teachers Journal and its political and instructional implications.

Q-5 Ethical decision making in the science classroom

G. L. MAGRANE
Area 15 Education Agency, Ottumwa, Iowa 52501

The advances of science have imposed an area of concern about the moral dimensions of decision making in the science classroom. Biological issues, constraints on energy and natural resources, political and religious confrontations, technological sophistication, cultural naivety and the subjective effects of pseudo-scientific endeavors present realistic problems for the contemporary science student and educator. A proper balance of emotional and rational experiences developed around a sound educational framework is advocated through issue-oriented case studies that deal with controversial issues in an effort to call for ethical decisions and promote the general dimensions of moral development.

Q-6 Reading skills and freshman biology performance

K. E. TUTINTRA and D. M. HUFFMAN
Department of Biology, Central College, Pella, IA 50219

Central College is the recipient of a three-year NEH grant to foster the teaching of writing, reading, and oral skills within the disciplines. In a summer 1979 workshop the authors developed a reading rate and comprehension test keyed to the textbook BIOLOGY by K. Arms and P. S. Camp ( Holt, Rinehart and Winston). Comparison of this test with other indicators of reading skills (Nelson-Denny Reading Test and ACT-Standard Score in Social Studies) has been initiated. The course grade is correlated with these tests as follows: 1. total-ND (0.608), 2. comprehension-biology (0.603), 3. cross-relation-ND (0.656), 4. vocabulary-ND (0.590), 5. rate-ND, 6. ACT-SS (0.484), 7. rate-biology (0.357). These results are based on the fall term. A regression analysis of data for both terms is underway and the overall results will be used to make a decision as to whether a specific reading test for a biology textbook is superior to reading tests administered to all freshmen for purposes of prediction and counseling.
Q-7 A program teaching about American scientists
SISTER MARY DENNIS LENTSCHE
Newman High School Mason City, IA 50401

A pretest given in the fall of 1978 showed that science students in our school lacked information about American scientists. A proposal was written seeking a Teacher Incentive Award Grant, funded by the Iowa Department of Public Instruction, to develop a program to teach about American scientists. A $2000.00 grant was received. This paper outlines the steps taken in preparing the proposal and the manner in which the program was developed during the summer of 1979. It was found that a wide variety of materials are available to teach about American scientists. Information about the types of materials and their sources will be shared. The progress in implementing the program and possible means of evaluation will be discussed.

Q-8 Organic chemistry for non-majors.
L. A. McGrew
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In a course in socio-economic chemistry for non-majors we attempt to increase appreciation and understanding of the ability of organic chemistry to improve the quality of life and provide solutions to societal problems. Since this is only one of the topics of the course there is a very limited amount of time for consideration of fundamentals. However, careful choice of a limited number of basic structure and reactivity concepts makes discussion of industrial organic chemistry, polymers, petroleum processing, and synthetic fuels processes possible. The choice of appropriate basic concepts and establishment of suitable study categories will be discussed.

Q-9 Science: a vehicle for interdisciplinary teaching
G.M. LAURACH
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Science to many individuals is a dry, sterile subject area. Applying the philosophical outlook that science can be an enjoyable experience as well as an educational one through hands-on participation, an exemplary educational program for students at King/Perkins Magnet school has been established with the cooperation of the Des Moines Center of Science and Industry. This project, based upon an expanded science program, involves all areas of the school curriculum. Science teachers continue to teach the school district's adopted science program. The Science Center's resource personnel are not only present to enrich the science classroom but also to aid other teachers in implementing science in areas of the curriculum such as mathematics, social studies, music and language arts. All teachers are actively involved in the planning, implementation and evaluation of these enrichment activities.

Q-10 Better science through safety.
G. R. DOWN & J. A. GERLOVICH
Department of Elementary Education
Iowa State University
Ames, Iowa 50011

School science laboratories are active sites of learning. They may also be areas of potential danger from fire, explosives, caustic chemicals, poisons, noxious fumes, and projectiles. Science teachers need to be aware of potential dangers and safety responsibilities related to science teaching.

In an effort to increase the science teacher's awareness of potential danger and responsibilities, the Iowa Department of Public Instruction (DPI), the Iowa Council of Science Supervisors (CSS), and Iowa State University through an NSF Project have developed a safety manual for teachers of grades 7-12. The teacher reference manual and supporting print material will be discussed.

Q-11 Teaching science in Malaysia
JAMES R. DALLAS
Science Education Center, The University of Iowa, Iowa City, Iowa 52242

Two years experience teaching high school sciences in eastern Malaysia enables the author to describe how students are prepared for Senior Cambridge Exams, their learning strategies, their view of science, and the teacher's role to coach (not to evaluate) his students' progress. The class of '72, revisited in '79, is adapting to rapid technological changes.

Q-12 Using analogies for energy education
D.A. SIMONS
Science Education, The University of Iowa
Iowa City, Iowa 52242

Large numbers and abstract concepts that are part and parcel of energy considerations can be difficult for students to grasp. Analogies that put relationships into concrete form or scale quantities to tangible units can bridge the terminology gap and put new perspectives on some mathematical expressions. Examples of analogical descriptions of thermodynamics, exponential growth, and physical limits will be given.

ZOOLOGY
F-1 The role of the pelvic nerve in parturition
K. C. EVANS
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The involvement of the pelvic nerve in parturition is investigated in this paper. It has been shown that bilateral pelvic nerve ablation interferes with the delivery process although it does not affect gestation length. Pregnant Sprague-Dawley rats were bilaterally pelvic neuronecrotized on day 12 of gestation (day 1 was counted when sperm were present in the vaginal smear). Treatments consisted of the following regimen of drug and hormone administration: a) 10 rats received no drugs; b) 10 rats received Indomethacin in sesame oil, twice on days 20 and 21; c) 10 rats received prostaglandin P2 in phosphate buffer, 4 times on day 21; d) 10 rats received relaxin in 5% beeswax and oil, once on day 20; e) 10 rats received relaxin in 5% beeswax and oil, once on day 21; and f) controls groups were sham-operated or unoperated. The rats receiving prostaglandin or relaxin delivered more of their litters and had a lower mortality rate than those which received Indomethacin or no drugs. The sham-operated rats were as successful as the unoperated rats in delivering their pups. The results of this paper indicate that the pelvic nerve plays an important role in the release of prostaglandins and relaxin which facilitate normal parturition.
F-2 Is vitamin-E "stomatin" for Tetrahymena vorax?
D. C. LERNER and P. G. BOEKE
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The well-known transformation of the ciliate protozoan, Tetrahymena vorax from a normal, small-mouthed bactriote to a large ("giant") cannibalistic carnivore has been said by Howard Buhse (J. Protozool. 14:608-13, 1967) to be triggered by an extract from axenic cultures of Tetrahymena pyriformis of unidentified constitution termed "stomatin". We find that an aqueous solution of α-tocopheryl succinate (vitamin-E) at 1 x 10⁻⁶ or 1 x 10⁻⁷ M concentration produces giants (3 to 5X of the organisms) that are morphologically identical to those produced by "stomatin" which are actively carnivorous and cannibalistic. Giants develop in 10-12 hrs at 22-23°C. Buhse produced 70-80% giants only in concentrated "stomatin"; and otherwise got giants (32) in Trypticase (that may have contained vitamin-E as a contaminant). What "stomatin" is, or contains, that promotes transformation is unknown. Since vitamin-E is an anti-oxidant, we suggest that it or some other anti-oxidant may be, or may be the active component of "stomatin".

F-3 "Walking" locomotion by the radiate form of the marine ameba, Vannella mira (Schaefler, 1926).
E. C. BOEKE and E. A. BOEKE
Dept. of Physiology & Cell Biology, University of Kansas, Lawrence, Kansas, 66045.
Naked, lobose amebas locomote by creeping or crawling on substrate by what is called amoeboid movement. Radiate forms of such amebas are considered passive, floating and drifting states, incapable of locomotion. Schaefer (1926) noted that Vannella mira (fan-shaped in creeping locomotion) actively tumbles when radiate and slow and "pseudopods" on attached pseudopods. My recent observations on V. mira in radiate form show an active "walking" by repeated extension and contraction of the tapered pseudopods of the radiate state, causing the ameba to roll and "walk" forward on pseudopodial tips that are at an angle of gravity is altered. The radiate form also locomotes by extension of tapered pseudopods that adhere by their tips to debris, causing them to drag the body over and through openings in the debris at rates faster than the usual crawling rates, Schaefer (1926) reported a mean crawling rate for V. mira of 25 um/min, with maximum of 75 um/min. The maximal rate of the "walking", radiate form may exceed the crawling rate, being 2-3 um/sec (120-300 um/min) for short distances and equalizing or somewhat exceeding the crawling rate, when as a steady, rolling "walk".

F-4 Feeding differences between naupliar and adult cyclopoid copepods.
J. R. HAEVE
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In-lab feeding experiments used naupliar and adult cyclopoids as predators on a variety of food types. Methods used included prey difference counts, radiolabeled prey, and predator survivorship. Adult cyclopoids predared on cyclopoid nauplii, small cladocera, rotifers, and ciliated protozoa, but not on large cladocera, green algae, nor bacteria. One-day-old nauplii fed only on dissolved organic. They would not take large or small cladocera, rotifers, ciliated protozoa, green algae, nor bacteria.
Electron micrographs of the adult and nauplius revealed fine detail of their mouthparts. Some feeding abilities, such as that of adults to grasp motile prey, are directly related to mouthpart structure. However, lack of ability for nauplii to feed on small prey in not apparent, since the mouthpart anatomy indicates that these could be used.

F-5 Distribution and ecology of the crayfishes Orconectes Iowensis Fitzpatrick and Orconectes Rusticus (Girard) in Minnesota
G. S. PHILLIPS
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During 1979, a field study was conducted to determine the species of crayfish present in southern Minnesota. During this study, specimens of Orconectes Iowensis Fitzpatrick, Orconectes Rusticus (Girard), and Orconectes Virilis (Nenge) were collected. These collections represent new state records for O. Iowensis and O. Rusticus. O. Iowensis appears restricted to the Root River drainage system in extreme southeastern Minnesota. O. Rusticus was found to occur in the West Fork of the Des Moines River in southwestern Minnesota and the Cedar River drainage system in south central Minnesota. Notes on the ecology of these species are included.

F-6 Peoria Loess mollusc faunas of northeastern Illinois and northeastern Iowa
L. P. FAY and T. J. FRESE
The University of Iowa, Department of Geology, Iowa City, IA 52242.
Fossil molluscs have been collected from fifteen Peoria Loess localities in Illinois and Iowa. Taiga, open coniferous forest, and mixed coniferous-deciduous forest biomes are reflected in the composition of the various faunas. This geographic-climatic zonation is well developed and readily recognized in all reported Peoria Loess faunas. Stratigraphic zonation, previously reported for northcentral Iowa Wisconsinan mollusc faunas, is not substantiated by the present study. First Wisconsinan occurrences are reported for Deroceras laeve, Vertigo biermanni, V. hannahi, and V. occulta. Decus shimeki was found at four Illinois localities, a new state record and eastern range extension.

F-7 The status of the small-mouthed salamander (Ambystoma texanum) in Iowa.
J. T. CRAWFORD
Department of Biology, Drake University, Des Moines, Iowa 50311.
A search was initiated in the spring of 1978 to determine the status of the secretive small-mouthed salamander (Ambystoma texanum) in Iowa. Populations were located in Jefferson, Lee, Louisa, Lucas, Warren, and Wayne counties. Previously thought to be rare, the salamander appears to be common in many wooded stream valleys in southern-central and southeastern Iowa. Evidence gathered suggests that this species is not as rare as previously believed and may not be worthy of threatened status in Iowa.

F-8 Sternotherus odoratus: one of Iowa's rare, peripheral turtle species.
J. L. CHRISTIANSEN
Department of Biology, Drake University, Des Moines, Iowa 50311.
Sternotherus (Sternotherus odoratus) were first reported from Iowa by Dodge in 1959 from a locality now known as Pike Run. Since that time extensive trapping in southeastern Iowa has produced stinkpots from the same and two other localities in Muscatine County, Iowa (in the Cedar River drainage) and from extreme southern Johnson County (in the Iowa River drainage). In all instances very sandy terrestrial habitat was available and in one, very poorly adapted Illinois mud turtles (Kinosternon flavescens spenceri) were found. Extensive trapping in similar habitats up to 25 miles south of these locations failed to yield stinkpots. Evidence continues to support listing of this peripheral species as endangered in Iowa.
F-9 The occurrence of the western mosquito fish (Gambusia affinis affinis) in Iowa.

J. A. RUSSELL

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The western mosquito fish (Gambusia affinis affinis) was discovered in Lee county, Iowa during settling of various habitats. It occupied the margins of overflow pools of the Mississippi river south of Ft. Madison. It is common in Missouri and Illinois and was expected to be found in southeaster Iowa because of the wide avenue for species dispersal from the south provided by the Mississippi river. This fish was abundant in the area where it was collected, but appeared absent from similar habitat farther south along the river. Additional study must be made to determine whether this population has been introduced or represents a peripheral population.

F-10 Host-parasite interactions in Hyalella azteca infected with Leptonychoidees thecatus.

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The two-host life cycle of the acanthocephalan Leptonychoidees thecatus involves the amphipod Hyalella azteca and freshwater fishes of at least five families. In West Lake Okoboji, L. thecatus constitutes a significant portion of the parasite fauna of centrarchid fishes. During summer 1979, infection frequency approached 100%, and mean intensity was approximately 10 parasites per fish. In contrast, frequency of infection in amphipods was low (.approximately 1.7%). Multiple infections in amphipods were rare. Current laboratory experiments are designed to investigate behavioral changes induced by L. thecatus in H. azteca, leading to increased vulnerability to predation by centrarchids. Studies of the intermediate host-parasite interface using light-level and transmission electron microscopy are also underway.

F-11 Ultrastructure and cytochemistry of plasmodia of the myxosporidian, Chloromyxum triligum.

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Department of Zoology, Iowa State Univ., Ames, IA 50011

The myxosporidian, Chloromyxum triligum, is a common parasite of several centrarchid fishes in North America. Plasmodia are free-floating in bile or attached to the epithelium of the gall bladder. Light and electron micrographs of attached plasmodia reveal anastomosing microvillus-like folds on the free surface. Cytocytic vesicles are sometimes evident at the bases of microvilli. Plasmodia adhere to underlying epithelial cells by pseudopod-like extensions. At points of parasite-host juncture (binding zones) cell membranes are intact and separated by a narrow gap. Regions adjacent to binding zones show various stages of mucosal destruction. Cytochemical localization of acid phosphatase and aryl sulfatase was used to identify regions of digestive enzyme activity in attached plasmodia. Results for aryl sulfatase were negative. Acid phosphatase was localized in myelinated bundles and membrane-bound vacuoles containing small vesicles, membrane fragments, or dense matrix material.

F-12 Coccidian parasites from Iowa reptiles. VII.

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Dept. of Biology, Drake University, Des Moines, IA 50311

In a recent survey of the coccidian parasites of Iowa turtles, 2 heretofore undescribed species of Eimeria were found. One of the eimerians was isolated from Blanding's Turtle, Emydidae blandingi, and had ovoid oocysts and sporocysts measuring 25 x 13 and 10 x 6 micrometers, respectively; sporocyst and oocyst residua were present. The other eimerian was isolated from the Snapping Turtle, Chelydra serpentina, and had ovoid-ellipsoid oocysts and oval sporocysts measuring 15 x 9 and 8.3 x 4 micrometers, respectively; sporocyst residua were present, but an oocyst residua was not. These findings bring to 1 the number of E. species reported from Blanding's Turtle and to 3 the number reported from Snapping Turtles.

F-13 Visceral fibrosis in bluegill in central Iowa.

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Unusually severe liver and visceral fibrosis were observed in a population of bluegills (Lepomis macrochirus) from the Iowa State University Horticulture Farm pond in Story County during 1978-1979. The lesions were associated with heavy infections of metacercariae of the trematode, Posthodiplostomum minimum, and plerocercoids of Proteocephalus ambiguus. Affected bluegills were from 3 to 7 years of age. Parasite loads were heavy, averaging 1700 metacercariae and 5 plerocercoids per host. Fibrotic lesions varying from scattered tubular branched foci in livers to massive adhesions throughout the viscera occurred in 60 (4.6%) of 411 bluegills examined during 1978-79. Lesions in 85% of these fish were melanotic. In section, severely affected livers consisted of islets of hepatocytes interspersed with rigid fibrotic cysts. Cysts were formed of concentric layers of dense fibers, often containing melanin granules and remnants of melanin macrophages. Central cores of cysts appeared empty or were partially filled by amorphous debris or metacercariae. Despite the apparent severity of this condition and the heavy parasite loads, affected bluegills showed no obvious external signs of disease.

Note: Some papers included in the program are not included here because of submission after the announced deadlines.