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Academy of Science**  
Supplement to Volume 86

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**86th Annual Meeting  
October 15-16, 1993**

**SOUTHERN ILLINOIS UNIVERSITY**  
Carbondale, Illinois

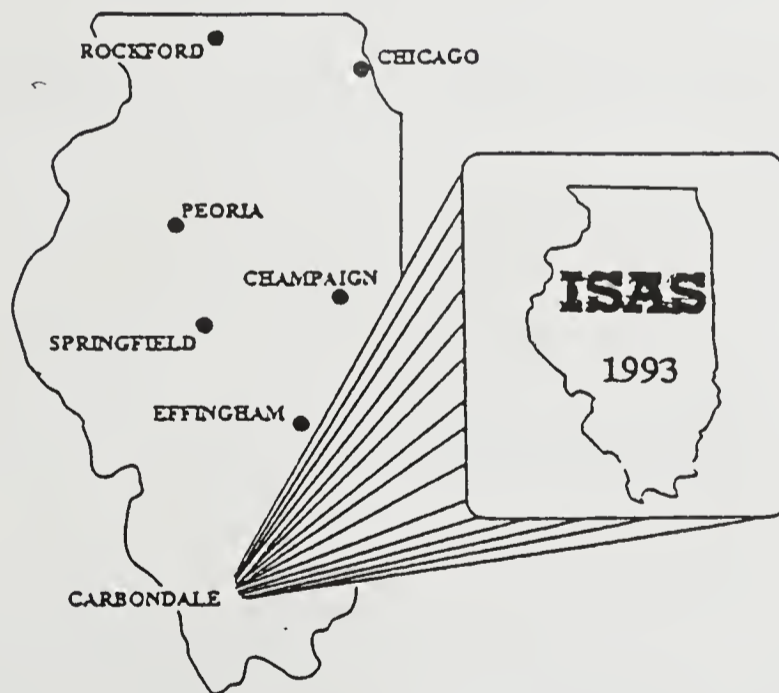
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**PROGRAM AND ABSTRACTS**  
**OF THE**  
**ILLINOIS STATE ACADEMY OF SCIENCE**  
**86TH ANNUAL MEETING**

**THEME: EXPANDING FRONTIERS**

**OCTOBER 15-16, 1993**



**SOUTHERN ILLINOIS UNIVERSITY AT**  
**CARBONDALE**  
**CARBONDALE, ILLINOIS**



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THE ILLINOIS STATE ACADEMY OF SCIENCE

WISHES TO THANK

THE FOLLOWING ORGANIZATIONS FOR CONTRIBUTIONS

FOR THE 1993 ANNUAL MEETING

\*BAXTER HEALTHCARE\*

\*FLUOR DANIEL COMPANY, CHICAGO\*

\*MERSS CORPORATION\*

\*NALCO CHEMICAL COMPANY\*

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The Illinois State Academy of Science Also Wishes To Thank  
The Following Units At Southern Illinois University At  
Carbondale For Contributing Funds And/Or Other Forms Of  
Support:

School of Medicine

College of Agriculture

College of Education

College of Engineering

College of Science

Department of Plant Biology

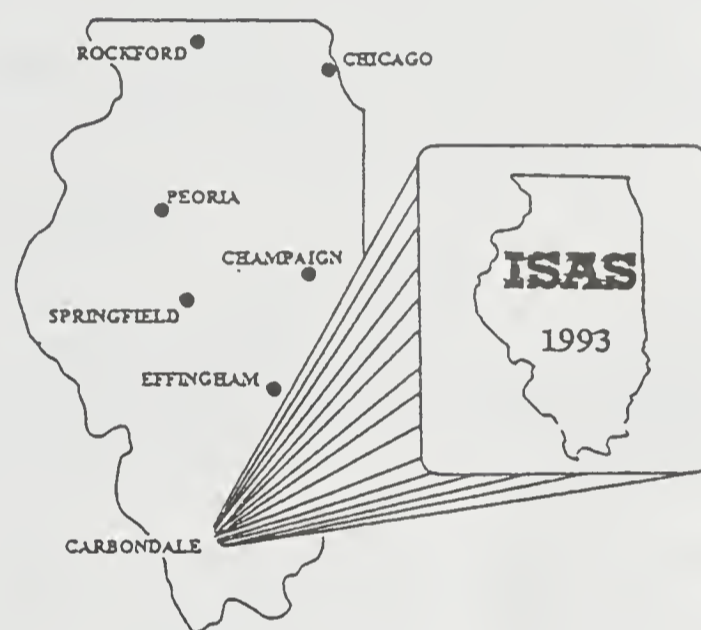
# ILLINOIS STATE ACADEMY OF SCIENCE

## 86th Annual Meeting

### EXPANDING FRONTIERS

OCTOBER 15 -16, 1993

Southern Illinois University  
At Carbondale  
Carbondale, Illinois



## REGISTRATION

Participants are urged to pre-register for the ISAS Annual Meeting by returning the enclosed Registration Form with a payment of \$20.00 (\$10.00 for student members, \$30.00 for non-members) to the Treasurer. The deadline for receipt of the pre-registration form is October 6, 1993. Tickets for the ISAS Luncheon, Dinner (includes Poster Session Social), and Poster Session Social (if purchased separately) should be reserved when you pre-register and may be picked up at the Registration Table in the Student Center, Southern Illinois University at Carbondale, on Thursday evening, October 14, or Friday, October 15, 1993.

On-site registration will be conducted during both days of the meeting. On-site registration fee is \$25.00 for regular members, \$12.50 for student members and \$40.00 for non-members. Host institution students (ID card required) are invited to attend the oral paper sessions free of charge after on-site registration as "student guests".

All participants (including all guest host-institution students) must register and have their ISAS name tag before they can participate in the ISAS meeting activities.

## TRAVEL INFORMATION

Southern Illinois University at Carbondale is accessible by car, train, and air. If traveling by auto, refer to the maps of the Carbondale area and the University provided elsewhere in this publication for the most direct route from your location to your motel and the University meeting site. Amtrak's Chicago-New Orleans route passes through the heart of Carbondale. The area is also served by two airports--Southern Illinois Airport, just outside Carbondale, and Marion Airport, about 20 minutes away. Commercial flights use the Marion Airport. If planning to travel to Carbondale on Amtrak or by air, call the local organizer in order to make arrangements for local transport to your motel.

## PARKING

Because SIUC classes will be in session Oct. 15, adjacent campus parking will be at a premium. Where convenient, car pooling from your motel to SIU is suggested for Friday, October 15. Pay or permit parking is needed only on weekdays until 4:30 PM.

There is a small number of meter parking slots (see B on Campus map) directly across the street from the SIUC Student Center (\$2.00 in quarters for 8 hrs. or \$2.00 permit available at registration). The one entrance and exit to this lot is located on the short street southwest of the football stadium (and southeast of the Student Center). Easiest route: Turn right off of Highway 51 at the south end of the stadium (go past signal light) and, near the end of the street, turn right into the lot.

Free parking is available in the SIUC Arena parking lot (see A on Campus map). This lot may involve a longer walk (about three city blocks), but competition for space is low. Easiest route: Go south on Highway 51 to the signal at the south end of Campus. Turn right; turn right again at next street and proceed around to parking lot (on right). DO NOT use the circular parking area adjacent to the Arena. To reach the Student Center, walk north, on past the Arena on the right (east) side.

Lawson Hall parking lot (see E on Campus map) will be open, free of charge, on Saturday October 16 only.

## MEALS

The ISAS Luncheon, Friday, October 15, will be served in Ballroom A of the Student Center at Southern Illinois University at Carbondale from 12 noon to 1 PM. Lunch will be followed by the Annual Business Meeting and will conclude by 1:30 PM in time for the afternoon Paper Sessions. Luncheon tickets (see Registration Form for costs) must be purchased by pre-registration.

The ISAS Banquet, Friday October 15, will be held in the Old Main Room of the Student Center at Southern Illinois University at Carbondale from 6:30-7:45 PM. The Banquet will be preceded by the Poster Session Social in Ballroom B of the Student Center at Southern Illinois University at Carbondale from 5:00-6:15 PM. At the conclusion of the Banquet, the Keynote Address will be presented in the Auditorium of the Student Center at Southern Illinois University at



Carbondale from 8:00-9:00 PM. Banquet tickets (see Registration Form for costs; price includes tickets for both Banquet and Poster Session Social) must be purchased by pre-registration.

Menus for both the ISAS Luncheon and the ISAS Banquet are presented elsewhere in this publication.

## POSTER SESSION SOCIAL

The Poster Session Social, which precedes the ISAS Banquet, will be held in Ballroom B of the Student Center at Southern Illinois University at Carbondale from 5:00-6:15 PM. Poster presenters may have access to Ballroom B beginning at 3 PM for set up of presentation materials (posters must be removed by 6:30 PM). Wine, soft drinks, and cheese will be available. Banquet prices (see Registration Form for costs) include admittance to both the Banquet and Poster Session Social. For those who wish, tickets for the Poster Session Social are also available separately (see Registration Form for costs) and must be reserved during pre-registration.

## KEYNOTE ADDRESS

The Keynote Address, which is open to the public, will be presented by Dr. Sidney W. Fox in the Auditorium of the Student Center at Southern Illinois University at Carbondale from 8:00-9:00 PM on Friday, October 15. World renown for his work in chemistry, on amino acids, and aspects of the origin of life, Dr. Fox is currently Distinguished Scientist, at the University of South Alabama. His title, "The Emergence of Life and Mind" reflects the relationship between past work and the direction of his current research.

## ABSTRACTS

Abstracts of the Keynote Address and the Paper Session and Poster Session presentations are included elsewhere in this publication.

## QUESTIONS

If you have any questions concerning the 86th Annual Meeting of the Illinois State Academy of Science, please contact the local organizer:

Walter J. Sundberg  
Department of Plant Biology  
Southern Illinois University at Carbondale  
Carbondale, IL 62901-6509

Telephone: (618) 453-3212  
Fax: (618) 453-3441  
Internet: [sundberg@qm.c-plant.siu.edu](mailto:sundberg@qm.c-plant.siu.edu)

## ISAS ACADEMY LUNCHEON MENU

Southern Illinois University Student Center, Ballroom A  
Friday, October 15, 1993 -- 12 Noon

Seasonal Fruit Cup  
Oriental Stir-Fry  
( Beef, Oriental Vegetables, And Rice)  
Fresh Bread And Butter  
Apple Crunch With Warm Rum Sauce  
Coffee, Tea, Or Sanka

\*\*\*\*\*

## POSTER SESSION SOCIAL

Southern Illinois University Student Center, Ballroom B  
Friday, October 15, 1993 -- 5-6:15 PM

Wine And Hors d'Oeuvres

\*\*\*\*\*

## ISAS ACADEMY BANQUET MENU

Southern Illinois University Student Center, Old Main Room  
Friday, October 15, 1993 -- 6:30-7:45 PM

Tossed Green Salad With Pepper Cream Sauce  
Chunky Tomato Crisp Soup  
Chicken Kiev  
Red Potatoes  
Steamed Broccoli Spears With Lemon Butter  
Fresh Rolls And Butter  
Split Lemon Layer Cake  
Coffee, Tea, Or Sanka

\*\*\*\*\*

Note: Tickets are required for the Luncheon, Poster Session Social, and Banquet. Banquet prices include admittance to both the Banquet and Poster Session Social. For those who wish, tickets for the Poster Session Social are also available separately. Tickets for all of these events should be reserved during pre-registration. They will be issued at the ISAS Registration Desk located in the Student Center, Southern Illinois University at Carbondale in the Gallery Lounge on Thursday, October 14, 1993 from 5 to 9 PM and in the Old Main Lounge on Friday, October 15, 1993 from 8 AM to 4:30 PM.



## RECOMMENDED MOTELS

Because SIUC's Parent's Weekend and a home football game are scheduled for the same weekend as the ISAS Annual Meeting, there is extremely heavy pressure on local motels.

For ISAS members and guests, we have "blocked out" 30 rooms at each of three local motels until August 30 and a smaller number (if available) thereafter until September 31. Summary information and phone numbers are included below. For choice in price and amenities, **Reserve Rooms Early--Consider Doing It NOW!** When making reservations, be sure to mention the ILLINOIS STATE ACADEMY OF SCIENCE to receive the special low rates noted.

A. Best Inns of America. 1345 East Main, Carbondale, IL 62901 Phone: (618) 529-4801.  
(see A on Carbondale map)

Cost (all rooms): \$34.88 + tax for Oct 14 and 15; \$44.88 + tax for Oct 16. Single (queen size bed; 1-2 people), Double (2 queen size beds; 1-4 people, or King (1 king size bed, 1-2 people); non-smoking rooms available. No roll-aways. Blocked: 30 rooms until August 1; smaller number (if available) thereafter until September 31. [Approx. cost/night with tax: Oct 14 & 15 - \$38.80; Oct 16 - \$49.92].

Amenities: Continental breakfast from 6-10 am (cereal, toast, fruit and fruit juices, donuts, English muffins oatmeal, coffee tea, hot chocolate and milk). No Bar or Restaurant in Motel. Adjacent to University Mall (Carbondale's largest shopping area).

Nearby Restaurants: Yan Jing Restaurant, Pasta House, Garfield's Restaurant and Pub near or in mall; Shoney's, Oriental Foods, Ponderosa Steak House, Long John Silver's, and McDonald's across highway.

B. Knights Court. 800 East Main St., Carbondale, IL 62901. Phone: (618) 529-1100  
(previously Holiday Inn; see B on Carbondale Map)

Cost (all rooms; Oct. 14, 15, and/or 16): \$39.00 + tax/night. Single (queen sized bed, 1-2 people) or Double (2 queen sized beds, 2-4 people). Roll-away: \$5.00 (approx. 10 [?] available), allows one extra person per room. Blocked: 30 rooms--5 singles, 25 doubles--until August 1; smaller number (if available) thereafter until September 30. [Approx. cost/night with tax: \$43.40, \$48.95 with roll-away].

Amenities: Bar, restaurant, and atrium (with indoor pool, jacuzzi, and lounge area) in motel. Free coffee in lobby 7-11 am.

Nearby Restaurants: Hunan Village (finer dining) next door; My Brother's Place, Godfather's Pizza, Kentucky Fried Chicken, Fazoli's, and Pizza Hut nearby.

C. Knights Inn. 3000 West Main St., Carbondale, IL 62901 Phone: (618) 529-2424  
(previously Travelodge. Perhaps less luxuriant, but a good "buy"; see C on Map)

Cost (October 14, 15, and/or 16): Single (1 double bed, 1 person) = \$25.00+ tax//night; Double (2 double beds, 2 people) = \$30.00 + tax/night. \$5 more each additional person; single can take 1 additional, double can take 2 additional). Only four roll-aways available. Blocked: 40 rooms until August 1; smaller number (if available) thereafter until September 31. [Approx. cost/night with tax (listed by number of people in room): 1 = \$27.51, 2 = \$33.38, 3 = \$38.94, 4 = \$44.50, 5 (in double with roll-away) = \$50.06].

Amenities: indoor pool, sauna, free coffee in lobby 6-11 am, and 10 % discount at Ponderosa Steakhouse--across the street). No bar or restaurant in motel.

Nearby Restaurants: Ponderosa Steakhouse and Dairy Queen across the street; Mississippi Flyway (bar and grill), Fiddler's (finer dining), Denny's, Cristaudo's Cafe and Bakery (33% discount to all ISAS registrants, discount card provided with registration materials), On A Roll, Little Caesar's Pizza, and McDonald's nearby.



## SUMMARY OF EVENTS

**October 14, 1993** (All activities in the Student Center, Southern Illinois University at Carbondale)

5-9 pm: Registration. Gallery Lounge. SIUC Parking permits and discount coupons for Cristaudo's Cafe and Bakery available at registration. Displays by Carbondale Tourism Bureau and Academy-related University Colleges and Departments.

6-10 pm. Council Dinner and Meeting (Dinner at 6:15; Meeting follows). Mississippi Room.

**October 15, 1993** (All activities in the Student Center, Southern Illinois University at Carbondale)

8 am-4:30 pm: Registration. Old Main Lounge. Refreshments. SIUC Parking permits and discount coupons for Cristaudo's Cafe and Bakery available at registration. Displays by Carbondale Tourism Bureau and Academy-related University Colleges and Departments.

9-11:30: Paper sessions. River Rooms: Mississippi, Illinois, Ohio, Kaskaskia, Missouri, Mackinaw, and Saline rooms. Open to Registrants and SIUC students.

12 noon to 1:30 pm: ISAS Academy Luncheon And Business Meeting. Ballroom A. Entrance ticket required.

1:45-4:30 pm: Paper sessions. River Rooms: Mississippi, Illinois, Ohio, Kaskaskia, Missouri, Mackinaw, and Saline rooms. Open to registrants and SIUC students

5-6:15 pm: Poster Session. Ballroom B. (Poster set up after 3pm; remove at 6:25 pm) Entrance ticket required. Refreshments. Displays by Carbondale Tourism Bureau and Academy-related University Colleges and Departments.

6:30-7:45 pm: ISAS Academy Banquet, Old Main Room. Entrance ticket required.

8-9 pm: Keynote Address. Dr. Sidney W. Fox-- "THE EMERGENCE OF LIFE AND MIND". Auditorium. Open to Registrants and general public.

**October 16, 1993** (All activities in Lawson Hall, Southern Illinois University at Carbondale).

8-11 am: Registration. Refreshments. Displays by local groups (incl. Tourism Bureau) and Academy-related University Colleges and Departments.

8:30- 11:30 am: Paper sessions. Lawson Hall 101.

11:30 am: Meeting end.

### Tours:

1. 9 am: Science Center (An Emerging Community Hands-On Science Facility For Young People). Science Center, 611 East College St. (near City Hall, off Wall St.). Sign up at registration. (See Related Poster).
2. 11 am and 2 pm: Winery Tours --Alto Pass Vineyards . Alto Pass Vineyards, near Alto Pass, south of Murphysboro on Highway 127. Sign up at registration.



**ILLINOIS STATE ACADEMY OF SCIENCE**  
**86th Annual Meeting**  
**EXPANDING FRONTIERS**

**Southern Illinois University at Carbondale**  
**Carbondale, Illinois**

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**KEYNOTE ADDRESS**

**"The Emergence of Life & Mind"**

**SPEAKER**

**Dr. Sidney W. Fox**

**Distinguished Research Scientist**  
**University of South Alabama**

**OCTOBER 15, 1993 - 8:00 p.m.**

**Student Center Auditorium**  
**Southern Illinois University at Carbondale**

**THE EMERGENCE OF LIFE AND MIND**

The origin of life has been treated mythologically and in science as a natural event in a hypothetical chemical context. Experiments with amino acids under terrestrial conditions have led to polybiofunctional cells through informed polypeptides. The development required two heretical findings: (a) self-ordering of amino acids to thermal polypeptides (proteinoids) and (b) the simple self-organization of the thermal polymers, when wetted, to cellular structures. In the third phase of study (1958-1982), the biofunctions found in the microscopic units have been catalogued. They include (1971) all of the functions that comprise Webster's definition of life: metabolism, growth, reproduction, and response to stimuli, plus many more. By 1981, the origins of the genetic coding mechanism and of the roots of other biofunctions had been retraced by experiments.

Popular suppositions that DNA or RNA was an original bioinformational molecule have failed to yield results, although much effort was spent on those ideas in the 1980s. Part of the explanation is that amino acids are evolutionary precursors of informed polypeptides, whereas polynucleotides act only as modern "instruction manuals" (Kornberg, 1989) in the synthesis of modern proteins.

The high nonrandomness of thermal polypeptides explains their recent introduction into industry as in microencapsulation and water treatment. During the cataloguing of biofunctions of proteinoid microspheres in 1971-1993, major attention has been devoted to the bioelectrical behavior of the protocell models. These and other results suggested the inference that the protocell was also a protoneuron. The protocellular neurons also organize spontaneously, suggesting an early step toward the evolutionary emergence of the brain.

# PAPER SESSIONS

## AGRICULTURE DIVISION

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DIVISION CHAIR:  
 Steven E. Kraft  
 Department of Agribusiness Economics  
 Southern Illinois University  
 Carbondale, IL 62901

SESSION I - Friday, October 15

PRESIDING: Steven Kraft

| <u>TIME</u> | <u>PAPER #</u> | <u>LOCATION: KASKASKIA ROOM</u>                                                                                                                                                    |
|-------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9:00 AM     | 1              | EFFICACY OF A COMMERCIAL FAT SOURCE IN THE DIET OF EARLY WEANED LAMBS TRIAL I. <u>A.E. Wertz</u> and <u>P.M. Walker</u> , Illinois State University, Normal.                       |
| 9:15 AM     | 2              | CRP CONTRACT HOLDERS" INTENTIONS FOR THEIR POST-CONTRACT USE OF THEIR LAND. <u>K. Munyoka</u> , <u>S.E. Kraft</u> , and <u>C. Lant</u> , Southern Illinois University, Carbondale. |
| 9:30 AM     | 3              | ECONOMIC EFFICIENCY OF DAIRY FARMS BY SIZE IN SOUTHERN ILLINOIS. <u>D. Kadekov</u> and <u>P.R. Eberle</u> , Southern Illinois University, Carbondale.                              |
| 9:45 AM     | 4              | THE PRICE AND USE OF NITROGEN IN SOUTHCENTRAL ILLINOIS: IMPLICATIONS FOR ENVIRONMENTAL POLICY. <u>W. Duke</u> and <u>S.E. Kraft</u> , Southern Illinois University, Carbondale.    |
| 10:00 AM    |                | DIVISION BUSINESS MEETING                                                                                                                                                          |



BOTANY DIVISION  
 ~~~~~

DIVISION CHAIR:  
 Marian Smith  
 Department of Biological Sciences  
 Southern Illinois University  
 Edwardsville, IL 62026

SESSION I - Friday, October 15

PRESIDING: Marian Smith

TIME

PAPER #

LOCATION: OHIO ROOM

- |          |    |  |
|----------|----|--|
| 9:00 AM  | 5  | THREE-DIMENSIONAL RECONSTRUCTIONS FROM SERIAL CROSS SECTIONS USING A MACINTOSH. <u>Lawrence C. Matten</u> , Southern Illinois University, Carbondale.  |
| 9:15 AM  | 6  | MEASUREMENTS OF INORGANIC CARBON USAGE BY AQUATIC PLANTS OF ACID MINE LAKES USING pH DRIFT TECHNIQUES. <u>R.M. Hartley</u> , <u>P. Gannon</u> and <u>R.B. Brugam</u> , Southern Illinois University, Edwardsville.                             |
| 9:30 AM  | 7  | THE SYSTEMATIC VALUE OF STAMENS IN THE SOLANACEAE. <u>R.C. Keating</u> and <u>W.G. D'Arcy</u> , Southern Illinois University, Carbondale, and Missouri Botanical Garden, St. Louis, MO.  |
| 9:45 AM  | 8  | CHANGES OBSERVED IN TRACE FORMATION IN THE FROND OF AN UPPERMOST DEVONIAN SEED FERN. <u>S.D. Klavins</u> , Southern Illinois University, Carbondale.   |
| 10:00 AM | 9  | PRE- AND POST-BURN VEGETATION DATA AND POST-BURN TREE SURVIVAL SURVEY IN A SAVANNA RESTORATION, FOREST GLEN PRESERVE, VERMILLION COUNTY, ILLINOIS. <u>Mary C. Hruska</u> and <u>John E. Ebinger</u> , Eastern Illinois University, Charleston. |
| 10:15 AM |    | BREAK  |
| 10:30 AM | 10 | AN UPLAND FLORA OF PERE MARQUETTE STATE PARK, JERSEY COUNTY, ILLINOIS. <u>A.M. DeJarnett</u> , Southern Illinois University, Edwardsville.   |
| 10:45 AM | 11 | THE DEVELOPMENT OF ACER SACCHARUM FOREST IN THE OZARK HILLS REGION OF ILLINOIS. <u>L.M. Strazzante</u> and <u>J.S. Fralish</u> , Southern Illinois University, Carbondale.   |

11:00 AM 12 THE PRESETTLEMENT FOREST BY SITE TYPE IN THE SOUTHERN COASTAL PLAIN REGION OF ILLINOIS. A.L. Schildt and J.S. Fralish, Southern Illinois University, Carbondale.

11:15 AM 13 MYCORRHIZAL DEPENDENCE OF BIG BLUESTEM (ANDROPOGON GERARDII) AND LITTLE BLUESTEM (SCHIZACHYRIUM SCOPARIUM) IN TWO PRAIRIE SOILS. R.C. Anderson, Illinois State University, Normal, and B.A. Hetrick and G.W.T. Wilson, Kansas State University, Manhattan, KS.

11:30 AM LUNCHEON AND ISAS BUSINESS MEETING

SESSION II - Friday, October 15

PRESIDING: Marian Smith

TIME

PAPER #

LOCATION: OHIO ROOM

1:45 PM 14 AN EXAMINATION OF THE RELATIONSHIP BETWEEN GARLIC MUSTARD (Alliaria petiolata) AND VESICULAR-ARBUSCULAR MYCORRHIZAL FUNGI. K.J. Roberts, Illinois State University, Normal.

2:00 PM 15 ELEVATION AND SEED DISPERSAL IN DISTURBED CYPRESS SWAMPS IN SOUTHERN ILLINOIS. B.A. Middleton, Southern Illinois University, Carbondale.

2:15 PM 16 METHODOLOGY INVOLVED IN THE STUDY OF HYDROCHORY AND SEED DENSITY PATTERNS WITHIN AN ALLUVIAL CYPRESS-TUPELO SWAMP IN SOUTHERN ILLINOIS. John R. Wilker, Southern Illinois University, Carbondale.

2:30 PM 17 FOREST DEVELOPMENT IN 10-12 YEAR OLD CLEARCUTS AT LAND BETWEEN THE LAKES IN KENTUCKY AND TENNESSEE. P.R. Snyder and J.S. Fralish, Southern Illinois University, Carbondale.

2:45 PM 18 WOODY VEGETATION OF ELKHART WOODS, LOGAN COUNTY, ILLINOIS. J. Ebinger, D. O'Connell, S. Turner, F. Catchpole, Eastern Illinois University, Charleston, and W. McClain, Illinois Department of Conservation, Springfield.



- 3:00 PM 19 EFFECTS OF GAS PIPELINE RIGHT-OF-WAY VEGETATION ON A POORLY DRAINED DECIDUOUS FOREST EDGE IN MIDLAND COUNTY, MICHIGAN: A DESCRIPTION OF THE HERBACEOUS FOREST UNDERSTORY. J.R. Rastorfer and J.A. Clemente, Chicago State University, Chicago, G.D. VanDyke, Trinity Christian College, Palos Heights, and S.D. Zellmer, Argonne National Laboratory, Argonne.
- 3:15 PM 20 WOODY VEGETATION OF THE COLLINSON ECOLOGICAL PRESERVE, ROCK ISLAND COUNTY, ILLINOIS. Ann M. Ehnle and Bohdan Dziadyk, Augustana College, Rock Island.
- 3:30 PM 21 COMPARISON OF WOODY VEGETATION OF TWO UPLAND FORESTS IN ROCK ISLAND COUNTY, ILLINOIS. Bohdan Dziadyk, Augustana College, Rock Island.
- 3:45 PM 22 PEELE'S LEPIOTA: A CASE OF SYSTEMATIC CONFUSION RESULTING FROM POPULARIZED PUBLICATION. B.P. Akers, Southern Illinois University, Carbondale.

SESSION III - Saturday, October 16      PRESIDING: Marian Smith

- | <u>TIME</u> | <u>PAPER #</u> | <u>LOCATION: LAWSON HALL</u>   |
|-------------|----------------|--|
| 9:00 AM     | 23             | BASIDIOCARP DEVELOPMENT AND CULTURAL CHARACTERISTICS OF RESUPINATUS ALBONIGER (AGARICALES; TRICHOLOMATACEAE). <u>A.S. Methven</u> and <u>M.A. Miller</u> , Eastern Illinois University, Charleston.  |
| 9:15 AM     | 24             | SPOROGENESIS IN SELECTED SPECIES OF <u>LEPIOPA</u> (BASIDIOMYCETES, LEPIOTACEAE, AGARICALES). <u>A.K. Krajec</u> and <u>W. J. Sundberg</u> , Southern Illinois University, Carbondale.   |
| 9:30 AM     | 25             | A COMPARATIVE STUDY OF SIX POPULATIONS OF <u>QUERCUS COCCINEA</u> IN NORTHERN AND SOUTHERN ILLINOIS. <u>D.A. Shepard</u> , Western Illinois University, Macomb.  |
| 9:45 AM     | 26             | VEGETATION RESPONSES TO A WETLAND AND PRAIRIE RESTORATION AT DRAGON LAKE FOREST PRESERVE, NAPERVILLE, ILLINOIS. <u>R.T. Bittner</u> and <u>D.J. Gibson</u> , Southern Illinois University, Carbondale, and <u>W. Lampa</u> , DuPage County Forest Preserve District, Glen Ellyn. |





11:00 AM 34 THE HEAT SHOCK RESPONSE IS A FUNCTION OF HABITAT IN SIPUNCULANS. Linda Dybas, Knox College, Galesburg.

11:30 AM LUNCHEON AND ISAS BUSINESS MEETING

SESSION II - Friday, October 15 PRESIDING: Howard Buhse

TIME PAPER # LOCATION: ILLINOIS ROOM

- 1:45 PM 35 THE EXAMINATION OF POSSIBLE TRANSLATIONAL CONTROLS OF HORMONAL RESPONSES IN BARLEY ALEURONE CELLS. Paul A.S. Benson and Mark R. Brodl, Knox College, Galesburg.
- 2:00 PM 36 THE EFFECTS OF BREFELDIN A ON THE GOLGI APPARATUS OF BARLEY ALEURONE CELLS. Maya A. Blakey and Mark R. Brodl, Knox College, Galesburg.
- 2:15 PM 37 NEUTRAL B-GALACTOSIDASE (B-GAL) ACTIVITY ENHANCED IN ARTIODACTYL LIVER CELLS. S.L. Campbell, G. Jara, S.B. Stahl and W.L. Daniel, University of Illinois, Urbana.
- 2:30 PM BREAK
- 2:45 PM 38 SIGNAL TRANSDUCTION DURING CELL DEVELOPMENT. P. Vortriede, C. Gutjahr and P. Wanda, Southern Illinois University, Edwardsville.
- 3:00 PM 39 GENISTEIN, A TYROSINE KINASE INHIBITOR, BLOCKS THE INITIATION BUT NOT THE EXECUTION OF ACUTE NEURITE RETRACTION. J.Y. Ali, Knox College and N.R. Smalheiser, University of Chicago, Chicago.
- 3:15 PM 40 MOLECULAR STUDIES ON A CLASS OF CALCIUM-BINDING CYTOSKELETAL PROTEINS IN VORTICELLA AND TETRAHYMENA. J.J. Maciejewski, E.J. Vacchiano and H.E. Buhse, Jr., University of Illinois, Chicago.
- 3:30 PM 41 A TEM AND SEM STUDY OF THE SCOPULA AND STALK OF VORTICELLA CONVALLARIA. R. Wibel, J.J. Maciejewski, E.J. Vacchiano and H.E. Buhse, Jr., University of Illinois, Chicago
- 3:45 PM 42 PROGRESS TOWARD THE ANALYSIS OF AMINO ACID COORDINATES INVOLVED IN HUMAN FIBRINOGEN CALCIUM BINDING. J.A. Glasner and M.G. Bolyard, Southern Illinois University, Edwardsville.

4:00 PM        43        A COMPARATIVE INVESTIGATION OF POTATO (CV. KATAHDIN) SHOOT REGENERATION FROM LEAF TISSUE: AN IMPROVED TWO-STAGE PROTOCOL CONTRASTED WITH STANDARDIZED METHODS. J.H. Hensley and M.G. Bolyard, Southern Illinois University, Edwardsville.

4:15 PM                    DIVISION BUSINESS MEETING

4:30 PM                    ADJOURN

CHEMISTRY DIVISION  
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DIVISION CHAIR:  
Philip D. Morse, II  
Department of Chemistry  
Illinois State University  
Normal, IL 61761

SESSION I - Friday, October 15

PRESIDING: Kurt Field

| <u>TIME</u> | <u>PAPER #</u> | <u>LOCATION: SALINE ROOM</u>                                                                                                                            |
|-------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1:45 PM     | 44             | CHEMISTRY AND ALCHEMY IN CASANOVA'S MEMOIRS. <u>R.F. Trimble</u> , Southern Illinois University, Carbondale.                                            |
| 2:00 PM     | 45             | THE SYNTHESIS OF PHENCYCLONE AND DIHYDROPHENCYCLONE. <u>G.A. Weisenburger</u> , <u>W.R. Forsyth</u> and <u>K.W. Field</u> , Bradley University, Peoria. |
| 2:15 PM     | 46             | SONOCHEMICAL BROMINATION OF SUBSTITUTED BENZENES. <u>J.M. Wagner</u> and <u>E.B. Flint</u> , Bradley University, Peoria.                                |
| 2:30 PM     |                | DIVISION BUSINESS MEETING AND BAXTER HEALTHCARE AWARD FOR BEST UNDERGRADUATE RESEARCH PAPER PRESENTATION IN CHEMISTRY.                                  |



## COMPUTER SCIENCE DIVISION

DIVISION CHAIR:  
 Lee H. Tichenor  
 Department of Computer Science  
 Western Illinois University  
 Macomb, IL 61455

SESSION I - Friday, October 15

PRESIDING: Lee Tichenor

| <u>TIME</u> | <u>PAPER #</u> | <u>LOCATION: KASKASKIA ROOM</u>                                                                                                                                                                                                      |
|-------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1:45 PM     | 47             | PASCAL DEBUGGER. <u>A. Ramakris</u> , Illinois College, Jacksonville, <u>W. Pittenger</u> , <u>D. Thompson</u> and <u>L. Leff</u> , Western Illinois University, Macomb.                                                             |
| 2:00 PM     | 48             | CAYLEY NUMBERS AND RANDOM NUMBERS GENERATION. <u>Patrick Lamont</u> , Western Illinois University, Macomb.                                                                                                                           |
| 2:15 PM     | 49             | USING A GALOIS FIELD TO DESIGN AN ERROR CORRECTING CODE. <u>R. Czerwinski</u> , Millikin University, Decatur.                                                                                                                        |
| 2:30 PM     |                | BREAK                                                                                                                                                                                                                                |
| 2:45 PM     | 50             | VISUAL DATABASE INTERFACE. <u>A. Ramakris</u> , Illinois College, Jacksonville, <u>L. Leff</u> and <u>Y. Sheng</u> , Western Illinois University, Macomb.                                                                            |
| 3:00 PM     | 51             | OUR EXPERIENCE IN IMPLEMENTING CLOSED LABORATORIES IN THE COMPUTER SCIENCE CURRICULUM. <u>Adel M. Abunawass</u> , Western Illinois University, Macomb, and <u>Theresa G. Fisher</u> , Saint Cloud State University, Saint Cloud, MN. |
| 3:15 PM     | 52             | COMPARISON AMONG FOUR SHAREWARE RAYTRACING PACKAGES, THEIR SCRIPT FILES AND APPLICABILITY FOR CLASS USE. <u>L.H. Tichenor</u> Western Illinois University, Macomb.                                                                   |
| 3:30 PM     |                | DIVISION BUSINESS MEETING                                                                                                                                                                                                            |

EARTH SCIENCE DIVISION  
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DIVISION CHAIR:  
 Richard L. Leary  
 Department of Geology  
 Illinois State Museum  
 Springfield, IL 62706

SESSION I - Friday, October 15                      PRESIDING: Richard Leary

<u>TIME</u>	<u>PAPER #</u>	<u>LOCATION: KASKASKIA ROOM</u>
3:45 PM	53	APPLICATION OF ELECTRICAL EARTH RESISTIVITY MEASUREMENTS IN CHARACTERIZING THE HYDRO-GEOLOGIC ENVIRONMENT IN ILLINOIS. <u>Philip C Reed</u> , Illinois State Geological Survey, Champaign.
4:00 PM	54	LEAF MORPHOLOGY VARIATION WITHIN <u>LESLEYA</u> : WHAT DOES IT MEAN? <u>Richard Leary</u> , Illinois State Museum, Springfield.
4:15 PM	55	BERTHIERINE PIPESTONES OF NATIVE AMERICANS IN THE MID-CONTINENT. <u>R.E. Hughes</u> and <u>D.M. Moore</u> , Illinois Geological Survey; <u>K.B. Farnsworth</u> , Center for American Archeology, Kampsville; and <u>T.E. Berres</u> , University of Illinois, Urbana.

ENGINEERING AND TECHNOLOGY AND PHYSICS DIVISIONS  
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DIVISION CHAIR:  
 Raghupathy Bollini  
 Department of Electrical Engineering  
 Southern Illinois University  
 Edwardsville, IL 62026

SESSION I - Friday, October 15                      PRESIDING: Raghupathy Bollini

| <u>TIME</u> | <u>PAPER #</u> | <u>LOCATION: SALINE ROOM</u>                                                                                                                |
|-------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 9:00 AM     | 56             | DRY FINE COAL BENEFICIATION UTILIZING OPEN-SYSTEM ELECTROSTATIC SEPARATOR. <u>Frank X. Wang</u> , Southern Illinois University, Carbondale. |
| 9:15 AM     | 57             | ACCOUNTING FOR COMPRESSIBILITY IN THERMODYNAMIC EQUATIONS. <u>Sundar Narayanan</u> , Southern Illinois University, Carbondale.              |

- 9:30 AM 58 A FORMULA OF BESSEL FUNCTIONS OF THE FIRST KIND. X.A. Lin and O.P. Agrawal, Southern Illinois University, Carbondale.
- 9:45 AM 59 SAFE DAM AND RESERVOIR DESIGN AND OPERATION. Krishan P. Singh, Illinois State Water Survey, Champaign.
- 10:00 AM BREAK
- 10:15 AM 60 RELATIVE AIR PERMEABILITY AS A FUNCTION OF SATURATION IN A FOUR-PHASE SOIL VENTING SYSTEM. C. Stylianou and B.A. Devantier, Southern Illinois University, Carbondale.
- 10:30 AM 61 ULTIMATE UPLIFT CAPACITY AND SHAFT RESISTANCE OF METAL PILES IN CLAY. E.C. Shin, Southern Illinois University, Carbondale.
- 10:45 AM 62 PLASMA PROCESSING USING A DIELECTRIC BARRIER DISCHARGE. B. Pashale and S.K. Dhali, Southern Illinois University, Carbondale.
- 11:00 AM 63 RESTORATION AND OPERATION OF AN ANTIQUE 12 INCH NEWTONIAN REFLECTING TELESCOPE. J.E. Nielson, W. Trentadue and Paul P. Szipiera, Harper College, Palatine.

ENVIRONMENTAL SCIENCE DIVISION  
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DIVISION CHAIR:  
 Karen S. Midden  
 Department of Plant and Soil Sciences  
 Southern Illinois University  
 Carbondale, IL 62901

SESSION I - Friday, October 15

PRESIDING: Karen Midden

TIME            PAPER #

LOCATION: MACKINAW ROOM

- 10:45 AM 64 LIGHT LIMITATION OF PRIMARY PRODUCTIVITY IN A CENTRAL ILLINOIS RESERVOIR. S.W. Phipps, J.H. Ensign, Jr. and C.L. Pederson, Eastern Illinois University, Charleston.



- 11:00 AM 65 EFFECTS OF GAS PIPELINE RIGHT-OF-WAY VEGETATION ON A POORLY DRAINED DECIDUOUS FOREST EDGE IN MIDLAND COUNTY, MICHIGAN: INITIAL HERBACEOUS PLANTS ON THE RIGHT-OF-WAY. J.R. Rastorfer and J.A. Clemente, Chicago State University, Chicago; G.D. Van Dyke, Trinity Christian College, Palos Heights; and S.D. Zellmer, Argonne National Laboratory, Argonne.
- 11:15 AM 66 WHERE DOES FOOD COME FROM? K.S. Midden, Southern Illinois University, Carbondale.

HEALTH SCIENCES DIVISION  
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DIVISION CHAIR:  
 Dennis J. Kitz  
 Department of Biological Sciences  
 Southern Illinois University  
 Edwardsville, IL 62026

SESSION I - Friday, October 15      PRESIDING: Dennis Kitz

- TIME      PAPER #      LOCATION: MISSISSIPPI ROOM
- 9:00 AM 67 CYTOKINE ENHANCEMENT OF IMMUNE RESPONSE IN DIABETIC MICE TO OPPORTUNISTIC FUNGAL PATHOGENS. T.L. Wildhaber, R.C. Soltys and D.J. Kitz, Southern Illinois University, Edwardsville.
- 9:15 AM 68 THE RELATIONSHIP BETWEEN THERMOTOLERANCE AND PATHOGENICITY IN THE ZYGOMYCETES. M.E. Parks and D.J. Kitz, Southern Illinois University, Edwardsville and M.M. McBride, Washington University School of Medicine, St. Louis, MO.
- 9:30 AM 69 IDENTIFICATION OF CD4+ CYTOTOXIC T LYMPHOCYTES THAT RECOGNIZE FOREIGN MHC CLASS I ANTIGENS BY AN INDIRECT PATHWAY. M.D. Shornick, B.M. Susskind, T. Mohanakumar, Washington University School of Medicine, St. Louis, MO. and D.J. Kitz, Southern Illinois University, Edwardsville.
- 9:45 AM 70 A PRELIMINARY MODEL FOR THE ROLE OF VARIOUS ONCOGENES IN THE GENESIS OF OVARIAN CARCINOMAS. A.G. Amador, J. Fanning and R.D. Hilgers, Southern Illinois University School of Medicine, Springfield.



- 10:00 AM 71 ALLIUM AND ITS ROLE IN DIETARY CANCER CHEMOPREVENTION. C.B. Lewandowski and C.W.C. Beecher, University of Illinois, Chicago.
- 10:15 AM 72 PATIENT EDUCATION PROGRAMS EMPLOYING INTERACTIVE COMPUTER-ASSISTED INSTRUCTION. R.N. Woll, N. Woll, Inc. San Jose.

MICROBIOLOGY DIVISION  
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DIVISION CHAIR:  
 Amrik S. Dhaliwal  
 Department of Biology  
 Loyola University  
 Chicago, IL 60626

SESSION I - Friday, October 15

PRESIDING: Amrik Dhaliwal

TIME

PAPER #

LOCATION: MACKINAW ROOM

- 9:00 AM 73 ELECTRON MICROSCOPY OF CYANOBACTERIA TREATED WITH THE EXTRACT OF ZINGIBER OFFICINALE AND INFECTED WITH CYANOPHAGE LPP-I. Humayra Ali, Amrik S. Dhaliwal, Warren Jones and M. Singh, Loyola University, Chicago.
- 9:15 AM 74 INFECTIVITY STUDIES OF CYANOPHAGE LPP-I TREATED WITH FRACTIONS OF THE EXTRACTS OF CAPSICUM FRUTESCENS SEPARATED BY CENTRIFUGATION TECHNIQUE. Francesca Turner and Amrik S. Dhaliwal, Loyola University, Chicago.
- 9:30 AM 75 INFECTIVITY OF TOBACCO MOSAIC VIRUS TREATED WITH THE FRACTIONS OF ALLIUM SATIVUM EXTRACT PREPARED BY USING SEPHADEX COLUMN CHROMATOGRAPHY. Asma Syeda and Amrik S. Dhaliwal, Loyola University, Chicago.

SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION DIVISION  
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DIVISION CHAIR:  
 James V. Rauff  
 Department of Mathematics  
 Millikin University  
 Decatur, IL 62522

SESSION I - Friday, October 15

PRESIDING: James Rauff

TIME

PAPER #

LOCATION: MACKINAW ROOM

|         |    |                                                                                                                                                                                                                     |
|---------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1:45 PM | 76 | FOSTERING AN APPRECIATION FOR SCIENCE IN NON-SCIENCE MAJORS. <u>Ralph Troll</u> , Augustana College, Rock Island.                                                                                                   |
| 2:10 PM | 77 | A COMPUTER VIDEO PROFILING SYSTEM TO ENHANCE SCIENCE TEACHING: RESULTS AND RECOMMENDATIONS. <u>P. Barrette</u> and <u>K. Wise</u> , Southern Illinois University, Carbondale.                                       |
| 2:30 PM | 78 | EMPLOYING DIRECT INSTRUCTION IN TEACHING MATH AND SCIENCE. <u>R.N. Woll</u> , N. Woll, Inc., San Jose.                                                                                                              |
| 2:50 PM | 79 | TEACHING SCIENCE IN GERMANY. <u>Frank Mittermeyer</u> and <u>W. Lagerwey</u> , Elmhurst College, Elmhurst.                                                                                                          |
| 3:10 PM | 80 | PROTOCELLS AND METAPROTOCELLS OF THE PROTOLIFE KINGDOM. <u>Aristotel Pappelis</u> , <u>Sidney W. Fox</u> , Southern Illinois University Carbondale, and <u>Michael Papaqiannis</u> , Boston University, Boston, MA. |
| 3:30 PM | 81 | ANTI-EVOLUTIONIST ACTIVITIES IN ILLINOIS PUBLIC SCHOOLS. <u>R.R. Traxler</u> , St. Louis Association for Teaching and Education, O'Fallon.                                                                          |
| 3:50 PM | 82 | ILLINOIS STATE BOARD OF EDUCATION AND CREATIONISM IN THE PUBLIC SCHOOLS. <u>Jack Bennett</u> , Northern Illinois University, DeKalb.                                                                                |
| 4:15 PM |    | DIVISION BUSINESS MEETING                                                                                                                                                                                           |

## ZOOLOGY DIVISION

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DIVISION CHAIR:  
 Dianne Jedlicka  
 Department of Biological Sciences  
 University of Illinois  
 Chicago, IL 60680

SESSION I - Friday, October 15      PRESIDING: Dianne Jedlicka

TIME      PAPER #      LOCATION: MISSISSIPPI ROOM

1:45 PM      83      A TWO-YEAR STUDY OF THE BENTHOS IN TWO ACID STRIP-MINE LAKES. J.B. Stahl and R.B. Brugam, Southern Illinois University, Carbondale.

2:00 PM      84      A FAUNAL STUDY OF THE MECOPTERA (INSECTA) OF ROCKY BRANCH, CLARK CO., IL. J.W. Griffiths and M.A. Goodrich, Eastern Illinois University, Charleston.

2:15 PM      85      HOME RANGE AND VERTICAL STRATIFICATION OF SYMPATRIC GOLDEN MICE AND WHITE-FOOTED MICE IN SOUTHERN ILLINOIS. D.A. Blumenstock and C.A. Feldhamer, Southern Illinois University, Carbondale.

2:30 PM      86      MICROHABITAT USE AND INTERSPECIFIC COMPETITION IN GOLDEN MICE AND WHITE-FOOTED MICE IN SOUTHERN ILLINOIS. D.A. Corgiat and G.A. Feldhamer, Southern Illinois University, Carbondale.

2:45 PM      87      BIOLOGY OF OXYPORUS STYGICUS (COLEOPTERA: STAPHYLINIDAE), INCLUDING A DESCRIPTION OF HOST PREFERENCES AND LIFE HISTORY. M.A. Goodrich and R.S. Hanley, Eastern Illinois University, Charleston.

3:00 PM      DIVISION BUSINESS MEETING AND BREAK

3:15 PM      88      GENDER-RELATED DIFFERENCES IN THE LEVELS OF STEROIDS IN THE ADRENALS OF ADULT WOODCHUCKS (MARMOTA MONAX). A.G. Amador, Southern Illinois University, Springfield, and A. Woolf, Southern Illinois University, Carbondale.

3:30 PM      89      GENETIC VARIATION IN YELLOW PERCH DETECTED BY MITOCHONDRIAL DNA ANALYSIS. N. Billington, Southern Illinois University, Carbondale.



- 3:45 PM 90 KARYOTYPIC ANALYSIS OF CYNOLEBIAS, A GENUS OF SOUTH AMERICAN ANNUAL KILLIFISH. E.D. Lowenthal and L.R. Scott, Augustana College, Rock Island.
- 4:00 PM 91 DIFFERENCES IN PANCREATIC INSULIN LEVELS AMONG NORMAL OUTBRED RAT STOCKS AND BETWEEN GENDERS. D. Pittman, A.G. Amador and R.D. Hilgers, Southern Illinois University School of Medicine, Springfield.
- 4:15 PM 92 DIFFERENCES IN OVARIAN STEROID LEVELS AMONG NORMAL OUTBRED RAT STOCKS. D. Pittman, A.G. Amador and R.D. Hilgers, Southern Illinois University School of Medicine, Springfield.

# POSTER SESSION

Friday, October 15  
5:00 PM - 6:15 PM

Southern Illinois University  
Student Center - Ballroom B

## POSTER #

- 93            WHITE-TAILED DEER BROWSING ON ILLINOIS PRAIRIE VEGETATION. E. Corbett, R.C. Anderson and J. Nelson, Illinois State University, Normal.
- 94            WETLAND MITIGATION: SEED BANKS OF A WETLAND AND AN AGRICULTURAL FIELD. M.R. Anderson and R.C. Anderson, Illinois State University, Normal.
- 95            EFFECTS OF ETHYLENE ON SELECTIVE RIBOSOMAL CISTRON REGULATION IN EXCISED BASAL, EQUATORIAL, NEAR-APICAL, AND APICAL LEAF BASE TISSUE FROM YELLOW, SWEET SPANISH ONIONS. C.S. Karagiannis and A.J. Pappelis, Southern Illinois University, Carbondale.
- 96            GERMINATION AND EMERGENCE OF TEN SWEET CORN VARIETIES. M.K. Faver and J.M. Coons, Eastern Illinois University, Charleston.
- 97            THE EFFECTS OF ULTRAVIOLET RADIATION ON DNA REPAIR IN CULTURED CHICK EMBRYO RETINAL EPITHELIAL CELLS. D.T. Clerc and A. Baich, Southern Illinois University, Edwardsville.
- 98            THE DNA BINDING BEHAVIOR OF A GROUP OF PROTEINS ISOLATED FROM CULTURED TOBACCO CELLS. R.L. Robinson and A. Baich, Southern Illinois University, Edwardsville.
- 99            THE NON-ENZYMATIC EFFECT OF MELANIN ON ORNITHINE. S. Kim and A. Baich, Southern Illinois University Edwardsville.
- 100           HYPERCARD STACKS FOR TEACHING BASIC CONCEPTS IN PLANT BIOLOGY AND GENERAL BIOLOGY. L.C. Matten, Southern Illinois University, Carbondale.
- 101           THE SCIENCE CENTER - IDEA TO OPENING. L.K. Herrold and J.F. Smith, Southern Illinois University, Carbondale.
- 102           ESSENTIAL CONCEPTS OF BIOLOGY ON HYPERCARD. D.M. Miller, Southern Illinois University, Carbondale.

- 103 LIFE-CYCLE, DRIFT, AND IMPOUNDING EFFECTS ON GAMMARUS PSEUDOLIMNAEUS (AMPHIPODA) IN AN ILLINOIS PRAIRIE STREAM. R.G. Moore, C.M. Delucchi and T.S. Howe, Augustana College, Rock Island.
- 104 CONSTRAINT LINE THEORY AND STABILIZATION. J.L. Kriz, Joliet Junior College, Joliet, and D.M. Jedlicka, University of Illinois, Chicago.
- 105 SEASONAL HABITAT SELECTION AND DIET CHOICE OF THE EASTERN FOX SQUIRREL (SCIURUS NIGER). D.M. Jedlicka, University of Illinois, Chicago.
- 106 SYSTEMATIC OF FOSSIL AND RECENT GONORYNCHID FISHES. T. Grande, University of Illinois, Chicago.



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# ABSTRACTS

1

EFFICACY OF A COMMERCIAL FAT SOURCE IN THE DIET OF EARLY WEANED LAMBS TRIAL I. A. E. Wertz and P. M. Walker, Illinois State University, Normal, IL 61790. Thirty-six Suffolk lambs were blocked by sex and stratified by weight to 18 pens to evaluate the dietary addition of a processed animal fat source. The trial consisted of three test diets, control (C), 3% added fat (T1), and 6% added fat (T2) and was divided into two periods. Medium energy-high fiber diets were fed during Period I (PI). The mean CP was  $24.26 \pm 1.0\%$  and the mean ADF was  $15.29 \pm .33\%$  for the diets during PI. High energy-lower fiber diets were fed during Period II (PII). The mean CP was  $16.83 \pm 1.53\%$  and the mean ADF was  $10.83 \pm 1.18\%$  for the diets during PII. Mean starting and ending weights of the lambs were  $19.6 \pm .12$  kg and  $57.2 \pm .68$  kg, respectively. The mean age of the lambs at the start of the trial was  $51.8 \pm 5.3$  d. During PI lambs fed T1 had 6.3% higher ( $P < .05$ ) ADG than C and lambs fed T2 had 7.6% higher ( $P < .05$ ) ADG than T1 and 13.9% higher ( $P < .05$ ) ADG than C. Lambs fed T1 and T2 had 10.7% improved ( $P < .05$ ) G:F over C in PI. No differences ( $P < .05$ ) in ADG, ADFI or G:F were observed in PII. The 6% added fat diet was more efficacious during Period I while the 3% added fat diet was more efficacious during Period II.

2

CRP CONTRACT HOLDERS' INTENTIONS FOR THEIR POST CONTRACT USE OF THEIR LAND. K. Munyoka, S.E. Kraft, and C. Lant, Southern Illinois University, Carbondale, IL 62901. Starting in 1996, the 36 million acres of land under CRP contracts in the US will start to become available for alternative uses. A significant public policy concern is what the owners of this land intend to do with it. Using survey data from ten midwestern counties, we address in this paper what the 114 farmers with CRP land intend to do with it. Data indicate that 25% intend to return it to crop production with a Conservation Compliance farm plan; 60.5% desire to keep their land in a CRP-like program. Socio-economic variables are used to characterize both groups of CRP-contract holders. The results are presented within a policy context relevant for the 1995 farm bill.

3

ECONOMIC EFFICIENCY OF DAIRY FARMS BY SIZE IN SOUTHERN ILLINOIS. By D. Kadekoy and P.R. Eberle, Southern Illinois University, Carbondale, Illinois, 62901. The purpose of this study is to investigate the relationship between technical efficiency of Southern Illinois dairy farms, by comparing input-output measures. Data from the Illinois FBFM records from 1980 to 1989 were used. Farms were grouped by hundred weight of milk produced into four size categories. The categories were less than 9,000 cwt, between 9,000 and 15,000 cwt, between 15,000 and 21,000 cwt, and greater than 21,000 cwt. Average milk productions per cow ranged between 15,000 and 20,000 Lbs. for the large-size farms, as compared to 12,000 and 14,000 Lbs. for the small-size farms. The results indicated that the larger farms consistently performed better than smaller farms, and the large farms had higher capital and labor productivity, and higher returns per \$100 feed fed. The results also show a trend toward larger and more specialized dairy farms.



THE PRICE AND USE OF NITROGEN IN SOUTHCENTRAL ILLINOIS: IMPLICATIONS FOR ENVIRONMENTAL POLICY. W. Duke and S.E. Kraft, Southern Illinois University, Carbondale, IL 62901. Factors influencing the price and demand for nitrogen fertilizer in south central Illinois are studied over time. The responsiveness of farmers in their demand for fertilizer given price changes is assessed. The impact of increasing the price of fertilizer on the demand for fertilizer is evaluated within a regression framework and the implications for Pigovian taxes are studied.

THREE-DIMENSIONAL RECONSTRUCTIONS FROM SERIAL CROSS SECTIONS USING A MACINTOSH. Lawrence C. Matten, Southern Illinois University at Carbondale, Carbondale, IL 62901. A method for producing three dimensional reconstructions from serial cross sections of plant parts has been developed using a relatively inexpensive combination of commercially available hardware and software components. The researcher needs a method for copying the sections into the Macintosh computer. This can be accomplished using one of the following: digitizing pad, tracing paper and image projector (camera lucida, contour projector, slide projector), camera mounted on a microscope, and scanner. The obtained images of the sections must be aligned; this is done at the time of initial recording or later with a graphics program. The images are converted into a single file. The assembled file is opened with a commercial three-dimensional graphics program and manipulated for various views and animations. The system used by the writer includes a scanner, a contour projector, and a Macintosh II CI. The computer requires loads of RAM memory (20 megabytes at a minimum). The entire system can be assembled for \$3,000- \$5,000. It is being used successfully with studies on fossil plants, but can be applied to standard paraffin sections of various plant tissues and organs.

MEASUREMENTS OF INORGANIC CARBON USAGE BY AQUATIC PLANTS OF ACID MINE LAKES USING pH DRIFT TECHNIQUES R.M. Hartley, P. Gannon and R.B. Brugam Southern Illinois University, Edwardsville, IL 62026. When aquatic plants are incubated in a closed, lighted, vessel containing water of a known  $\text{HCO}_3^-$  concentration, they raise pH to an equilibrium level that depends on their affinity for inorganic carbon. The higher the maximum pH attained, the lower the inorganic carbon level required for photosynthesis. We tested two species from a pH 3.0 coal mine lake (Sphagnum sp. and Mougeotia sp.), an exotic aquatic moss (Vesicularia dubyana) and a common aquatic weed of alkaline lakes (Myriophyllum spicatum) in pH drift experiments. Maximum pH's attained were: Sphagnum, 8.3; Vesicularia, 8.7; Mougeotia, 9.3; Myriophyllum spicatum, 10.6. The poor affinity of Sphagnum for inorganic carbon is surprising given the low levels of inorganic carbon found acid mine lakes.



## 7

THE SYSTEMATIC VALUE OF STAMENS IN THE SOLANACEAE. R. C. Keating, and W. G. D'Arcy, Southern Illinois University, Carbondale, 62901, and Missouri Botanical Garden, St. Louis, MO 63110. The nightshade family, with about 2500 species, has anthers containing systematically important features. The anthers are basifixed and poricidally or longitudinally dehiscent. Anatomically, they form unusual, systematically valuable features in the distribution of endothelial thickenings and of calcium oxalate crystals. In most species examined, a discrete crystal zone occurs one layer beneath the stomium. Cytoplasmically dense, it is formed early in anther ontogeny. At maturity it reaches its most extensive expression in the Subfamily Solanoideae. A similar substomial ontogeny is found in the Ericaceae. We argue that the tissue is a parallel development in that family and that it is probably not ancestral within the Solanaceae. Its function remains problematic although a number of suggestions can be ruled out.

## 8

CHANGES OBSERVED IN TRACE FORMATION IN THE FROND OF AN UPPERMOST DEVONIAN SEED FERN. S.D. Klavins, Southern Illinois University at Carbondale, Carbondale, IL 62901. Laceyia hibernica was described from the uppermost Devonian [Coomhola formation = lowermost Tournaisian (Tn 1a - 1b)] from Ballyheigue, County Kerry, Ireland. Petioles and rachises of the frond were studied in order to describe the anatomical and morphological changes that occur. Morphometric and statistical analyses were conducted to quantify features observed such as length and width of the petiole, cross-sectional area of vascular tissue, cross-sectional area of the sparganum outer cortex and ratio of vascular tissue and sparganum outer cortex to each other and to the cross-sectional area of the petiole. These quantitative features are being used to identify disarticulated fragments and their position within the frond.

## 9

PRE- AND POST-BURN VEGETATION DATA AND POST-BURN TREE SURVIVAL SURVEY IN A SAVANNA RESTORATION, FOREST GLEN PRESERVE, VERMILION COUNTY, ILLINOIS. Mary C. Hruska and John E. Ebinger, Eastern Illinois University, Charleston, IL 61920. There were several significant changes in the density and frequency of vegetation after the burn. Twelve herbaceous species increased in frequency, while five species decreased. Two shrubs increased in frequency: *Rubus allegheniensis* and *R. flagellaris*. One tree seedling decreased in frequency, *Juglans nigra*, while two decreased in density, *J. nigra* and *Prunus serotina*. One tree seedling increased in density: *Sassafras albidum*. One tree sapling decreased in frequency, *P. serotina*, while two decreased in density, *P. serotina* and *J. nigra*. For the post-burn tree survival survey individuals  $\geq 3\text{m}$  tall of *Quercus alba*, *Q. imbricaria*, *Q. rubra/velutina*, *J. nigra*, *Liriodendron tulipifera* and *Liquidambar styraciflua*, were fire resistant. *Quercus macrocarpa* was fire resistant when  $>1\text{m}$  tall. For all *Quercus* spp., individuals that were top killed exhibited good resprouting ability.



AN UPLAND FLORA OF PERE MARQUETTE STATE PARK, JERSEY COUNTY, ILLINOIS. A. M. DeJarnett, Southern Illinois University, Edwardsville, IL 62025. Five ridge and ravine areas, five hill prairies, and all marked hiking trails were surveyed. Four natural communities (dry upland forest/dry-mesic upland forest, mesic upland forest, limestone cliff, loess hill prairie) and three cultural communities (horse pasture, disturbed areas, roadsides) are described. Identified and deposited at SIU (Carbondale) were 450 species, nine lesser taxa, two hybrids, 100 families, 61 county records, and one state record. Sorensen's similarity index compiled for the park and the Olin Natural Area, Madison County, showed a similarity of 67%. For Twin Mounds Hill Prairie in 1950-51 and 1990-92 a similarity of 57% was found.

THE DEVELOPMENT OF *ACER SACCHARUM* FOREST IN THE OZARK HILLS REGION OF ILLINOIS. L. M. Strazzante and J. S. Fralish, Southern Illinois University, Carbondale 62901. Research is being conducted on the rate of invasion and growth of *Acer saccharum* (sugar maple) into mature undisturbed oak-hickory stands of the Illinois Ozark Hills region. Tree, sapling and seedling data were collected from 46 permanent nested plots of 0.04, 0.005, and 0.025 ha, respectively, located in the Ozark Hills Nature Preserve. These plots, first measured in 1986, were relocated and resampled. Data from the two measurement times are being analyzed to study the rate of composition change. Data from an additional 48 plots randomly located throughout the Ozark Hills region also are being analyzed. For all 94 plots, a compositional index [CI = sum of (Species Importance value x Adaptation value)] was developed separately for trees and for seedlings/saplings, and differences between overstory and understory compared to examine successional trends by site type. Results from a stand table projection procedure (TWIGS) will be compared with a forest growth simulator model (JABOWA) used to investigate long term change in forest composition. Early results indicate that *Acer saccharum* is rapidly replacing oak on all site types.

THE PRESETTLEMENT FOREST BY SITE TYPE IN THE SOUTHERN COASTAL PLAIN REGION OF ILLINOIS. A. L. Schildt and J. S. Fralish, Southern Illinois University, Carbondale 62901. Witness tree data from the 1806-7 original land survey records were used to reconstruct forest community patterns in the Gulf Coastal Plain region which extends approximately 35 Km into the southern tip of Illinois. Using topographic maps, section and quarter-section corners were categorized as upland or bottomland. Upland corners were further classified by aspect and slope position. Species importance values (relative basal area), and stand density and basal area were calculated for each site type (ridgetop, southwest slope, mid to high south slope, low south slope, north slope and stream terrace). *Quercus alba*, *Quercus velutina* and *Carya* spp. were the major species of most upland sites but a few mesophytic species occurred on low south, north and terrace sites. Bottomland sites were delineated by elevation, distance from the Ohio River and distance from the nearest permanent stream. *Fraxinus*, *Ulmus*, *Liquidambar* and *Quercus* (lowland species) occur on well-drained bottomlands while some *Taxodium* appeared in wettest areas.



MYCORRHIZAL DEPENDENCE OF BIG BLUESTEM (ANDROPOGON GERARDII) AND LITTLE BLUESTEM (SCHIZACHYRIUM SCOPARIUM) IN TWO PRAIRIE SOILS. R. C. Anderson, Illinois State University, Normal, IL 61790, and B. A. Hetrick and G. W. T. Wilson, Kansas State University, Manhattan KS 66506. Previous research in tallgrass prairie in Kansas indicated warm-season, C<sub>4</sub>, grasses are obligate mycotrophs. Growth of big bluestem and little bluestem was compared in prairie soil collected from Konza Prairie, Riley County Kansas and Sand Ridge State Forest, Mason County, Illinois. Plants of both species demonstrated a positive mycorrhizal response when grown in the Kansas prairie soil, but there was no mycorrhizal response when the plants were grown in the Illinois soil. The lack of a mycorrhizal response in the Illinois soil is attributed to the greater plant-available P level of this soil.

AN EXAMINATION OF THE RELATIONSHIP BETWEEN GARLIC MUSTARD (Alliaria petiolata) AND VESICULAR-ARBUSCULAR MYCORRHIZAL FUNGI. K.J. Roberts, Illinois State University, Normal, IL 61761. This study was designed to examine the interactions between garlic mustard, a nonmycotrophic plant, and the vesicular-arbuscular mycorrhizal fungi found in the soil in which it grows. Garlic mustard and tomato seedlings were grown in four substrates containing different levels of mycorrhizal inoculum. Pre- and post-bioassays and biomass of each plant species were compared for each of the various substrates. Garlic mustard plants grown in soils containing mycorrhizal inoculum produced less biomass than those grown in soil which was sterile. Tomato produced the greatest biomass when low levels of inoculum were present. Bioassays revealed that garlic mustard growth reduced levels of mycorrhizal inoculum in soil no differently than if no plants were grown in the soil at all.

ELEVATION AND SEED DISPERSAL IN DISTURBED CYPRESS SWAMPS IN SOUTHERN ILLINOIS. B. A. Middleton, Southern Illinois University, Carbondale, IL, 62901. Seeds are deposited in drift lines along the edge of the flood sheet of the river at elevations determined by flood dynamics. Because farmed cypress swamps are nearly devoid of cypress swamp seeds, flooding may be able to restore their seed banks with the more than 60 species of cypress swamps which disperse in the river. Monthly estimates of seed dispersal show that many species can disperse to farm fields via the flood sheet including cypress, planer-tree, buttonbush, and beggar-ticks. The highest numbers of seeds are deposited at the drift line of the water sheet. The location of the water sheet can be calculated daily by matching elevation and water gauge information. The work contributes to the basic understanding of seed dispersal in riverine systems and will be of value in the restoration of farmland to cypress swamp in areas along the Cache River targeted for restoration.



**METHODOLOGY INVOLVED IN THE STUDY OF HYDROCHORY AND SEED DENSITY PATTERNS WITHIN AN ALLUVIAL CYPRESS-TUPELO SWAMP IN SOUTHERN ILLINOIS.** John R. Wilker, Southern Illinois University, Carbondale, IL 62901. Seed dispersal by water, hydrochory, is directional and linear with respect to water current speed and direction, but has been shown to be affected by water surface currents as well as emergent stems. The general linear model of seed movement is tested by releasing marked seeds within a 20 m grid while monitoring the independent variables of; distance and direction traveled by seeds, wind and water direction and speed, emergent stem density, amount of lemna coverage and seed rain. Multiple regression analysis is used to relate the dependent variable of seed density to the independent variables. The hypothesis that seed dispersion over the water sheet is non-random and affected by the above independent variables is evaluated by collecting floating seeds and all independent variable values along 5 transects at permanent locations and mapping them using the Kringing method of spatial analysis, using the Geostat program.

**FOREST DEVELOPMENT IN 10-12 YEAR OLD CLEARCUTS AT LAND BETWEEN THE LAKES IN KENTUCKY AND TENNESSEE.** P. R. Snyder and J. S. Fralish, Southern Illinois University, Carbondale 62901. Research on forest re-establishment after timber harvesting at LBL is being conducted under the auspices of the Center for Field Biology, Austin Peay State University, Clarksville, TN, and the Department of Forestry, SIU. During the summers of 1992 and 1993, eight points were systematically located in each of 20 oak-dominated stands clearcut between 1980 and 1983. Each point was the center of 0.06 ha and 0.03 ha plots used to sapling saplings and seedlings, respectively; species and density data were collected for all woody stems. On the drier ridgetops and south slopes, regrowth appears to be similar in composition to the original overstory. On these sites, *Quercus stellata*, *Q. velutina* and *Q. falcata* were the major species in the sapling stratum of the new forest, while on south slopes, *Q. alba*, *Q. velutina*, and *Carya* dominated. Low east and north slopes and stream terraces supported a community of *Acer saccharum*, *Ulmus rubra* and associated species. In the absence of preharvest fire, there generally is an immediate conversion to mesophytes on moist sites.

**WOODY VEGETATION OF ELKHART WOODS, LOGAN COUNTY, ILLINOIS.** J. Ebinger, D. O'Connell, S. Turner, F. Catchpole, Eastern Illinois University, Charleston, IL 61920, and W. McClain, Illinois Department of Conservation, Springfield, IL 62706. Elkhart Woods is a high quality, mesic upland forest located 1 km east of the town of Elkhart. This isolated prairie grove is situated on a glacial kame, surrounded by relatively flat farmland. *Acer saccharum* Marsh. dominates all diameter classes, has the highest importance value (83 out of a possible 200), averages 132.5 stems/ha, and has a basal area of 9.33 m<sup>2</sup>/ha. Other species include *Ulmus rubra* Muhl., *Celtis occidentalis* L., *Fraxinus quadrangulata* Michx., *Ulmus americana* L., and *Quercus macrocarpa* Michx. The woods has a stand composition of 283.8 stems/ha and an average basal area of 25.24 m<sup>2</sup>/ha. The woody seedling and sapling layer is dominated *Acer saccharum*, with *Asimina triloba* (L.) Dunal. fairly common. The herbaceous layer is dominated by *Laportea canadensis* (L.) Wedd. with *Hydrophyllum virginianum* L. and *Asarum canadense* L. also common.



EFFECTS OF GAS PIPELINE RIGHT-OF-WAY VEGETATION ON A POORLY DRAINED DECIDUOUS FOREST EDGE IN MIDLAND COUNTY, MICHIGAN: A DESCRIPTION OF THE HERBACEOUS FOREST UNDERSTORY.\* J.R. Rastorfer and J.A. Clemente, Chicago State University, Chicago, IL 60628; G.D. Van Dyke, Trinity Christian College, Palos Heights, IL 60463; and S.D. Zellmer, Argonne National Laboratory, Argonne, IL 60439. Two sites were established in 1989 to document the development of plant communities on the right-of-way (ROW) and any compositional changes within adjacent forest communities that might be caused by ROW construction activities and ROW plant communities. Although the forested portions of both sites represented second growth, Site 1 had evidence of recent selective logging, whereas Site 2 had no marked evidence of logging for at least 50 years prior to 1989. The understory vegetation was analyzed by cover-class estimates using one-meter-square plots along three transects at each site. On the basis of 1990 and 1991 sample data, average coverages of ferns, forbs, sedges and grasses were 53%, 35%, 31%, and 7.6% for Site 1, respectively, and 24%, 14%, 27%, and 1.3% for Site 2, respectively. Our present data will be compared with those from future studies to determine whether the ROW effected any changes in the forest understory.

\* Work supported by Gas Research Institute, 8600 W. Bryn Mawr Avenue, Chicago, IL 60631.

WOODY VEGETATION OF THE COLLINSON ECOLOGICAL PRESERVE, ROCK ISLAND COUNTY, ILLINOIS. Ann M. Ehnle and Bohdan Dziadyk, Augustana College, Rock Island, IL, 61201-2296. We inventoried the 27 hectare remnant of upland forest using the point-quarter method. Thirty three species of trees, shrubs and vines are represented in the total density of 1230 stems/ha. Carya cordiformis and Ulmus rubra together account for approximately 40% of the density. Eleven species are represented by fewer than five stems/ha, and, especially striking, is the lack of all species of Fraxinus. The species with greatest basal area ( $m^2/ha$ ) are Quercus alba (5.35), Q. velutina (3.54) and Q. rubra (3.29) which contribute more than half of the total basal area (21.6) of woody stems. That few stems of any species approach or exceed one meter in diameter suggests logging in previous decades.

COMPARISON OF WOODY VEGETATION OF TWO UPLAND FORESTS IN ROCK ISLAND COUNTY, ILLINOIS. Bohdan Dziadyk, Augustana College, Rock Island, IL, 61201-2296. Black Hawk State Historic Site (BHS), formerly a state park, and Collinson Ecological Preserve (CEP) are two remnant forests surrounded by the Quad Cities metropolitan area (population 350,000) in northwest Illinois. Separated by three km, the two forests are situated on different soil associations and are drained by different streams. Topography of both is slightly rolling. At BHS Ostrya virginiana and Tilia americana are the species which contribute most to the total density (1289 stems/ha). Carya cordiformis and Ulmus rubra are most important at CEP (1230 stems/ha). This difference plus the absence of Fraxinus americana at CEP, an important species at BHS, indicate strong edaphic control of the woody species.



PEELE'S LEPIOTA: A CASE OF SYSTEMATIC CONFUSION RESULTING FROM POPULARIZED PUBLICATION. B.P. Akers, Southern Illinois University, Carbondale, IL 62901. An agaric species native to northern Florida, Lepiota humei Murrill, has been incorrectly cited as an undescribed mushroom with hallucinogenic properties in commercial, nontechnical literature. Spores of this mushroom were advertised for sale to the public under the name "Peele's Lepiota". Microscopic analysis of the spores, considered along with its popularized description, confirmed its identity as L. humei. Subjective bioassay failed to substantiate the hallucinogenic effects attributed to this species, nor were any other toxic effects indicated.

BASIDIOCARP DEVELOPMENT AND CULTURAL CHARACTERISTICS OF RESUPINATUS ALBONIGER (AGARICALES; TRICHOLOMATACEAE). A.S. Methven and M.A. Miller, Eastern Illinois University, Charleston, IL 61920. Basidiocarps of Resupinatus alboniger, a pleurotoid, lignicolous basidiomycete found on decaying hardwood logs and branches, were collected and somatic tissue isolates obtained. Culture mat analyses were completed on several different media to provide data for identification of somatic cultures and the presence of extracellular oxidases were determined. Basidiocarps were produced by isolates grown on Malt Extract Agar exposed to a fourteen hour light/dark cycle at 20° C. *In vitro* basidiocarp production facilitated an investigation of basidial nuclear behavior during meiosis and basidiospore ontogeny.

SPOROGENESIS IN SELECTED SPECIES OF LEPIOTA (BASIDIOMYCETES, LEPIOTACEAE, AGARICALES). A. K. Krajec and W. J. Sundberg, Dept. of Plant Biology, Southern Illinois University, Carbondale, IL 62901. In the mushroom genus Lepiota sensu lato, basidiospores exhibit considerable variation in shape. Spores of some species are ovoid to short-ellipsoid, others are fusiform, and still others are bicornute (somewhat truncate and spurred at the hilar appendix end). Because these micro-morphological variations appear to be species complex-specific and may be useful in elucidating phylogenetic relationships, this project was undertaken to determine when the differences develop. Sporogenesis of Lepiota cristata (Bolt.: Fr.) Kumm., Lepiota clypeolaria (Bull.: Fr.) Kumm., and Lepiota Krajec #62 (an as yet undetermined species), with spurred, fusoid, and ovoid-short ellipsoid spores respectively, was studied with scanning electron microscopy, light microscopy using plastic embedded thin sections, and standard procedures for anatomical evaluation of herbarium specimens. Sporogenesis was divided into four stages--inception, axis shift (to one oblique to the basidial vertical axis), spherical growth (on the oblique axis), and elongation (in line with the basidial vertical axis). Species complex-specific differences appeared late in spore ontogeny--during stage four, the elongation stage. The hilar appendix was initiated in late stage one and achieved its maturity by the early part of stage four.



A COMPARATIVE STUDY OF SIX POPULATIONS OF QUERCUS COCCINEA IN NORTHERN AND SOUTHERN ILLINOIS. D.A. Shepard, Western Illinois University, Macomb, IL 61455. A Principal Components and Discriminant Functions Analysis based on twenty one morphological character states of the leaves, buds, fruit and twigs was performed on five northern Illinois populations of the purported taxon Quercus ellipsoidalis Hill., and one population of the taxon Quercus coccinea Muenchh. from southern Illinois. The statistical results and additional soil and ecological studies showed no significant differences between northern and southern populations that might support the current recognition of two taxa within the state of Illinois. Herbarium analysis also revealed three syntype specimens of Quercus ellipsoidalis collected by E. J. Hill and one collected by William Trelease labeled also Quercus ellipsoidalis, possessing the diagnostic characters of Quercus coccinea. Quercus ellipsoidalis does not appear to be a valid taxon in the state of Illinois and should be synonymized with Quercus coccinea.

VEGETATION RESPONSES TO A WETLAND AND PRAIRIE RESTORATION AT DRAGON LAKE FOREST PRESERVE, NAPERVILLE, ILLINOIS. R. T. Bittner<sup>1</sup>, D. J. Gibson<sup>1</sup>, and W. Lampa<sup>2</sup>, <sup>1</sup>Dept. of Plant Biology, Southern Illinois University at Carbondale, Carbondale, IL 62901 and <sup>2</sup>DuPage Co. Forest Preserve District, Glen Ellyn, IL 60137. Two years after initiating a wetland and prairie restoration, vegetation sampling was conducted in a restored old field and wetland, and an unrestored control. Species were identified and their respective ground cover estimated to quantify the state of the restoration. Principal Components Analysis and ANOVA was used to compare vegetation in the three areas. Compared with the control, wetland vegetation was significantly higher in native species cover, diversity, and evenness, and lower in total and adventive species cover, and homogeneity. Conversely, the restored old field showed no significant differences to the control apart from higher grass cover in the former. The restoration efforts seem to be working better in the wetland than in the restored old field.

THE RELATIONSHIP BETWEEN MYCORRHIZAL INOCULUM POTENTIAL OF FOREST SOILS AND THE DISTRIBUTION OF GARLIC MUSTARD (Alliaria petiolata).

M.S. Tyler, R.C. Anderson, and K.J. Roberts, Illinois State University, Normal, IL 61761. Garlic mustard is a nonmycorrhizal, exotic plant species which has invaded Illinois forest habitats. The relationship between the vesicular-arbuscular mycorrhizal (VAM) inoculum potential of nine forest sites and the occurrence of garlic mustard was examined. The VAM inoculum potential of the soil of all sites was measured using a corn root bioassay; the range varied from 0-8.2 %. No consistent pattern was found between the mycorrhizal inoculum potential of the soil and the distribution of garlic mustard.



MEDIA EFFECTS ON GERMINATION OF PACIFIC YEW (TAXUS BREVIFOLIA) EMBRYOS. S.E. Allen and M.G. Bolyard, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1651. Two separate media experiments were conducted on immature Pacific yew embryos. The first experiment was designed to find a medium that gave more favorable germination and growth rates than the medium (Murashige and Skoog) that was currently in use. Of the four media tested, (Vacin and Went, Heller's, Eriksson's and Lindeman's), Vacin and Went gave the highest germination rates, although Heller's produced comparable growth rates after germination. In the second experiment, gibberellic acid was added to the media in an attempt to boost germination rates further. Low concentrations of gibberellic acid (2.5 - 5.0 $\mu$ M) were found to have a positive effect on germination rates of yew embryos.

EVALUATION OF PARAMETERS NECESSARY FOR GENETIC ENGINEERING OF AMERICAN ELM. D.A. Stone and M.G. Bolyard, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1651. Progress is being made toward producing transgenic American elms (Ulmus americana) by electroporation and Agrobacterium-mediated transformation. Parameters for leaf explant electroporation such as compatible buffers and incubation times, as well as appropriate levels of kanamycin for selection have been determined. Conditions are also being determined for Agrobacterium-mediated transformation, although augmentin levels necessary to kill the bacteria after co-cultivation may inhibit shoot regeneration. Transformation efficiencies can also be increased by improving tissue culture methods. Shoot regeneration has been tested using several growth regulator combinations. Varying levels of the cytokinins kinetin, benzyladenine, or zeatin have been combined with thidiazinon to improve regeneration from leaf explants. After 10-12 weeks, mature shoots were transferred to soil, where further comparisons were made to determine optimal conditions for development of shoots into rooted trees.

SEASONAL PATTERNS IN PHOTOSYNTHESIS AND WATER-USE-EFFICIENCY OF SUN AND SHADE POPULATIONS OF MUHLENBERGIA SOBOLIFERA. Marian Smith, Southern Illinois University at Edwardsville, IL, 62026-1651. M. sobolifera is one of the few C<sub>4</sub> species native to understory habitats, and occurs throughout the NE and Central United States. In a mixed hardwood forest in Illinois in which recent cutting had exposed a population of M. sobolifera, a study was conducted to compare gas exchange characteristics in sun and shade plants during summer 1992. Maximum assimilation rates and leaf temperatures were higher and water-use-efficiency lower in sun plants than in shade plants. Assimilation saturated with respect to light at low levels of PFD (ca. 200  $\mu$ E) in both groups of plants, and it is proposed that in habitats where water is limiting the slightly higher assimilation rate of sun plants may be offset by water loss to the extent that M. sobolifera is generally excluded from high-light habitats.



THE CYTOSKELETON AND SECRETION IN HEAT-SHOCKED BARLEY ALEURONE CELLS. Jennifer Lonsdale and Mark Brodl, Knox College, Galesburg, IL 61401. Research has found that heat shock (HS) causes the production of an elite set of heat shock proteins (hsps) in all organisms. Other physiological and biochemical changes have also been documented following HS. Our laboratory focuses on the changes in gene expression caused by HS in the barley aleurone cell. Heat shock not only causes the production of hsps in these cells, but also the selective suppression of secretory protein synthesis and the selective destabilization of secretory protein mRNAs. Non-secretory protein synthesis continues during HS. In our model system, HS also causes the collapse of the endoplasmic reticulum (ER). It has been hypothesized that by causing the dissociation of the ER, HS destabilizes the mRNA of secretory proteins, which are translated by ER-bound ribosomes. We are interested in the mechanism for selective suppression of secretory protein synthesis during HS, and much of our research focuses on the cause of ER dissociation. In animal cells the cytoskeleton collapses during HS. In our system indirect immunofluorescence microscopy has revealed that HS causes the collapse of microtubules (MTs) within the cell. In normal aleurone cells, MTs are evenly dispersed in the cytoplasm. Following HS, however, MTs are concentrated near the aleurone grains and the nucleus of the cell. Currently, ELISA tests are being performed to quantitate this cytoskeletal collapse. Animal research has also shown that the distribution of the ER is highly dependent on the cytoskeleton. If this is true in plant cells, the collapse of the MTs previously described could lead to the dissociation of the ER. We will report on experiments in which aleurone cells have been exposed to microtubule-disrupting drugs (taxol, colchicine, oryzalin, and trifluralin), in an effort to assess whether this relationship exists between the ER and the MTs in the aleurone cell.

THE EFFECTS OF HEAT SHOCK AND ABSCISIC ACID ON THE BARLEY ALEURONE CELL, Ana Tobar and Mark Brodl, Knox College, Galesburg, IL 61401. Our laboratory investigates the changes in gene expression in the barley aleurone cell caused by heat shock. Mature barley aleurone cells treated with gibberellic acid (GA, a phytohormone) and heat shock have shown the selective suppression of the synthesis of secretory proteins and the induction of several stress related proteins. Transmission electron microscopy has shown that heat shock causes a delamination and fragmentation of the endoplasmic reticulum (ER) lamellae of barley aleurone cells. This destruction of the ER in response to heat shock may cause the suppression of secretory proteins synthesis. Abscisic acid (ABA) is a phytohormone which is naturally produced in developing barley grains to induce the synthesis of storage proteins and eventually to promote dormancy. It has also been documented that ABA is produced in plants undergoing stress, and it may make plants more resistant to the detrimental effects of heat shock. In the aleurone layer of mature barley grains ABA induces the synthesis of a novel set of ABA-induced proteins. Ultrastructurally ABA causes a measurable proliferation of the (ER). ABA also counteracts the effects of GA by suppressing the synthesis of secretory protein alpha-amylase and other GA-induced proteins. Gibberellic acid is naturally produced in the mature barley grain to drive the cell to germination. This project deals with the changes in cell biology that occur during heat shock in ABA-treated cells. We have shown that during heat shock ABA-treated aleurone cells retain the ability to synthesize proteins and ABA-induced cells continue to secrete proteins. Furthermore, longer term heat shock (6 hours) appears to increase the amount of ABA-induced proteins synthesized and the ABA-induced cells sustain the secretion of normal cellular proteins. These observations indicate that ABA may enhance the thermostability of the ER in barley aleurone cells.

SECRETORY PROTEIN MRNA STABILITY IN HEAT-SHOCKED BARLEY ALEURONE CELLS AND THE ROLE OF SIGNAL SEQUENCES. Brian A. Fischer and Mark R. Brodl, Knox College, Galesburg, IL 61401. Barley aleurone cells synthesize and secrete a battery of hydrolytic enzymes upon exposure to gibberellic acid (GA), among them alpha-amylase. The endoplasmic reticulum (ER) also proliferates upon exposure to GA, in order to sustain the secretory effort. Exposure to heat shock causes the delamination and fragmentation of the ER lamellae and the selective destabilization of secretory protein mRNA, but heat shock does not affect nonsecretory protein synthesis. The principle difference between secretory and nonsecretory protein synthesis is the location where translation occurs. The presence of a signal sequence at the 5' end of secretory protein mRNA targets that mRNA for translation at the ER. The lack of a signal sequence at the 5' end of nonsecretory protein mRNA targets that mRNA for translation by free ribosomes. We Hypothesize that during heat shock, secretory protein mRNA is rendered unstable because the site of its translation (ER) is destroyed, meaning that the presence or absence of the signal sequence on the 5' end of the mRNA could be an important determinant of mRNA stability in this system. In order to test this hypothesis, we are using PCR to prepare a series of GUS reporter constructs containing the signal sequence of alpha-amylase and/or its 5' and 3' untranslated regions. These constructs will be introduced to barley aleurone cells by microprojectile bombardment. At this conference we will report on the construction of these GUS constructs by PCR cloning methods.



THE HEAT SHOCK RESPONSE IS A FUNCTION OF HABITAT IN SIPUNCULANS. L. Dybas, Knox College, Galesburg, IL 61401. Sipunculan worms are distributed throughout the polar, temperate, and tropical oceans with benthic habitats ranging from intertidal zones to abyssal depths. In this study the heat shock response of two species of sipunculans (*Phascolosoma agassizii*, collected from rock crevices in the intertidal zone and *Golfingia pugettensis*, collected by dredging at depths of 30 meters in the San Juan Archipelago on the northwest coast of the state of Washington) is compared. The water temperature in both habitats ranges from 11-14°C however at very low tides *P. agassizii* may be subjected to short exposure to elevated temperatures that may be as high as 35°C. In both species elevated temperatures induced synthesis of heat shock proteins identified by SDS-PAGE of <sup>35</sup>S- methionine- radiolabeled proteins) which persisted for more than 20 hrs. Pulse-chase experiments estimated their half-life is between 12 and 16 hrs. During this time there was suppression of many normal cellular proteins and induction of new secreted proteins. At 24h animals had completely recovered at the molecular level. In many other organisms, including tropical sipunculans, production of heat shock proteins is associated with thermotolerance. This is not the case with these temperate species. A second heat shock (same temperature and time) after a 24h recovery period was lethal for both species. Although there are overall similarities in the responses of these sipunculans to heat, *P. agassizii* which inhabits an environment regularly subjected to more change, tolerated much higher temperatures and longer exposure to higher temperature and responded more quickly than did *G. pugettensis*.

THE EXAMINATION OF POSSIBLE TRANSLATIONAL CONTROLS OF HORMONAL RESPONSES IN BARLEY ALEURONE CELLS. Paul A. S. Benson and Mark R. Brodl. Knox College, Galesburg, IL 61401.

Upon exposure to the phytohormone, gibberelic acid (GA<sub>3</sub>), cells in the aleurone layer of the barley seed synthesize and secrete an array of hydrolytic enzymes in preparation for germination. Data from SDS-PAGE studies have documented that the addition of GA<sub>3</sub> results in a commitment on the part of the aleurone cell to the synthesis of these secreted hydrolases. Other studies have indicated that the genes encoding these hydrolases have a pronounced GC bias in the 'wobble' position, as compared to the proteins in cells cultured in the absence of GA<sub>3</sub>. This phenomenon may also be reflected in the tRNA populations of GA<sub>3</sub>-stimulated barley aleurone layers. Though the GA<sub>3</sub>-induced change in gene expression could be primarily attributed to transcript abundance, we are investigating the possibility that another mechanism for the control of the observed hormonal responses in the barley aleurone cells lies at the level of translational efficiency. Ribosomes and initiation factors will be extracted from cured commercial lysates (wheat and rabbit reticulocyte) by ultracentrifugation. Poly-A<sup>+</sup> RNA and tRNA have been isolated from barley aleurone cells by oligo-dT column chromatography. These components will be combined in *in vitro* translation assays to assess the translational efficiencies of specific mRNAs in tRNA pools derived from aleurone layers incubated in the presence or absence of GA<sub>3</sub>.

THE EFFECTS OF BREFELDIN A ON THE GOLGI APPARATUS OF BARLEY ALEURONE CELLS. Maya A. Blakey and Mark R. Brodl, Knox College, Galesburg, IL 61401. Brefeldin A (BFA) is a drug that interrupts the secretory pathway between the ER and the Golgi apparatus. BFA stops the antrograde vesicle movement that exists between the ER and the Golgi; however, retrograde vesicle traffic still continues. This results in the eventual dismantling of the Golgi complex. Much experimentation on the effects of the drug BFA has already been done in animal cells but little is known about the effects of BFA on plant cells. We report here that BFA suppresses the synthesis and secretion of proteins from the aleurone layers of barley grains. This suppression is correlated with the appearance of Golgi marker enzyme activity (IDPase) in fractions containing ER marker enzyme activity (cytochrome *c* reductase) on continuous sucrose gradients. We are currently examining the ultrastructure of BFA-treated barley aleurone layers. Preliminary data indicate a marked reduction of Golgi organelles within three hours of BFA treatment.



NEUTRAL  $\beta$ -GALACTOSIDASE ( $\beta$ -GAL) ACTIVITY ENHANCED IN ARTIODACTYL LIVER CELLS. S.L. Campbell, G. Jara, S.B. Stahl, and W.L. Daniel, University of Illinois, Urbana, IL 61801. Acid  $\beta$ -GAL (EC 3.2.1.23) occurs primarily in lysosomes of most mammalian cells. Artiodactyls (pig, sheep, and deer) possess an additional  $\beta$ -GAL activity that also localizes to lysosomes. Rodent (rat, mouse), primate (human), and canine (dog) hepatic cells expressed very low levels of the second enzyme. This unusual isozyme exhibited properties that more closely resembled those described for mammalian neutral  $\beta$ -GAL, did not aggregate like its acidic counterpart, and was immunologically distinct from acidic  $\beta$ -GAL. Enhancement of the "neutral"  $\beta$ -GAL was limited to liver, kidney, and duodenal cells, while cultured porcine fibroblasts, skin biopsies, leukocytes, and brain cells lacked detectable activities of this isozyme.

SIGNAL TRANSDUCTION DURING CELL DEVELOPMENT. P. Vortriede, C. Gutjhar, and P. Wanda, Southern Illinois University, Edwardsville, IL 62026.

The effect of induction of cell development in a human leukemia cell line, K562, on second messenger production was investigated. Mammalian cell proliferation and development are initiated when chemical signals are received from the external environment and mediated to the nucleus by means of a secondary signal system involving inositol phospholipid metabolism. We grew K562 cells in the presence of radiolabeled inositol  $\pm$  12-O-tetradecanoylphorbol-13-acetate (TPA) at 4 nM concentration or genistein at 40  $\mu$ M (agents for cell development) and  $\pm$  epidermal growth factor (EGF) at 100 ng/ml (agent for cell proliferation) and extracted radiolabeled inositol phosphates, separated by ion exchange chromatography, and analyzed by liquid scintillation counting. We found that when K562 cells were induced to develop that levels of second messenger production were reduced when compared to induction of cell proliferation.

GENISTEIN, A TYROSINE KINASE INHIBITOR, BLOCKS THE INITIATION BUT NOT THE EXECUTION OF ACUTE NEURITE RETRACTION. J.Y. Ali and N. R. Smalheiser, Knox College, Galesburg, IL, 61401 and Univ. of Chicago, Chicago, IL 60637.

Retraction of neurites is involved in the regulation of axonal growth and in the emergence of stable neuronal networks. Genistein prevents retraction of NG108-15 cell neurites [J. Neurochem. 61: 340-343, 1993], but its cellular target remains unclear. When neurites were exposed to lysophosphatidic acid (LPA; 10  $\mu$ M), most exhibited thickening, followed by shortening and complete retraction. If genistein (100  $\mu$ M) was added at the same time as LPA, all morphologic changes were blocked. However, if genistein was added 1-3 minutes later, in the continued presence of LPA: a) nearly all neurites which had already begun to shorten continued to retract completely; b) neurites which had not yet shown thickening progressed to thicken and/or shorten further, but (unlike those exposed in parallel to LPA alone) usually did not retract completely within 10 minutes. These findings suggest that genistein blocks the initiation, but not the execution, of LPA-induced neurite retraction. Partial protection by genistein could indicate that retraction involves more than one underlying commitment event per neurite; less likely, genistein might have a second effect in slowing the progress of retraction. Supported by a Ford Foundation summer fellowship to J. Y. A.



MOLECULAR STUDIES ON A CLASS OF CALCIUM-BINDING CYTOSKELETAL PROTEINS IN *VORTICELLA* AND *TETRAHYMENA*. J. J. Maciejewski, E. J. Vacchiano, and H. E. Buhse, Jr., Department of Biological Sciences, University of Illinois at Chicago, Chicago, IL 60680. The cytoskeletons of both *Vorticella* and *Tetrahymena* contain members of a family of proteins which we call calfilamins. These proteins are calcium-binding, filament-forming, cytoskeletal proteins with a molecular weight in the range of 20 kD. The *Vorticella* calfilamin, called spasmin, and the *Tetrahymena* calfilamin, a caltractin/centrin homologue, have both been shown to be immunologically related to the well-characterized *Chlamydomonas* calfilamin, caltractin. Southern blot analysis revealed that a *Chlamydomonas* caltractin cDNA clone hybridized to a 3.2 kb band of EcoRI-digested *Tetrahymena vorax* genomic DNA. The sequences of two *Vorticella convallaria* spasmin peptides, a 19-mer and an 8-mer, were used to design three oligonucleotide probes for the spasmin gene. Northern blot and genomic Southern blot analyses have been performed and preliminary data are being used to construct a cDNA library for *V. convallaria*.

A TEM AND SEM STUDY OF THE SCOPULA AND STALK OF *VORTICELLA CONVALLARIA*. R. Wibel, J.J. Maciejewski, E.J. Vacchiano, and H.E. Buhse, Jr. University of Illinois at Chicago, Chicago, IL 60680. Electron Microscopic examination of Triton extracted and non-extracted *Vorticella* show that the stalk forms from the aboral surface of cell body between the last scopular ridge and the scopular organelles (9+0 cilia). The stalk consists of an outer sheath constructed of hexagonal components forming tubules that parallel the long stalk axis, and a central matrix in which is embedded the acentrically placed contractile spasmoneme. When *Vorticella* transforms into a motile telotroch, the stalk is jettisoned and the last scopular ridge extends enfolding the scopular organelles and producing a seal that excludes the external environment.

PROGRESS TOWARD THE ANALYSIS OF AMINO ACID COORDINATES INVOLVED IN HUMAN FIBRINOGEN CALCIUM BINDING. J.A. Glasner and M.G. Bolyard, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1651. The conversion of fibrinogen to fibrin during the blood coagulation cascade is known to require calcium ions. Each of the two  $\gamma$  chains of fibrinogen contains one high affinity calcium binding site. DNA encoding a region of the  $\gamma$  chain containing this site has previously been inserted into a prokaryotic expression vector, and the  $\gamma$  chain segment ( $\gamma$  259-411) has been expressed. Our current project involves site-directed mutagenesis of the six amino acids proposed to be involved in calcium binding, as determined by comparison of those sequences to other calcium binding domains. We have designed and assembled synthetic oligonucleotides which make sequential changes in this domain, and we are currently screening colonies for those containing the altered amino acids. Examination of this calcium binding domain will increase our understanding of the function of human fibrinogen.

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A COMPARATIVE INVESTIGATION OF POTATO (CV. KATAHDIN) SHOOT REGENERATION FROM LEAF TISSUE: AN IMPROVED TWO-STAGE PROTOCOL CONTRASTED WITH STANDARDIZED METHODS. J.H. Hensley and M.G. Bolyard, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1651. Leaf explants of Katahdin, a North American Potato Cultivar, were used in a two-stage shoot regeneration procedure. Explants were first cultured on media containing varying concentrations of Thidiazuron and  $\alpha$ -Naphthaleneacetic acid using a factorial design. Several of the combinations resulted in the production of green callus. The callus was then transferred to a medium containing Zeatin, 3-Indoleacetic acid, and Gibberellic acid which resulted in shoot formation. This process is compared to other potato regeneration protocols which have been applied to other cultivars. Regeneration of potato from leaf tissue is used frequently in transformation via agrobacterium.

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CHEMISTRY AND ALCHEMY IN CASANOVA'S MEMOIRS. R.F. Trimble, Southern Illinois University, Carbondale, IL 62901. Casanova's life spanned the period during which modern chemistry began to emerge. Scattered through his memoirs are glimpses of the chemical knowledge and alchemical beliefs of the time. Some of these, such as his "augmentation" of mercury, the alchemical beliefs of Mme d'Urfe, the assessment of Boerhaave as a chemist, and his encounters with St. Germain and Cagliostro, will be presented for their intrinsic interest and possible use to illustrate points in chemistry lectures.

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THE SYNTHESIS OF PHENCYCLONE AND DIHYDROPHENCYCLONE. G.A. Weisenburger, W.R. Forsyth, and K.W. Field Bradley University, Peoria, IL 61625. The base catalyzed condensation of 1,3-diphenylacetone and phenanthrenequinone can be used to synthesize either phencyclone or dihydrophencyclone. When the condensation is performed at room temperature using solid potassium hydroxide and approximately equimolar quantities of the ketone and quinone in ethanol solvent, high purity phencyclone is produced in moderate yield. In refluxing ethanol, a 2:1 molar ratio of the quinone:ketone coupled with the dropwise addition of ethanolic potassium hydroxide affords high purity dihydrophencyclone in moderate yield. Preliminary studies suggest that ethanol and the quinone participate in the reduction of phencyclone to dihydrophencyclone.



SONOCHEMICAL BROMINATION OF SUBSTITUTED BENZENES. J. M. Wagner and E. B. Flint, Bradley University, Peoria, IL 61625. The reaction of tetra-*n*-butylammoniumtribromide (TBABr<sub>3</sub>) with substituted benzenes in the presence of high intensity ultrasound results in the formation of brominated products in higher yields and shorter times than thermal and photochemical methods. Reaction of TBABr<sub>3</sub> with styrene produces 1,2-dibromostyrene. Mesitylene and TBABr<sub>3</sub> in the presence of ultrasound react to form 2-bromomesitylene in upwards of 50% yield in less than 5 minutes. These procedures hold the promise for safer reactions involving bromine that avoid the use of Br<sub>2</sub> and halogenated solvents.

PASCAL DEBUGGER. A. Ramakris, Illinois College, Jacksonville, IL 62650, and W. Pittenger and D. Thompson and L. Leff, Department of Computer Science, Western Illinois University, Macomb, IL 61455. One program is written in "C" on "UNIX". It is an exercise which helps to improve the debugging skills of a novice PASCAL programmer. It works like this; A program is taken and unknown "bugs" are introduced into it. The student inserts as many "Print" statements as they want into the program. Then, the program is executed with the bugs and the print statements. The output is produced and the student can either guess the bug or try again with more print statements. They have only three guesses. A similar program was written in Turbo Pascal under MS-DOS. An additional program supports similar debugging training for IBM 360 Assembler Language students (using the CMS debugger). This program will choose an unknown (based upon a debugger) and will stop the CMS Debugger from displaying the instruction just executed. This forces the student to find the error using the breakpoints and display statements supported by the CMS Debugger.

## CAYLEY NUMBERS AND RANDOM NUMBER GENERATION.

Patrick Lamont, Western Illinois University, Macomb, IL 61455.

Random number generators classically are iterated mappings  $f$  of reduced possibly vector residue systems with modulus an integer  $m$  often related to the computer word size. Suitable simple congruence, shift-register and lagged-Fibonacci mappings, using seeds, yield sequences of numbers satisfying statistical tests for randomness. For invertible  $f$  in simple congruential methods we have effective periods of order  $O(m)$ . Using Cayley integers [1] further increases in period for lagged-Fibonacci methods and their improvements [2] will be of use in genetic algorithms and other simulations.

[1] P. J. C. Lamont, **Unique factorization in Cayley arithmetics and cryptology.** Glasgow Math. J. 33 (1991), 267-273.

[2] G. Marsaglia, **The Mathematics of Random Number Generators.** Proceedings of Symposia in Applied Mathematics 46 (1991), 73 - 90.



USING A GALOIS FIELD TO DESIGN AN ERROR CORRECTING CODE. R. Czerwinski, Millikin University, Decatur, IL 62522. This presentation is an exposition of the Bose-Chaudhuri-Hocquenghem algebraic error-correcting code used on binary 4-digit packets of information in data communication. Each digit of the code is associated with an element of a 16 element Galois field. It is then possible to derive an algebraic equation whose roots represent the location(s) of up to two errors which can then be corrected without retransmission.

VISUAL DATABASE INTERFACE. A. Ramakris, Illinois College, Jacksonville, IL 62650, and L. Leff and Y. Sheng, Department of Computer Science, Western Illinois University, Macomb, IL 61455. Several visual interfaces to a database for various queries has been implemented, however, the characteristic feature of this project would be to display a two-dimensional picture of the object in question, itself, thus providing a clear and simple interactive to the user. This is a software written in "C" on "UNIX" environment. Based on the user's selection, the program retrieves the data from a set of tables and displays it on the screen using "X-Windows". The display is one which depicts a hierarchial structure where the windows or boxes holding the objects are drawn one inside the other in a recursive manner. The user can then manipulate the data by adding, copying or moving objects, with a simple click of the mouse and have his data updated in the original database.

**OUR EXPERIENCE IN IMPLEMENTING CLOSED LABORATORIES IN THE COMPUTER SCIENCE CURRICULUM.** Adel M. Abunawass, Western Illinois University, Department of Computer Science, Macomb, Illinois 61455. Internet: [mfama@uxa.ecn.bgu.edu](mailto:mfama@uxa.ecn.bgu.edu), and Theresa G. Fisher Saint Cloud State University, Department of Computer Science, Saint Cloud, Minnesota 55301. Internet: [fisher@eeyore.stcloud.msus.edu](mailto:fisher@eeyore.stcloud.msus.edu). Closed laboratories have been recommended for use in the computer science curriculum by the ACM/IEEE-CS Joint Curriculum Task Force. In their Computing Curriculum 1991 report, the task force recommends using a mixture of both closed and open laboratories for most of the courses in the computer science curriculum. Traditionally computer science courses use open laboratories. Closed laboratories differ significantly in their focus and structure than open laboratories. Closed laboratories are time limited supervised assignments where the students focus solely on problem solving and not on the syntactical issues of the programming language or the details of the operating system and editor. Strict guidelines should be followed throughout the course to accomplish very productive and consistent experiences. Closed laboratories should be coordinated very closely with those of the open laboratories. Our survey of the students indicated that they have benefited from the experiences and in some cases it was the deciding factor in enrolling in the major.



COMPARISON AMONG FOUR SHAREWARE RAYTRACING PACKAGES, THEIR SCRIPT FILES AND APPLICABILITY FOR CLASS USE. L.H. Tichenor, Western Illinois University, Macomb, IL 61455. The micro computer versions of Rayshade, POV, VIVID, and DBW-Render were evaluated for use in an upper level computer graphics class as a tool to demonstrate advanced rendering techniques. All proved acceptable for demonstration of shadowing, specular highlighting, standard transformations, and texture mapping. Each had an acceptable array of primitive objects. CSG was supported in POV and Rayshade while additional animation and stereo vision support was provided only in the latter. POV's script and documentation seemed the most straight forward, and it was chosen as the demonstration package for Spring 1993.

APPLICATION OF ELECTRICAL EARTH RESISTIVITY MEASUREMENTS IN CHARACTERIZING THE HYDROGEOLOGIC ENVIRONMENT IN ILLINOIS. Philip C. Reed, Illinois State Geological Survey, Champaign, IL 61820. Electrical earth resistivity studies have been performed using vertical electrical soundings (VES) and constant-electrode-separation (CES) profiling on a regular basis by the Illinois State Geological Survey since 1932. Case histories are presented demonstrating the utility of VES and CES in 1) detection, movement direction and water quality of oil field brine and landfill aquifer plumes, 2) locating sinuous, linear and discontinuous sand and gravel aquifers suitable for various groundwater supplies, 3) delineating subsidence features in karst terrane, 4) defining subsurface bedrock faulting, and 5) estimating particle size relationships in glacial and alluvial terrane through comparison of VES curves and natural gamma logs. The case histories demonstrate the utility of inexpensive and non-invasive geophysical method for obtaining subsurface information to aid in solving pollution, water supply, subsidence, and structural geology problems.

LEAF MORPHOLOGY VARIATION WITHIN LESLEYA: WHAT DOES IT MEAN? Richard Leary, Geology, Illinois State Museum, Springfield, IL 62702. Paleontologists are confronted with many obstacles in their study of fossil organisms. Many characters used by neobiologists to classify living plants and animals are not available to paleobiologists. Separating species is difficult at best. Frequently, paleontologists rely upon morphometrics to classify fossil remains. This is complicated by sexual dimorphism as well as changes through the life of an individual. This study draws upon a large population of Lesleya leaves and leaf fragments from a single locality in western Illinois. Although leaf size ranges from 2 to >60 cm and a wide diversity of leaf shape is present, other characters are very consistent (e.g., spacing and curvature of secondary veins). Thus, depending upon which characters are considered significant, these leaves may be considered to belong to a single species or multiple species.



### BERTHIERINE PIPESTONES OF NATIVE AMERICANS IN THE MID-

CONTINENT. R. E. Hughes<sup>1</sup>, D. M. Moore<sup>1</sup>, K. B. Farnsworth<sup>2</sup>, and T. E. Berres<sup>3</sup>, <sup>1</sup>Illinois Geological Survey, Champaign, Illinois 61820; <sup>2</sup>Center for American Archeology, Kampsville, Illinois 62053; <sup>3</sup>Department of Anthropology, University of Illinois, Urbana, Illinois 61801.

Plain- and animal-effigy platform pipes from Hopewell sites (~2100 to 1750 yrbp) in Illinois were carved from a flint clay from near Sterling, Illinois. Manufacturing debris, pipestone color, a 5,000-yr history of manufacture near Sterling, berthierine and boehmite in the flint clay, and discovery of this flint clay *in situ* in the Neda Formation all prove that the pipestone was from Illinois and not from southcentral Ohio, as had been assumed. Massive gray-green samples are mostly berthierine, oolitic samples contain more kaolinite and boehmite, and massive, greenish-reddish samples have sub-equal amounts of berthierine and kaolinite. This flint clay apparently formed by replacement of calcareous oolites in a low-Eh soil. Structural similarities between kaolinite and berthierine suggest a common predisposition for berthierine and kaolinite to form flint clays. Mixed-layered berthierine/chamosite (B/C) from this claystone has helped us distinguish B/C in several siliciclastic oil reservoirs. The diagenetic history of these "pre-biotic" flint clays suggests the importance of Eh during kaolinization.

DRY FINE COAL BENEFICIATION UTILIZING OPEN-SYSTEM ELECTROSTATIC SEPARATOR. Frank X. Wang, Southern Illinois University, Carbondale, IL62901. In this paper, investigation of the operation of a novel open-system cylindrical triboelectrostatic separator is presented. It dramatically reduces the effect of gas turbulence inside the separator on the coal separation. All of the sulfur pyrite in Illinois coal can be removed at an applied voltage as low as 10 kv. Pure vitrinite is consistently collected on the negative electrode with a rate 25-30 percent of the original feed. Applied voltage, supply gas pressure and impact target material as parameters are studied with the respect to the capability to beneficiate the coal and to increase the carbonaceous component recovery. Overall, open-system separator provides a promising perspective leading to a continuous coal beneficiation process.

### ACCOUNTING FOR COMPRESSIBILITY IN THERMODYNAMIC EQUATIONS. *Sundar Narayanan*, Mech Engr Dept, SIU-Carbondale.

The ideal gas equation of state  $pV=RT$ , though accurate only at low pressures and high temperatures is nevertheless used in the derivation of many thermodynamic relationships. Substituting the ideal gas equation of state with  $pV=ZRT$  where  $Z(p,T)$  is a known compressibility factor in thermodynamic analyses enables more accuracy in engineering calculations. A new equation  $pV^\gamma/Z=\text{const}$  is derived for an isentropic process which is shown to be more accurate than the commonly used  $pV^\gamma=\text{const}$ . It is also shown that the entropy change of a real gas undergoing an isobaric process is greater than that of an ideal gas by  $R\Delta Z$ , where  $\Delta Z$  is the change in the compressibility between initial and final states.



A FORMULA OF BESSEL FUNCTIONS OF THE FIRST KIND. X.A. Lin and O.P. Agrawal, Southern Illinois University, Carbondale, IL 62901. This paper studies a problem of the steady-state conduction heat transfer process of a non-viscous fluid flowing in a circular tube with a pseudo-term of inner heat generation. Solution of the partial differential equation resulting from the energy conservation and introduction of the concept of enthalpy lead to a new method to obtain a new formula that  $\sum_{n=1}^{+\infty} \left\{ \frac{\int_0^1 y J_\nu(\alpha_n y) dy}{J_{\nu+1}(\alpha_n)} \right\}^2 = \frac{1}{2^2}$ , for  $\nu \geq -\frac{1}{2}$ , where  $J_\nu(x)$  is a Bessel function of the first kind of order  $\nu$ , and  $\alpha_n$  is the  $n$ th positive zero of  $J_\nu(x)$ . Some series summations for  $\nu = 0, \pm\frac{1}{2}$ , and 2 are also discussed.

Research reported in the paper provides an alternate physical approach to derive a new formula in the area of Bessel functions. The advantages of this method are that it enriches physical understanding of an identity, and that we may benefit from physical insights to avoid difficulties emerging from rigid mathematical arguments.

SAFE DAM AND RESERVOIR DESIGN AND OPERATION. Krishan P. Singh, Illinois State Water Survey, Champaign, IL 61820. Safety of a dam and reservoir is jeopardized either by dam failure during an extremely high flood or by excessive retention of sediments entering a reservoir. A historical review of earthdam failures worldwide yields three significant dam breach parameters. Their interactions were studied by concluding breach simulations on eight dams in Illinois. The results provide lessons for safe design to minimize damages during a dam break. Excessive sediment entrapment can be largely mitigated by providing undersluices in a dam to vent most of the excess flows (together with sediments) through the sluices, thus improving water quality and conserving reservoir storage. This approach, which follows the concept of intergenerational equity and conservation of natural resources, will not only greatly increase the useful life of the project, but also greatly improve the recreation and environment for future generations.

RELATIVE AIR PERMEABILITY AS A FUNCTION OF SATURATION IN A FOUR-PHASE SOIL VENTING SYSTEM. C. Stylianou and B.A. Devantier, Southern Illinois University, Carbondale, IL 62901. A key parameter, in modeling soil venting systems, is relative air permeability which is a function of air saturation. The focus of this study was to determine the relationship of the relative air permeability as a function of air saturation in soil venting systems. A new laboratory apparatus was used to simulate the soil venting and measure the air permeability of soil samples. Sand samples wetted with mixtures of water and gasoline, at different ratios, were used. This study revealed that the relative air permeability for the moist soil depends only on the air-filled porosity and not on the type of liquid present in the liquid-filled pores. The relationship between the relative air permeability and air saturation was found to be a polynomial function.



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ULTIMATE UPLIFT CAPACITY AND SHAFT RESISTANCE OF METAL PILES IN CLAY. E.C. Shin, Southern Illinois University, Carbondale, IL 62901. Laboratory model pile tests were performed to evaluate ultimate uplift capacities and critical relative displacements. The pile surface conditions are significantly affected by the results of the uplift capacities which in turn are proportional to the depth of pile embedment. An adhesion coefficient ( $\alpha'$ ) to calculate the net ultimate uplift capacity of smooth metal pile is proposed,  $\alpha' = 0.274 - 0.00732 C_u$  ( $C_u$  = undrained cohesion,  $C_u \leq 27$  kN/m<sup>2</sup>). The test results show that the critical relative displacement (CRD) is not constant and the pile size is independent, but CRD (X) is most closely related to the magnitude of the critical pile-soil adhesion (Y) along the pile shaft. An empirical relationship between the two quantities is established from the experimental results,  $Y(\text{psi}) = 33.7 X(\text{in})$ . This empirical equation is verified by the results of field test.

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PLASMA PROCESSING USING A DIELECTRIC BARRIER DISCHARGE. B. Pashaie and S.K. Dhali, Southern Illinois University, Carbondale, IL 62901. Removal of SO<sub>2</sub> flue gas in a dielectric barrier discharge is reported. The device consisted of a Hg/Ar UV lamp irradiated SO<sub>2</sub>/O<sub>2</sub>/N<sub>2</sub>/H<sub>2</sub>O atmospheric pressure gas discharge. The radiation made this low temperature partial gas discharge more uniform and increased the coupled energy to the discharge by 50% which is desirable in plasma processing. The dielectric barrier discharge is seen to have a chance to be used for industrial applications. It can provide a removal rate comparable to an electron beam source.

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RESTORATION AND OPERATION OF AN ANTIQUE 12 INCH NEWTONIAN REFLECTING TELESCOPE. J.E. Nielson, W. Trentadue, and P.P. Sipiara, Dept. of Astronomy, Harper College, Palatine, IL 60067. The Astronomy Department of Harper College acquired an old 12 inch, f.8 Newtonian reflector through a donation from the DuPont family of New Jersey. After four years of restoration the instrument is now in operational order. A historical research of the origin of the telescope proved to be very exciting. The instrument was the personal telescope of the Rev. John Peate of Greenville, Pennsylvania. He was one of the premier telescope makers of the nineteenth century, but not one of the better known. The telescope currently resides at Harper College where over 5,000 people have viewed through it. The telescope was originally purchased by Kansas Wesleyan University in Salina, Kansas in 1903, but was built in the early 1880's. It is a fine representative of that era's telescopes.



LIGHT LIMITATION OF PRIMARY PRODUCTIVITY IN A CENTRAL ILLINOIS RESERVOIR. S.W. Phipps, J.H. Ensign, Jr., and C.L. Pederson, Eastern Illinois University, Charleston, IL 61920. As is true for most lakes in agricultural areas, Lake Taylorville is currently impacted by excess sedimentation and nutrient enrichment. A system of wetlands/sediment basins is being constructed on tributaries to the reservoir in effort to reduce sediment and nutrient loads. A comprehensive program of water quality assessment has been undertaken to provide a baseline for evaluating the success of the restoration project. Lake Taylorville can be categorized as hypereutrophic on the basis of the Carlson Trophic State Index (TSI) calculated from data on Secchi depth and total phosphorus. The TSI assumes phosphorus to be the limiting nutrient in lakes and nitrogen:phosphorus mass ratios in excess of 10:1 in Lake Taylorville suggest phosphorus limitation. However, the TSI based on chlorophyll a indicates no more than mesotrophy. Based on these data, it may be inferred that sufficient nutrients are available to support a larger phytoplankton standing crop and higher levels of productivity. Lack of correspondence between phosphorus and chlorophyll a TSI values implies that all available phosphorus is not being utilized. Most likely, productivity in Lake Taylorville is limited by light availability.

EFFECTS OF GAS PIPELINE RIGHT-OF-WAY VEGETATION ON A POORLY DRAINED DECIDUOUS FOREST EDGE IN MIDLAND COUNTY, MICHIGAN: INITIAL HERBACEOUS PLANTS ON THE RIGHT-OF-WAY.\* J.R. Rastorfer, and J.A. Clemente, Chicago State University, Chicago, IL 60628; G.D. Van Dyke, Trinity Christian College, Palos Heights, IL 60463; and S.D. Zellmer, Argonne National Laboratory, Argonne, IL 60439. Two sites were established in 1989 to document the development of plant communities on the right-of-way (ROW) and any compositional changes within adjacent forest communities that might be caused by ROW construction activities and ROW plant communities. Although the cleared portions of both sites for the ROW represented second growth, Site 1 had evidence of recent selective logging, whereas Site 2 had no marked evidence of logging for at least 50 years prior to 1989. Vegetation on the ROW was analyzed by cover-class estimates using one-meter-square plots along three transects at each site. On the basis of 1990 sample data, average coverages of ferns, forbs, sedges, and grasses were 3.6%, 39%, 22%, and 43% for Site 1, respectively, and 3.6%, 24%, 12%, and 26% for Site 2, respectively. The seeded grass, *Agrostis gigantea*, was the most abundant herbaceous plant at both sites, but its coverage differed among the transects. Data from post-1990 samplings will be used to determine compositional changes of the vegetation on the ROW.

\* Work supported by Gas Research Institute, 8600 W. Bryn Mawr Avenue, Chicago, IL 60631.

WHERE DOES FOOD COME FROM. K.S. Midden, Southern Illinois University, Carbondale, IL 62901. "Where Does Food Come From" is a computer game designed to introduce young people (target age 10-14) to the entire process food goes through from field to table. Many children are not aware of the origins of the food they eat. Use of a computer game involves the children in active learning which is fun and challenging. The scenario assumes the player is an investigative reporter of his/her school newspaper. During the game the player investigates the reason why there is no food in the school cafeteria for lunch. The player travels to farms, processing plants, and interviews school staff to uncover clues. There is a separate investigation for each item on the menu. To win the game the investigator must solve the mystery for three menu items in a limited amount of time and with a limited number of questions that can be asked. If the player does not meet these requirements their assignment will be ended for them. Engaged by action, a child will experience the lesson embedded in the game.



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CYTOKINE ENHANCEMENT OF IMMUNE RESPONSE IN DIABETIC MICE TO OPPORTUNISTIC FUNGAL PATHOGENS. T. L. Wildhaber, R.C. Soltys, and D.J. Kitz, S. Illinois University at Edwardsville, IL 62026-1651. Persons with diabetes mellitus, especially those in ketoacidosis, have a number of disease-related physiological side-effects which result in depression of their cell-mediated and phagocytic cell immune responses. Utilizing cultured macrophages (MØ) and peritoneal exudate cells (PEC) obtained from AKR mice, we have observed that diabetes itself (e.g. PEC from alloxan-diabetic mice) or MØ from non-diabetic mice cultured in the presence of ketone bodies at the levels seen in diabetic serum have depressed fungicidal activity for Candida species. Individual ketone bodies were not found to directly suppress yeast growth, therefore the ketone bodies were thought to decrease the rate of MØ killing of internalized yeasts. The ability of cytokines (murine interferon-gamma & human tumor necrosis factor-alpha, Genentech, Inc.) to increase fungicidal activity by the "diabetic MØ" were determined, as well as the ability of these cytokines to boost organ clearance rates for diabetic mice intravenously challenged with Candida. Our findings suggest that cytokine immunotherapy may be beneficial for diabetic individuals suffering from opportunistic Candida infections.

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THE RELATIONSHIP BETWEEN THERMOTOLERANCE AND PATHOGENICITY IN THE ZYGOMYCETES. M.E.Parks\*, M.M.McBride<sup>†</sup>, and D.J.Kitz\*, \*Southern Illinois University at Edwardsville, IL 62026-1651, <sup>†</sup>Washington University School of Medicine, St. Louis, MO 63110. Some fungal molds in the Zygomycetes (Order Mucorales) are known to be opportunistic pathogens for immune-compromised human beings, especially uncontrolled diabetics in ketoacidosis. Our study has involved looking at the relationship of thermotolerance (defined as growth at or above 37°C) and pathogenicity of Mucorales species in mice challenged intravenously with sporangiospores. Groups of normal mice and mice rendered immune-compromised by alloxan (diabetic) or cortisone were used. Of special interest to us was a human isolate of Circinella, a thermotolerant species not previously reported to cause zygomycosis. Virulence was measured by LD<sub>50</sub> values over a 30-day time interval, and specific organ involvement was determined by microscopic observation of hyphae in KOH-ink tissue squashes and by culture on Sabouraud's dextrose agar done at necropsy.

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IDENTIFICATION OF CD4<sup>+</sup> CYTOTOXIC T LYMPHOCYTES THAT RECOGNIZE FOREIGN MHC CLASS I ANTIGENS BY AN INDIRECT PATHWAY. M.D. Shornick, B.M. Susskind, D.J. Kitz\*, and T. Mohanakumar. Washington University School of Medicine, St. Louis, MO 63110 and Southern Illinois University, Edwardsville, IL 62026. Allorecognition of foreign major histocompatibility complex (MHC) molecules on a transplanted organ is most commonly viewed as requiring direct contact between the patient's T cells and the donor organ. Recent evidence indicates there may be an indirect pathway of allorecognition. Patient's antigen presenting cells may pinocytose donor class I MHC shed from the graft, process it, and present it in the context of self class II. In order to characterize T cells mediating indirect allorecognition, lymphocytes from a normal individual were cultured with peptides derived from allogeneic MHC class I molecules. After three weekly sensitizations, the resulting T cells were cloned by limiting dilution. FACS analysis demonstrated that all clones were CD3<sup>+</sup>, CD4<sup>+</sup>, CD8<sup>-</sup>. Clones were screened for cytolytic activity against lymphoblastoid cell lines (LCLs). Only MHC class II LCLs pulsed with the same synthetic allogeneic peptide used to simulate the original bulk cultures were lysed; irrelevant LCLs and the no peptide controls were not lysed. These results demonstrate the presence of a population of CD4<sup>+</sup> CTLs capable of indirect allorecognition that may play a role in the allograft response.



A PRELIMINARY MODEL FOR THE ROLE OF VARIOUS ONCOGENES IN THE GENESIS OF OVARIAN CARCINOMAS. A. G. Amador, J. Fanning and R. D. Hilgers. SIU School of Medicine, Springfield, IL 62794-9230.

Since the discovery that oncogenes were mutated alleles of developmental and regulatory genes, an attempt has been made to design models for the sequential involvement of oncogenes in the genesis of neoplasias. Such models have been proposed for colorectal carcinoma and thyroid carcinoma. With respect to ovarian neoplasias, the problem has been that there are really several different entities, with distinct pathological and biological characteristics. This undoubtedly is due to different pathogenic mechanisms. We propose here a preliminary model for the sequential action of oncogenes in the development of ovarian carcinomas, mostly epithelial carcinomas. The first step would be the transformation of normal ovary to adenoma. This would be caused by mutation of the gene for the stem cell factor receptor and/or its ligand. The transformation of adenomas into well differentiated carcinomas would entail mutations of tumor suppressor genes like p53. The dedifferentiation of ovarian carcinomas would be related to alterations at 6q and to drug-resistance associated genes. Proliferation and metastasis of ovarian carcinomas would be aided by amplification and/or overexpression of EGF, TGFalpha, heregulin, CSF-1 and their respective receptors. Future studies will produce, without doubt, better and more detailed models.

*Allium* and its Role in Dietary Cancer Chemoprevention. C.B. Lewandowski and C.W<sup>m</sup>.W. Beecher. Program for Collaborative Research in the Pharmaceutical Sciences, Department of Medicinal Chemistry and Pharmacognosy, University of Illinois at Chicago, 833 S. Wood Street, Chicago, IL 60612-7231,

*Allium cepa* (onion) and *Allium sativa* (garlic), popular food items, each have a long history of use in traditional and folkloric medicine. Recent chemical analysis of the thiosulfinates and related compounds in both provide a means of understanding these ethnomedical uses. This paper will review and discuss the importance of these studies to dietary cancer chemoprevention.

PATIENT EDUCATION PROGRAMS EMPLOYING INTERACTIVE COMPUTER-ASSISTED INSTRUCTION R.N. Woll, N. Woll, Inc., San Jose, IL 62682-0077. The burgeoning cost of health care in the United States demands measures to decrease cost without sacrificing medical health care. One substantial savings potential is to limit unnecessary surgeries. It is our contention, proven by studies, that a more fully informed patient will decline elective surgery more often than someone less informed. Also a truly informed patient is less likely to sue should the outcome be less than favorable. Interactive videodisc programs are available to deliver this patient information. Existing programs, including a joint effort by Dartmouth Medical School and the Sony Corp., will be described and example materials shown. A proposal will be presented employing future efforts such as distance learning technologies and educational networks.



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ELECTRON MICROSCOPY OF CYANOBACTERIA TREATED WITH THE EXTRACT OF ZINGIBER OFFICINALE AND INFECTED WITH CYANOPHAGE LPP-I. Humayra Ali, Amrik S. Dhaliwal, Warren Jones and M. Singh Department of Biology, Loyola University Chicago, Chicago, IL 60626. Zinziber officinale extract was prepared by grinding it with pestle and mortar using saline buffer pH 7.0. Cyanobacteria grown under 250 foot candle light intensity for 3 weeks were treated with the extract fractions. At various time intervals after the treatment the cyanobacteria were inoculated with cyanophage. At several incubation timings the cyanobacteria were fixed in Karnovsky's fixative and post fixed in 2% Osmium tetroxide. Bacteria were washed in buffer, dehydrated through acetone and were embedded in Spurr's resin. Time of incubation of cyanobacteria treated with extract affected the susceptibility more than the surface morphology noted with electron microscopy. Overall the surface changes of extract treated cyanobacteria were negligible.

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INFECTIVITY STUDIES OF CYANOPHAGE LPP-I TREATED WITH FRACTIONS OF THE EXTRACTS OF CAPSICUM FRUTESCENS SEPARATED BY CENTRIFUGATION TECHNIQUE. Francesca Turner and Amrik S. Dhaliwal. Department of Biology, Loyola University Chicago, Chicago, IL 60626. Cyanobacteria were grown in 300 ml. flasks containing 150 ml. Bold's medium at 21°C under 250 foot candle light intensity. Seeds from Capsicum frutescens were separated and were macerated with pestle and mortar separately from the fruit. Purified cyanophage was treated with the extracts of the capsicum (50:50 by volume) and was tested for its infectivity by plating it with cyanobacteria. Petriplates were incubated at 25°C under 250 foot candle light intensity for 3 days. Plaque counts indicated that extracts of capsicum frutescens inhibited the infectivity of cyanophage by 50-100%. Infectivity of virus at zero time incubation was around 50% and was lost completely (100%) after 60 minutes of incubation.

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INFECTIVITY OF TOBACCO MOSAIC VIRUS TREATED WITH THE FRACTIONS OF ALLIUM SATIVUM EXTRACT PREPARED BY USING SEPHADEX COLUMN CHROMATOGRAPHY. Asma Syeda and Amrik S. Dhaliwal, Department of Biology, Loyola University Chicago, Chicago, IL 60626. Tobacco mosaic virus (TMV) samples were treated with Allium sativum extract fractions (50:50 by volume) and incubated for 30, 60, 90 and 120 minutes. Incubated samples were tested for virus infectivity on ten day old primary leaves of Phaseolus vulgaris cv pinto by inoculating the leaves using ultrasonic apparatus. Inoculated leaves were incubated at room temperature under 250 foot candle light intensity for three days. Lesion counts indicated that the extract of Allium sativum was 50 to 100 percent effective in inhibiting the infectivity of the virus. The zero time incubation is about 50% inhibitory. One hundred percent inhibition of the infectivity of the virus was obtained with 90 minutes incubation.



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FOSTERING AN APPRECIATION FOR SCIENCE IN NON-SCIENCE MAJORS. R. Troll, Augustana College, Rock Island, IL 61201. One way to increase scientific literacy and an appreciation for science, especially in non-science majors, is to make them aware of the scientific contributions made by persons generally not considered to be scientists. As examples, I have chosen the medieval emperor, Frederick II and the poet, Johann Wolfgang von Goethe. Frederick's De arte venandi cum avibus (Concerning the art of hunting with birds) is the most important medieval work in zoology and a masterpiece of objective and concise scientific description. Highlights from this treatise and other biological accomplishments of Frederick II are presented as well as Goethe's major contributions in the field of biology.

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A COMPUTER VIDEO PROFILING SYSTEM TO ENHANCE SCIENCE TEACHING: RESULTS AND RECOMMENDATIONS. P. Barrette and K. Wise, Department of Curriculum and Instruction, Southern Illinois University, Carbondale, Illinois 62901. Paper describes how a computer program and videotapes of classroom science teaching were merged to permit teachers to engage in a systematic process of analyzing their teaching. Project involved 10 elementary/secondary teachers from a rural school district. Results strongly suggest the use of this system increases frequency of teacher inductive events.

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EMPLOYING DIRECT INSTRUCTION IN TEACHING MATH AND SCIENCE R.N. Woll, N. Woll, Inc., San Jose, IL 62682-0077. Direct instruction has been used in special education applications for some time. Recently applications in elementary, secondary and remedial education have been very successful especially with disadvantaged school populations, primarily in inner city schools. Exemplary programs will be reported and statistical analysis provided comparing to other school systems employing traditional methods.

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TEACHING SCIENCE IN GERMANY. F. Mittermeyer and W. Lagerwey, Elmhurst College, Elmhurst, IL 60126. Various studies suggest that the quality of natural science and mathematics instruction has been declining in American schools. One approach to rethinking American education is to examine models and approaches used in other countries. Germany is technologically and industrially advanced and has a history of producing students who score well on international standardized examinations in science and mathematics. The German educational system was studied on-site during June 1993 with a focus on the teaching of science and mathematics in precollege classrooms and laboratories. Many similarities and differences between the German and U.S. systems were noted. Examples of strengths of the German system include: the respect for education among members of the society; the physical structure of the schools and classrooms; the materials and equipment for science instruction; the spiral curriculum in science and the amount of time devoted to science and mathematics; connections made between science and everyday life; teacher training programs; the writing skills and note-taking practices of students. Some of the ideas and methods observed in Germany may be beneficial if adapted into the American system.



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PROTOCELLS AND METAPROTOCELLS OF THE PROTOLIFE KINGDOM. Aristotel Pappelis, Sidney W. Fox, Southern Illinois University, Carbondale, IL 62901 and Michael Papagiannis, Boston University, Boston, MA 02215. Cosmogogenesis begins with the Big Bang, continues through Chemical Evolution, and leads to the emergence and evolution of humans by Biological Evolution. The emergence of life is often given limited attention; it usually serves as a precursor to prokaryotic species and evolving eukaryotic species. We teach that life emerged as proteins assembling to protocells (protospecies) which evolved to prokaryotes. We refer to these protospecies as members of the Protolife Kingdom. Protospecies vary in morphological and demonstrated "life" attributes. Synthesis of protocellular networks composed of metaprotocells suggests that molecular phylogeny in the Protolife Kingdom will be discovered by synthetic methods in a direction opposite to that of the analytical discovery of molecular phylogeny from eukaryotic through prokaryotic species.

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ANTI-EVOLUTIONIST ACTIVITIES IN ILLINOIS PUBLIC SCHOOLS. R. R. Traxler, St. Louis Association for Teaching and Education (SLATE), P.O. Box 462, O'Fallon, IL 62269. Although most scientists and educators believe that in 1987 the Supreme Court abolished creationism from our public school science classes, my investigations show that in several Illinois public school districts creationism is still openly taught as science and/or evolution is prohibited from discussion. In addition to this, I have discovered great apathy among scientists, educators, and their professional organizations towards this problem. The anti-evolutionists use a variety of grass-root techniques to propagate their religious views in our public schools at the expense of science education, largely with the help of local churches, national religious groups, high-level school district officials, and even the Illinois State Board of Education.

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ILLINOIS STATE BOARD OF EDUCATION AND CREATIONISM IN THE PUBLIC SCHOOLS. Jack Bennett, Northern Illinois University, DeKalb, IL 60115-2861. Report on conversations with the Board office about their role in public school compliance with federal law on teaching Creationism as science.

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A TWO-YEAR STUDY OF THE BENTHOS IN TWO ACID STRIP-MINE LAKES. J. B. Stahl and R. B. Brugam, Southern Illinois University, Carbondale, IL 62901, and Southern Illinois University, Edwardsville, IL 62026. The feasibility of raising pH by enhancing bacterial sulfate reduction with added organic matter was tested by adding 8.7 tons of cow manure to Pit C, a pH 3.1 strip-mine lake. Pit Y, a nearby lake of pH 3.3, was used as a control. Water chemistry and benthos were sampled fortnightly for two years. Chironomid pupal exuviae were also regularly collected, and occasionally adult midges were sampled with emergence traps. Although the benthos was broadly similar in both lakes, with Chironomus harpi an important constituent, that of Pit Y was consistently more diverse than Pit C. Each lake showed seasonal variations in its benthos, but these were not well-synchronized between lakes. Pit C has shown a rise in pH only in the deepest water. So far no change in the composition of the benthos is attributable to the manure treatment.



A FAUNAL STUDY OF THE MECOPTERA (INSECTA) OF ROCKY BRANCH, CLARK CO., IL. J. W. Griffiths and M. A. Goodrich, Department of Zoology, Eastern Illinois University, Charleston, IL 61920. The species of Mecoptera occurring in Rocky Branch Nature Preserve near Clarksville, Illinois are described. Nine species representing three families were identified: Panorpa helena, P. speciosa, and P. banksi representing the family Panorpidae; Hylobittacus apicalis, Bittacus strigosus, B. stigmaterus, B. pilicornis, and B. punctiger representing the family Bittacidae; and Merope tuber representing the family Meropeidae. The relative abundance and biology of each species are described.

HOME RANGE AND VERTICAL STRATIFICATION OF SYMPATRIC GOLDEN MICE AND WHITE-FOOTED MICE IN SOUTHERN ILLINOIS. D.A. Blumenstock and G.A. Feldhamer, Southern Illinois University, Carbondale, IL 62901. Four 20-day live-trapping periods were conducted from October 1992 through May 1993 on two study plots near Pomona, Jackson County, Illinois. On Plot #1 17 golden mice (Ochrotomys nuttalli) and 27 white-footed mice (Peromyscus leucopus) were marked and released. On Plot #2 7 golden mice were marked and released, while 21 white-footed mice were removed. Home ranges for individuals were estimated using both the minimum area method and an elliptical model. Aspects of 3-dimensional home range use were obtained using colored bait placed at ground level and three different heights throughout each plot in elevated feeding platforms, and resultant marked fecal pellets for both species.

MICROHABITAT USE AND INTERSPECIFIC COMPETITION IN GOLDEN MICE AND WHITE-FOOTED MICE IN SOUTHERN ILLINOIS. D.A. Corgiat and G. A. Feldhamer, Southern Illinois University, Carbondale, IL 62901. Ten microhabitat variables were recorded at each of 64 trap sites on two 8 X 8 live-trapping grids, one km apart, near Pomona, Jackson County, Illinois. Microhabitats were the same between grids throughout the year. Golden mice (Ochrotomys nuttalli) (n=7) were marked and released, while white-footed mice (Peromyscus leucopus) (n=21) were removed on the experimental grid. Resultant changes in microhabitat use of golden mice were monitored. On the control grid, 17 golden mice and 27 white-footed mice were marked and released, with no removal of the white-footed mice. Aspects of microhabitat use and interspecific competition between species will be discussed.

BIOLOGY OF OXYPORUS STYGICUS (COLEOPTERA: STAPHYLINIDAE), INCLUDING A DESCRIPTION OF HOST PREFERENCES AND LIFE HISTORY. M. A. Goodrich and R. S. Hanley, Department of Zoology, Eastern Illinois University, Charleston, IL 61920. The life history and habits of Oxyporus stygicus Say are described, based on material collected in the field and reared in the laboratory. Adults feed on mature sporocarps of a variety of fungi, including Pleurotus ostreatus, Pholiota aurivella, Grifola frondosa, Polyporus squamosus and Omphalotus illudens. Larvae are known to feed and develop in Pholiota aurivella and Omphalotus illudens. Durations of immature stages at room temperature (22-24°C) in days were: egg, 1; larva, instar I, 1-2; larva, instar II, 1-2; larva, instar III 1-2; prepupa, 1-2; pupa, 7-10. Complete developmental time of O. stygicus (egg to adult emergence) ranged from 16-18 days.



GENDER-RELATED DIFFERENCES IN THE LEVELS OF STEROIDS IN THE ADRENALS OF ADULT WOODCHUCKS (*Marmota monax*). A. G. Amador<sup>1</sup> and A. Woolf<sup>2</sup>, Southern Illinois University, <sup>1</sup>Springfield, IL 62794, and <sup>2</sup>Carbondale, IL 62901.

We have previously shown that maturational changes in the levels of adrenal steroids are observed in male woodchucks (Amador & Woolf, 1992). Since maturation is accompanied by a change in endocrine milieu, the present study was undertaken to compare the adrenal steroid levels in two distinct environments, such as the male and female animal. At sacrifice, the adrenals of wild-caught adult woodchucks (>2 year old) were obtained. Adrenals were homogenized in  $d_2H_2O$ , and steroid levels were determined by solid-phase radioimmunoassays, characterized to be accurate in these samples. The adrenal levels of progesterone, hydroxyprogesterone, testosterone, cortisol and aldosterone tended to be higher in female than in male woodchucks. These differences were significantly different for aldosterone ( $P < 0.025$ ), and curiously for testosterone ( $P < 0.05$ ). Thus, immature male and adult female woodchucks would tend to have higher adrenal levels of steroids than adult males. Therefore the present results, together with previously reported data, could indicate that androgenization of the animal is associated with a decrease in the levels of steroids in the adrenal of woodchucks.

GENETIC VARIATION IN YELLOW PERCH DETECTED BY MITOCHONDRIAL DNA ANALYSIS. N. Billington, Southern Illinois University, Carbondale, IL 62901.

Yellow perch, *Perca flavescens*, supports important sports and commercial fisheries in the North American Mid-west. Perch is also becoming increasingly important for aquaculture. Baseline genetic data are required for this species in order to identify its genetic stock structure and to allow the development of selective breeding programs for aquaculture. However, allozyme analysis of proteins has revealed a general lack of genetic variation in perch. Generally, analysis of mitochondrial DNA (mtDNA) with restriction endonucleases has revealed a higher level of genetic variation in fish species than allozymes. This technique was applied to yellow perch populations from the central Great Lakes region in order to determine if it could reveal genetic variation. To date, ten different mtDNA haplotypes have been identified in 50 fish. A detailed study of 22 yellow perch from the western basin of Lake Erie revealed seven different haplotypes and the mtDNA nucleotide diversity of this population (0.481) compared well with values obtained for Great Lakes walleye populations (0.377-0.613). However, previous studies of perch from this area using allozymes failed to reveal any genetic variation. Thus, mtDNA analyses appear to show great potential for the examination of genetic variation in yellow perch.

KARYOTYPIC ANALYSIS OF CYNOLEBIAS, A GENUS OF SOUTH AMERICAN ANNUAL KILLIFISH. E.D. Lowenthal and L.R. Scott, Augustana College, Rock Island, IL 61201. We examined the chromosome number and morphology of thirteen species of the South American killifish genus Cynolebias. Twelve of the species examined have a diploid number of 48, the presumed ancestral number for the group. Cynolebias, luteoflammulatus is the only species that was found to exhibit a reduced chromosome number,  $2N=32$ , and is the only one which possesses heteromorphic sex chromosomes. This stability of karyotype among Cynolebias species is in contrast to the extensive chromosomal rearrangements seen among other groups of killifish. The observation of heteromorphic sex chromosomes in C. luteoflammulatus is the second example within the genus and only the seventh example of male heterogamety within the order Cyprinodontiformes.



DIFFERENCES IN PANCREATIC INSULIN LEVELS AMONG NORMAL OUTBRED RAT STOCKS AND BETWEEN GENDERS. David Pittman, Armando G. Amador and Robert D. Hilgers, SIU School of Medicine, Springfield, IL 62794-9230

Considerable differences in endocrine function have been observed among various types of normal rats (Amador et al, 1989; Amador & Mayerhofer, 1992). Also, it has been suggested that sex steroids may regulated pancreatic function (Saydjari et al, 1988; Guo & Singh, 1990; Kasanova et al, 1990; Renauld et al, 1990). The present study was designed to determine some genetic-dependent factors such as genomic background or gender affect the pancreatic levels of insulin. Thus, pancreases were obtained from young adult (>8 wk old) male (m) and female (f) Long-Evans (LE), Wistar (W) and Sprague-Dawley rats, and homogenized in  $d_2H_2O$ . Insulin (INS) was thereafter determined by solid-phase radioimmunoassay. Female SD had greatest pancreatic weight and male W had the lowest. Female rats of each stock had higher pancreatic insulin levels than the males of their respective stocks. Female W and SD rats had the highest levels and male LE had the lowest. The present data appear to indicate that the different genomic backgrounds of the stocks include significant differences in pancreatic insulin levels. Also, a female endocrine environment appears to be conducive to higher pancreatic insulin levels.

DIFFERENCES IN OVARIAN STEROID LEVELS AMONG NORMAL OUTBRED RAT STOCKS. D. Pittman, A.G. Amador and R.D. Hilgers, SIU School of Medicine, Springfield, IL 62794-9230.

Considerable differences in endocrine function, specially in testicular function, have been observed among various types of normal rats (Amador et al, 1989; Amador & Mayerhofer, 1992). Therefore, the present study was designed to determine if some genetic dependent factors such as genomic background, affect ovarian endocrine parameters. Thus, ovaries were obtained from young adult (>8 wk old) Long-Evans (LE), Wistar (W) and Sprague-Dawley (SD) rats, and homogenized in  $d_2H_2O$ . Steroids were thereafter determined by solid-phase radioimmunoassays. The ovaries of SD rats were heavier than those of LE and W rats. Ovarian 17-OH-progesterone levels were higher in W than in SD rats, but they were not different from those in LE rats. Ovarian progesterone levels were not found to be statistically different among animals from different stocks. The ovarian testosterone and estradiol concentrations were greater in W than in the other two types of rats. However, due to the differences in ovarian weight, the ovarian testosterone and estradiol total contents were higher in W than in LE, but not higher than in SD rats. The present results appear to indicate that maybe, as in males, there exist several differences in gonadal endocrine function among normal female rats from various commonly used outbred stocks.

WHITE-TAILED DEER BROWSING ON ILLINOIS PRAIRIE VEGETATION. Erica Corbett, Roger C. Anderson, and Jennifer Nelson, Illinois State University, Normal, Illinois 61790-4120. We examined the effects of deer browsing on prairies by tallying browsed and unbrowsed forb stems in 25 x 25 cm quadrats. Chi-square analysis was used to determine if the proportion of stems browsed for a species was significantly ( $p < 0.05$ ) greater than the population of forbs as a whole. There were 6 of 54 species that were browsed disproportionately more than the population of forbs as a whole. Deer browsing has a negative effect on the reproductive effort of some forb species. For example, browsed Baptisia leucantha (wild indigo) produced  $8.9 \pm 7.7$  (mean  $\pm$  SE) reproductive units (fruits, flowers, and buds), per plants, whereas unbrowsed plants produced  $24.2 \pm 7.4$ .



WETLAND MITIGATION: SEED BANKS OF A WETLAND AND AN AGRICULTURAL FIELD. M. Rebecca Anderson, Health Sciences Dept., and R. C. Anderson, Biology Dept., Illinois State University, Normal, IL 61790. To evaluate the potential use of wetland soil to propagate wetland species on a mitigation site, seed banks of a wetland and an agricultural field (wetland mitigation site) were evaluated. Soil samples were collected from the upper 0-20 cm of the wetland and agricultural field. Samples were taken from a depth of 20-30 cm from the field. Seeds present in the soils were allowed to germinate in the greenhouse (35 days) under three treatment conditions. Wetland soils yielded 3,120 to 7,015 seedlings/m<sup>2</sup> depending upon treatment (35 native species, 4 weeds) and agricultural soils (0-20 cm) had 502 to 1,062 seedlings/m<sup>2</sup> (11 weeds, 1 native species). No seedlings germinated from deep soil samples. The agricultural field, a former wetland, did not retain sufficient seeds to re-establish a wetland. Addition of wetland soil would enhance wetland establishment.

EFFECT OF ETHYLENE ON SELECTIVE RIBOSOMAL CISTRON REGULATION IN EXCISED BASAL, EQUATORIAL, NEAR-APICAL, AND APICAL LEAF BASE TISSUE FROM YELLOW, SWEET SPANISH ONIONS. Connie S. Karagiannis and A.J. Pappelis, Southern Illinois University, Carbondale, IL 62901. Outer epidermal cells from the basal, equatorial, near-apical and apical regions of the third onion leaf base were treated (excised pieces 0.5 x 0.5 cm) with 10<sup>-5</sup> M ethylene to activate major and/or minor nucleolar organizer regions (NORs). In the basal region, ethylene affected the size and morphology of the major nucleoli, but did not induce expression of the minor NORs. In the equatorial and near-apical regions, ethylene affected the size and morphology of both the major and minor NORs. In the apical region, ethylene had no effect on either major or minor NORs; i.e., once the cells had passed the point of no return in the senescence pathway, ethylene had no effect on the NORs. We infer that irreversible nucleolar inactivation is one of the earliest cellular symptoms of senescence. This appears to be related to loss of nonhistone, nuclear proteins.

GERMINATION AND EMERGENCE OF TEN SWEET CORN VARIETIES. M.K. Faver and J.M. Coons, Eastern Illinois University, Charleston, IL 61920. Supersweet corn varieties have increased in popularity over traditional varieties due to sweeter taste and ability to hold flavor after harvest. However, germination and emergence of supersweet varieties is significantly lower than traditional varieties particularly at low temperatures. Percent germination of 10 sweet corn varieties (traditional and supersweet parent lines) was determined in a growth chamber for 9 days at 10<sup>0</sup>, 15<sup>0</sup>, 20<sup>0</sup>C. Field studies, soil temperature 19<sup>0</sup>C, determined emergence. Results indicated traditional sweet corn had greater germination and emergence percentages than supersweet corn. Continued studies will evaluate leakage from imbibing seeds to establish what substances and amounts are lost that affect germination and emergence.



THE EFFECTS OF ULTRAVIOLET RADIATION ON DNA REPAIR IN CULTURED CHICK EMBRYO RETINAL EPITHELIAL CELLS. D. T. Clerc and A. Baich, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1001. Cultured retinal epithelial cells from nine day chick embryos display increased rates of DNA repair upon exposure to ultraviolet radiation. DNA repair is measured by the incorporation of tritiated thymidine into the cell genome.

THE DNA BINDING BEHAVIOR OF A GROUP OF PROTEINS ISOLATED FROM CULTURED TOBACCO CELLS. R. L. Robinson and A. Baich, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1001. A group of perchloric acid soluble proteins isolated from cultured tobacco cells has been shown to exhibit DNA binding behavior. This group of proteins has a high mobility in an electric field, and an approximate molecular weight of 17000 daltons. These proteins are tentatively classified as High Mobility Group Proteins.

THE NON-ENZYMATIC EFFECT OF MELANIN ON ORNITHINE. S. Kim and A. Baich, Southern Illinois University at Edwardsville, Edwardsville, Illinois 62026-1001. The non-enzymatic reaction of ornithine and melanin produces a compound with properties similar to those of glutamic semialdehyde. It appears that melanin oxidizes ornithine spontaneously. We report the effects of temperature, pH, and the concentrations of melanin and ornithine on this reaction.

HYPERCARD STACKS FOR TEACHING BASIC CONCEPTS IN PLANT BIOLOGY AND GENERAL BIOLOGY. Lawrence C. Matten, Southern Illinois University at Carbondale, Carbondale, IL 62901. An electronic syllabus for use in teaching beginning botany and biology courses has been developed using HyperCard™. An initial set of 16 stacks has been developed as a commercial package and includes: Angiosperm Life Cycle, Cell structure, Cell types, Cellular energy, Chemistry, Comprehensive Quiz, Flower, Leaf, Mitosis/cell cycle, Osmosis, Ovule/seed, Photosynthesis, Pine Life Cycle, Protein Synthesis, Respiration, and Vegetative Anatomy. Subsequently, three additional stacks have been developed and tested: Plant Guess, Meiosis, and Genetics. Plant Guess is a program designed to help students learn the principles of constructing a taxonomic key. It is presented in the form of a game and has been used successfully with beginning students in general botany. The Meiosis stack provides the user with a means to examine the process through animations. The Genetics stack represents a plant breeding machine. A modified genetics program is also available to test and record students' attempts at determining genotypes of crosses. Access to these stacks will be provided during the poster session.

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THE SCIENCE CENTER--IDEA TO OPENING. L.K. Herrold and J.F. Smith, Southern Illinois University, Carbondale, IL 62901. In October, 1991 an effort was begun to develop a hands-on science center for southern Illinois. Organizational steps taken during the first 12 months were: contacts made, incorporation as a non-profit organization, formation of a board with officers. Regular meetings of interested individuals were begun, brochures printed and the new organization advertised at community events and through personal contacts. In August, 1992 the city of Carbondale offered The Science Center 8000 square feet of space rent-free. During the second 12 months the major activities were: renovation of space, solicitation of memberships and donations, and construction of exhibits. Saturday Science programs were also begun; these programs were enlarged during this time period and presently serve approximately 50 - 75 children a month. Opening is planned for October, 1993.

102

ESSENTIAL CONCEPTS OF BIOLOGY ON HYPERCARD™. D. M. Miller, Southern Illinois University, Carbondale, IL 62901-6512. Several teaching modules on essential concepts in biology have been put on hypercard for the Macintosh computer. Included in the demonstration will be Animal mitosis (partly animation) and Molecular genetics.

103

LIFE-CYCLE, DRIFT, AND IMPOUNDING EFFECTS ON GAMMARUS PSEUDOLIMNAEUS (AMPHIPODA) IN AN ILLINOIS PRAIRIE STREAM. R. G. Moore and C. M. Delucchi, and T. S. Howe, Augustana College, Rock Island, IL 61201. Gammarus pseudolimnaeus were sampled in a spring-fed stream at Nachusa Grassland in June of 1991 and 1992 to examine annual variation and the effect of a beaver impoundment. In addition, diel sampling was carried out in 1992 to study drift. Both adults and juveniles were larger and less abundant in 1992 than 1991 at the site unimpacted by beavers. This may indicate an earlier start to reproduction in 1992. At the site that was impacted by beavers in 1992, amphipods showed no difference in abundance between years but did show size differences, with males and juveniles larger and females smaller in 1992. Using the unimpacted site as a reference, beaver impoundment resulted in decreased abundance of all amphipods and decreased size of females. Drift sampling showed a diel pattern of drift for adults but not juvenile. Males drifted more than females, suggesting that one purpose of drift may be mate search.



CONSTRAINT LINE THEORY AND STABILIZATION. J. L. Kriz and D. M. Jedlicka, Joliet Junior College, Joliet, IL 60436 and University of Illinois at Chicago, Chicago, IL 60680. The process of stabilization leads to the removal of extreme strategies for a given trait and the narrowing of a population around a single strategy. Constraint line theory states that for every individual within a population each individual faces some level of environmental pressure which will determine those individual strategies that will survive. The addition of constraint line theory demonstrates on the individual level how the changing of the constraint line for an individual will drive a population towards stabilization.

SEASONAL HABITAT SELECTION AND DIET CHOICE OF THE EASTERN FOX SQUIRREL (Sciurus niger). Dianne M. Jedlicka. Dept. of Biological Sciences, University of Illinois at Chicago, Chicago, IL 60607 and Aurora University, Aurora IL 60506. Foragers must simultaneously evaluate diet and habitat suitability. In this study, I used two sizes of food (diet choice) to examine foraging preferences of the eastern fox squirrel (Sciurus niger) in a grass habitat and a wooded habitat during summer, fall, and winter seasons (habitat selection). I found that the squirrels forage preferentially for large seeds in the woods habitat during summer and fall. In the winter, fox squirrels forage all seed sizes at all habitats equally. A tradeoff between perceived predation and the food energy gained is indicated. During winter, these squirrels foraged the grassland habitat as much as the woodland habitat. Squirrels made no apparent distinction between habitat (perceived risk) or seeds size during the winter.

SYSTEMATIC OF FOSSIL AND RECENT GONORYNCHID FISHES. Terry Grande. Dept. of Biological Sciences, University of Illinois at Chicago, Chicago, IL 60607. The interrelationships of fossil and Recent gonorynchid fishes are reviewed. The monophyly of the family is cladistically verified, in part, by caudal fin and dentition characters. The family can be divided into two monophyletic clades; one consisting of Gonorynchus and †Notogoneus as sister taxa and the other consisting of †Charitosomus. The systematic placement of two Cretaceous taxa †Ramallichthys and †Judeichthys is reviewed. Data indicate that both taxa should be included within the Gonorynchidae, and possibly synonymized with the genus †Charitosomus.

## ROSTER OF OFFICIALS OF THE ILLINOIS STATE ACADEMY OF SCIENCE

October 1992 - October 1993

Patricia W. Zimmerman, Executive Secretary  
 Illinois State Museum  
 Springfield, Illinois 62706  
 217/782-6436; FAX 782-1254

## OFFICERS

- \*President: Herbert L. Monoson, Department of Biology, Bradley University, Peoria 61625. Office: 309/677-3017.
- \*President-Elect: Bohdan Dziadyk, Biology Department, Augustana College, Rock Island 61201-2296. Office: 309/794-7331.
- Vice-President (for 1993 Meeting): Walter J. Sundberg, Department of Plant Science, Southern Illinois University, Carbondale 62901-6509. Office 618/453-3212 x22.
- Vice-President (for 1994 Meeting): Linda K. Dybas, Knox College Box 20, Galesburg 61401. 309/343-0112, x352.
- Vice-Presidents (for 1995 Meeting):  
 Andrew S. Methven, Department of Botany, Eastern Illinois University, Charleston 61920. Office: 217/581-6241; FAX 217/581-2722  
 Charles L. Pederson, Department of Botany, Eastern Illinois University, Charleston 61920. Office: 217/581-6239; FAX 217.581-2722.
- Secretary: Laurence E. Crofutt, Department of Botany, Eastern Illinois University, Charleston 61920. Office: 217/581-6238 or 3624 (Department Office); home (answering machine): 217/345-5851; FAX 217/581-2722.
- Treasurer: JoAnn DeLuca, Department of Chemistry, Illinois State University, Normal 61761. Office: 309/438-2697.

## COUNCIL MEMBERS

Immediate Past-Presidents:

- Donal G. Myer (deceased), School of Sciences, Southern Illinois University, Edwardsville 62026.
- Laszlo D. Hanzely, Department of Biological Sciences, Northern Illinois University, DeKalb 60115-2861. Office: 815/753-7815.



Junior Academy Representative: Manly Tory, 1945 Hickory, Homewood 60430.  
708/799-5426

Editor (of Transactions): Teresa L. North, Department of Agriculture,  
Western Illinois University, Macomb 61455. Office: 309/298-1288.

Museum Representative: Everett D. Cashatt, Illinois State Museum Collection  
Center, 1920 S. 10.5 St., Springfield 62703. Office: 217/782-6689

COUNCILORS-AT-LARGE

Term to Expire 1993

\*Kathleen Andrews, Department of Conservation, 524 S. Second St., Springfield  
62701-1787. Office: 217/524-4126.

\*Bohdan Dziadyk, Biology Department, Augustana College, Rock Island 61201-  
2296. Office: 309/794-7331.

\*Gerard V. Smith, Molecular Science, Southern Illinois University, Carbondale.  
62901-4406. Office: 618/453-7319; home: 618/549-2565; FAX 618/453-  
6408.

Term to expire 1994

Linda K. Dybas, Knox College Box 20, Galesburg 61401. 309/343-0112, x352.

Charles L. Pederson, Department of Botany, Eastern Illinois University,  
Charleston 61920. Office: 217/581-6239; FAX: 217/581-2722.

Randy Vogel, Illinois Nurserymen's Association, 1717 S. 5th St., Springfield  
62703. Office: 217/525-6222; FAX: 217/525-6257

Term to Expire 1995

Amrik S. Dhaliwal, Department of Biology, Loyola University, Chicago 60626.  
Office: 312/508-3626.

Gary Kessler, Physics Department, Illinois Wesleyan University, Bloomington  
61702-2900. Office: 309/556-3004 or 3060; FAX: 309/556-3411.

Lorin I. Nevling, Illinois Natural History Survey, 607 E. Peabody Dr., Cham-  
paign 61820. Office: 217/333-6830.

## DIVISION CHAIRS

Agriculture: Steven E. Kraft, Department of Agribusiness Economics, Southern Illinois University, Carbondale 62901-4410. Office: 618/453-1716

Anthropology and Archaeology: Bonnie W. Styles, Illinois State Museum Collections Center, 1920 S. 10.5 St., Springfield 62703. Office: 217/782-7475.

Botany: Marian Smith, Department of Biological Sciences, Southern Illinois University, Edwardsville 62026. Office: 618/692-3005.

Cell, Molecular and Developmental Biology: Howard E. Buhse, Jr., Department of Biological Sciences, M/C 066, University of Illinois, Chicago 60680. Office: 312/996-2997; FAX 312/413-2435.

Chemistry: Philip D. Morse, II, Department of Chemistry, Illinois State University, Normal 61761. Office: 309/438-5595; FAX: 309/438-5538

Collegiate Chemistry: Kurt W. Field, Department of Chemistry, Bradley University, Peoria 61625. Office: 309/677-3024.

Computer Science: Lee H. Tichenor, Department of Computer Science, Western Illinois University, Macomb 61455. Office: 309/298-1479.

Earth Science: Richard L. Leary, Illinois State Museum Collections Center, 1920 S. 10.5 St., Springfield 62703. Office: 217/782-6633.

Engineering and Technology: Raghupathy Bollini, Department of Electrical Engineering, Southern Illinois University, Edwardsville 62026

Environmental Science: Karen S. Midden, Department of Plant and Soil Sciences, Southern Illinois University, Carbondale 62901. Office: 618/453-1786.

Health Sciences: Dennis Kitz, Department of Biological Sciences, Southern Illinois University, Edwardsville 62026.

Mathematics: William Bennewitz, Department of Mathematics and Statistics, Southern Illinois University, Edwardsville 62026.

Microbiology: Amrik S. Dhaliwal, Department of Biology, Loyola University, Chicago 60626. Office: 312/508-3626.

Neurobiology: Sidney B. Simpson, Jr., Department of Biological Sciences, M/C 066, University of Illinois, Chicago 60680. Office: 312/996-2211.

Physics and Astronomy:



Science, Mathematics, and Technology Education: James V. Rauff, Department of Mathematics, Millikin University, Decatur 62522. Office: 217/424-6249; FAX 217/424-3993.

Zoology: Dianne Jedlicka, 3002 Harris, Joliet 60435. Phone: 815/436-4081. (University of Illinois at Chicago, M/C 066, Box 4348, Chicago 60680, phone 312/996-4289, and Field Museum of Natural History, phone 312/922-9410, x.249 or 256)

#### CHAIRS OF STANDING COMMITTEES

#Budget: Gary Kessler, Physics Department, Illinois Wesleyan University, Bloomington 61702-2900. Office: 309/556-3004 or 3060; FAX 309/556-3411.

Constitution and Bylaws: Laszlo D. Hanzely, Department of Biological Sciences, Northern Illinois University, DeKalb 60115-2861. Office: 815/753-7815.

#Fellows and Honorary Members: Richard L. Leary, Illinois State Museum Collections Center, 1920 S. 10.5 St., Springfield 62703. Office: 217/782-6633.

#Meetings and Expositions: Lorin I. Nevling, Illinois Natural History Survey, 607 E. Peabody Dr., Champaign 61820. Office: 217/333-6830.

#Membership: Amrik S. Dhaliwal, Department of Biology, Loyola University, Chicago 60626. Office: 312/508-3626.

#Nominations and Elections: Harold M. Kaplan, 106 N. Almond St., Carbondale 62901. (School of Medicine, Southern Illinois University at Carbondale.) Office: 618-536-5513; home: 618/457-2707.

#Publications: Richard L. Leary, Illinois State Museum Collections Center, 1920 S. 10.5 St., Springfield 62703. Office: 217/782-6633.

#Research Grants: Marjorie A. Jones, Department of Chemistry, Illinois State University, Normal 61761-6901. Office: 309/438-2366.

#Resolutions: Richard L. Leary, Illinois State Museum Collections Center, 1920 S. 10.5 St., Springfield 62703. Office: 217/782-6633.

#Science Talent Search: James A. McGaughey, Department of Botany, Eastern Illinois University, Charleston 61920. Office: 217/581-6389; Department: 217/581-3624; FAX 217/581-2722.

#Science Education: Kevin C. Wise, Science/Environmental Education Center, Department of Curriculum and Instruction, Southern Illinois University, Carbondale 62901-4610. Office: 618/453-4212; Dept.: 618/536-2441.

## OTHER OFFICIALS

AAAS and NAAS Delegate (1992-1995): Barbara Frase, Department of Biology, Bradley University, Peoria 61625.

#Delegate to Junior Academy: Andrew S. Methven, Department of Botany, Eastern Illinois University, Charleston 61920. Office: 217/581-6241; FAX 217/581-2722.

#Chair of Necrology Committee: Harold M. Kaplan, 106 N. Almond St., Carbondale 62901. (School of Medicine, Southern Illinois University at Carbondale.) Office: 618-536-5513; home: 618/457-2707.

## OTHER TELEPHONE NUMBERS

Museum Board Room: 217/782-5860.

## FUTURE MEETINGS

15-16 October 1993: Southern Illinois University at Carbondale  
 1994: Knox College, Galesburg  
 1995: Eastern Illinois University, Charleston

\*Denotes position to be filled by election/succession effective October 1993

#Denotes presidential appointments



## Treasurer's Report, 1992

### ACCOUNT RECONCILIATION

	ISAS Accts.	Health Sci. Div.	Botany Div.	Total
Receipts	31,550.46	53.51	1038.08	32,642.05
Disbursements	28,575.61	0.00	50.00	28,625.61
Change	2974.85	53.51	988.08	4016.44

### Account balances

12/31/92	53,976.07	420.39	2492.49	56,888.95
12/31/91	51,001.22	366.88	1504.41	52,872.51
Change	2974.85	53.51	988.08	4016.44

ISAS funds are held in accounts at Bank One, Springfield, the SIU Credit Union, Carbondale, and in a Pacific Gas and Electric Company bond.

### DESCRIPTION OF RECEIPTS

Dues - Regular		7140.00
Student		595.00
Library subscriptions to <i>The Transactions...</i>		1468.75
Page charges, <i>The Transactions...</i>		5775.00
Bank earnings and bond interest		2260.30
Contributions		10,712.00
<i>The Transactions...</i>	5000.00	
Annual meeting	2450.00	
Undesignated	1190.00	
Student research	1048.00	
Botany	984.00	
Health Sciences	40.00	
1992 Annual meeting*		4631.00
Miscellaneous		60.00
Total		32,642.05

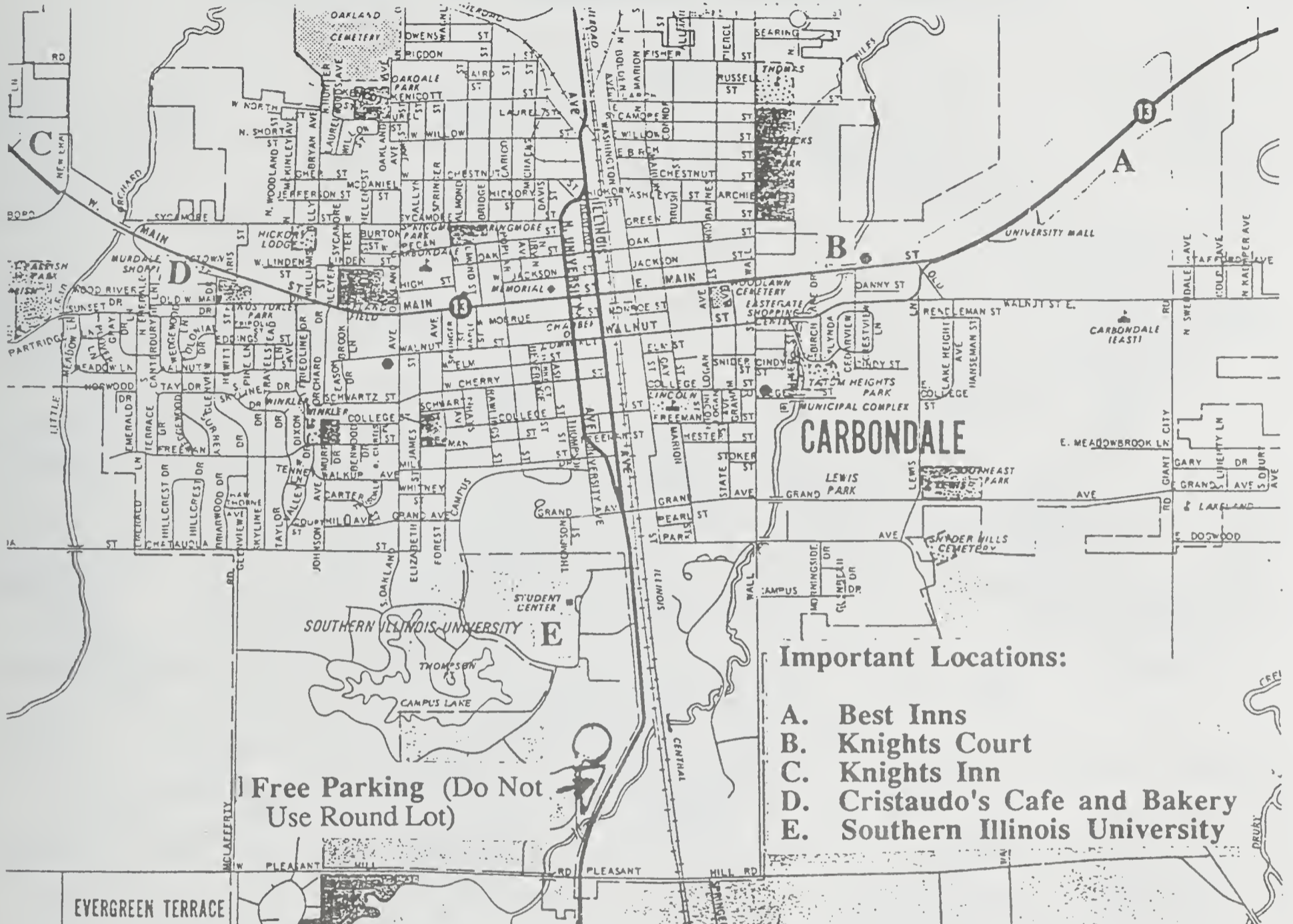
### DESCRIPTION OF DISBURSEMENTS

Central office		11,475.51
<i>The Transactions...</i>		12,650.20
Awards and grants		2450.00
Research grants	1900.00	
Frank Reed Award	200.00	
Chemistry Div. Awards	200.00	
Botany Div. Awards	150.00	
Annual meeting**		1817.50
Other expenses		232.40
Total		28,625.61

\*An additional \$1600.00 in contributions to the 1992 Annual Meeting are anticipated.

\*\*An additional \$5504.38 in 1992 Annual Meeting expenses were paid during the first quarter of 1993.

## CARBONDALE



### To reach Southern Illinois University at Carbondale:

**From Highway 127:** Turn left at Murphysboro onto Highway 13. Proceed into Carbondale.

Turn right (south) onto North University Ave. (= Highway 51; a one way street) which merges with northbound traffic at the north east corner of the University.

**From Highway 51:** Proceed through Carbondale on Highway 51 (= North University Ave.; a one way street). It merges with northbound traffic at the north east corner of the University.

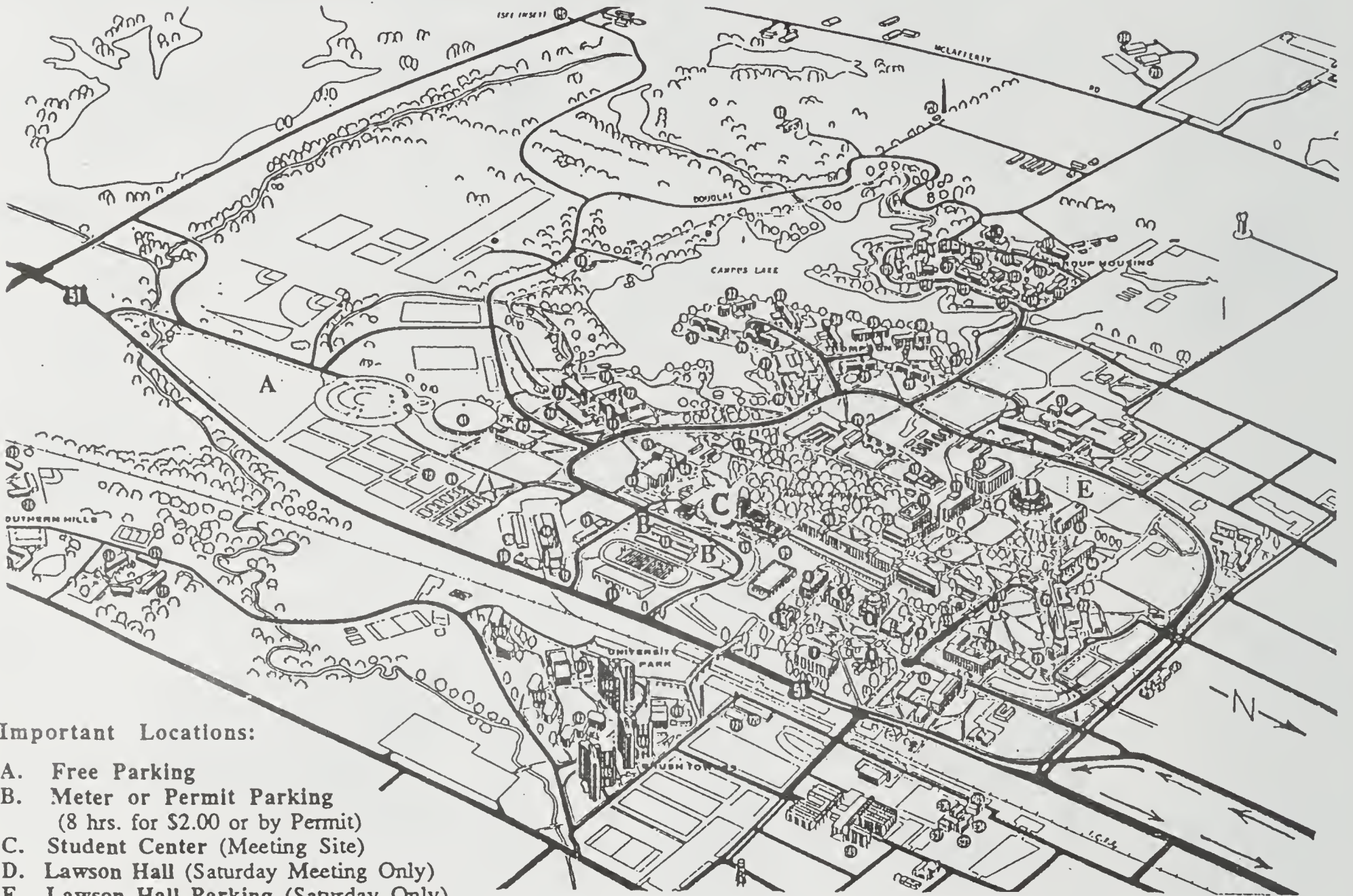
**From Interstate 57:** Turn right onto Highway 13 at Marion. Proceed into Carbondale. Turn left (south) onto North University Ave. (= Highway 51; a one way street) which merges with northbound traffic at the north east corner of the University.

**Parking:** There is a small number of meter parking slots (B on Campus map) across from the SIUC Student Center (\$2.00 in quarters for 8 hrs. or via Permit available at registration). Pay or Permit parking is needed only on weekdays until 4:30 PM. The SIUC Arena south parking lot is free--DO NOT use circular lot. Lawson Hall parking lot will be open on Saturday only.

**Discount Offer:** Cristaudo's Cafe and Bakery, well known in Carbondale for their breads and pastries and "serving breakfasts, lunch, and Sunday brunch; made from scratch in the back" offers 33% off "over-the-counter" purchases made on October 15 through 17. "Come in to the hospitality of SIUC's former Scientific Glassblower turned Chef and Baker, Lorenzo Cristaudo." Users must have an ISAS meeting registration badge and official discount coupon (available at registration) to obtain this special.



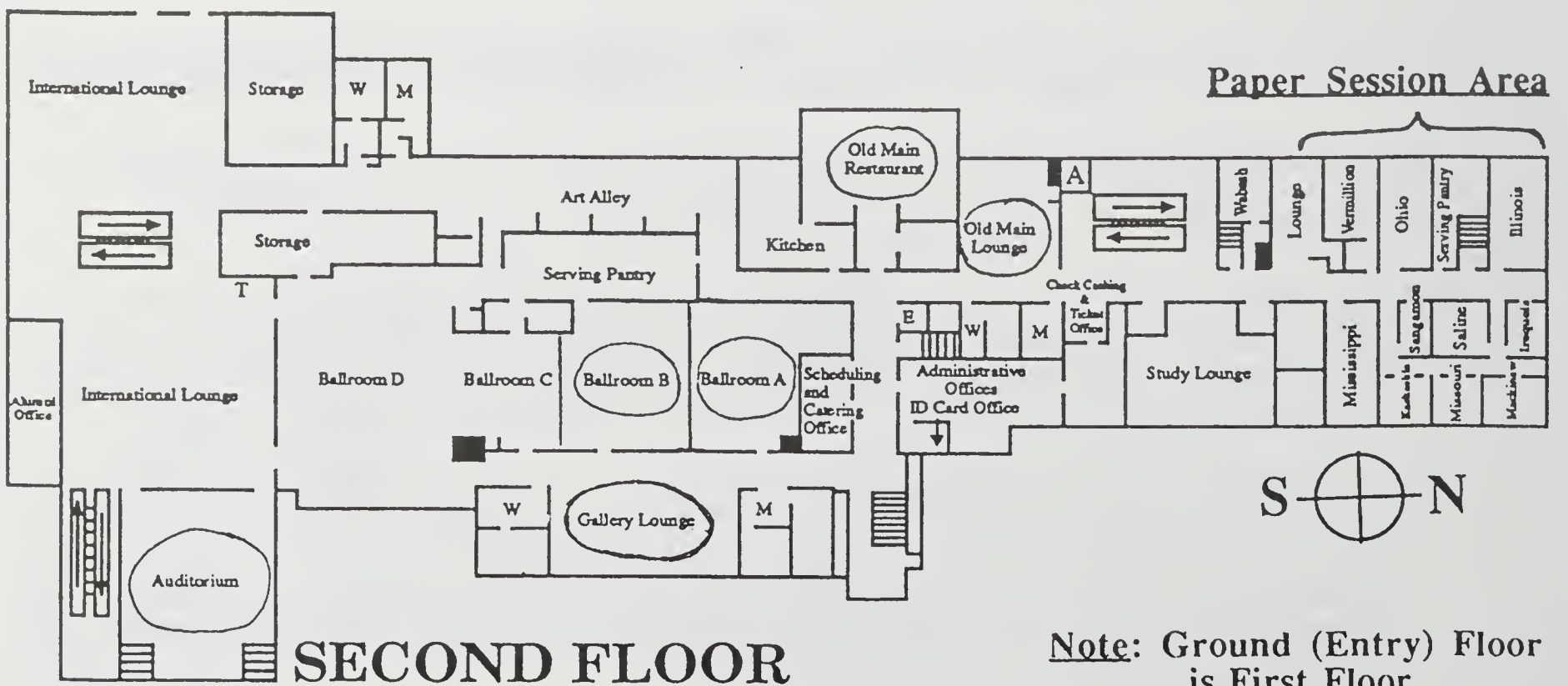
SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE



Important Locations:

- A. Free Parking
- B. Meter or Permit Parking (8 hrs. for \$2.00 or by Permit)
- C. Student Center (Meeting Site)
- D. Lawson Hall (Saturday Meeting Only)
- E. Lawson Hall Parking (Saturday Only)

STUDENT CENTER--SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE



Note: Ground (Entry) Floor is First Floor



# ILLINOIS STATE ACADEMY OF SCIENCE

## EXPANDING FRONTIERS

Southern Illinois University at Carbondale  
October 15-16, 1993

Annual Meeting Registration Form  
(Please type or print)

Name: \_\_\_\_\_  
Last First

Mailing Address: \_\_\_\_\_  
Street

\_\_\_\_\_ City State Zip Code

Affiliation: \_\_\_\_\_

Membership Status: Regular Member: \_\_\_\_\_ Student Member: \_\_\_\_\_  
Honorary Member: \_\_\_\_\_ Life Member: \_\_\_\_\_  
Emeritus Member: \_\_\_\_\_ Non-Member: \_\_\_\_\_  
Non-registrant guest--host school student \_\_\_\_\_ (*ID card required; paper sessions attendance only*)  
Non-registrant guest--other: \_\_\_\_\_ (*poster session and/or meals only*)  
Membership Information Requested: \_\_\_\_\_

Registration Fees: (Note: This form may be photocopied if more than one registration is submitted)

(Menus on reverse; T = Ticket required)	No.	Price	Total
ISAS Members (On site \$25.00)	_____ @	\$20.00	\$ _____
ISAS Student Members (On Site \$12.50)	_____ @	\$10.00	\$ _____
Non-Member (On Site \$35.00)	_____ @	\$30.00	\$ _____
Academy Luncheon ( <i>with important Annual Meeting</i> )	_____ @	\$10.00 T	\$ _____
Academy Luncheon--Student Member ( <i>see note above</i> )	_____ @	\$ 8.00 T	\$ _____
Academy Luncheon--Non-registrant guest ( <i>see above</i> )	_____ @	\$12.00 T	\$ _____
Academy Banquet (ISAS Member Registrants)**	_____ @	\$17.00 T	\$ _____
Academy Banquet (ISAS Student Member Registrants)**	_____ @	\$14.00 T	\$ _____
Academy Banquet (Non-Registrant Guests)**	_____ @	\$20.00 T	\$ _____
(** = Includes both Poster Session & Banquet)			
Poster Session <u>Only</u> (Registrants not attending Banquet)	_____ @	\$ 8.00 T	\$ _____
Poster Session <u>Only</u> (Non-registrant Guests--see above)	_____ @	\$12.00 T	\$ _____
Parking Sticker (needed weekdays until 4:30 pm)	_____ @	\$ 2.00	\$ _____
TOTAL (Payment must accompany form)			\$ _____

Registration forms must be received by the Treasurer no later than October 6, 1993. Please make checks payable to the **ILLINOIS STATE ACADEMY OF SCIENCE**. Address correspondence to:

JoAnn DeLuca, Treasurer  
Illinois State Academy of Science  
Chemistry Dept., Illinois State University  
Normal, IL 61761

Phone: (309) 438-2697

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JoAnn DeLuca, Treasurer  
1993 Annual Meeting, Illinois State Academy Of Science



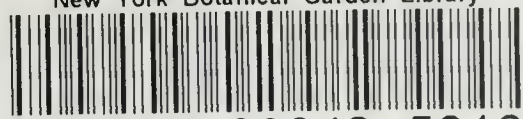








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