General Schedule

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109th Annual Meeting
The Ohio Academy of Science
Hosted by
Ohio Northern University
Ada, Ohio
March 31; April 1-2, 2000

About the Annual Meeting

The Ohio Academy of Science's Annual Meeting is for academic, governmental, and industry scientists and engineers, university and pre-college educators and teachers, and pre-college, undergraduate, and graduate students, and interested lay citizens in the Ohio region. Annually the several hundred scientific presentations are complimented by workshops, symposia, an All-Academy Lecture, and field trips on local geology and plant sciences.

Welcome!
Ohio Northern University welcomes you to the 109th Annual Meeting of The Ohio Academy of Science. We invite you to explore our campus and to share in the excitement and opportunities provided in this program.

REGISTRATION: Registration is required for all meeting presenters and attendees. On-site registration will be available at a higher rate. To assure reservations for meals, forms must be received by The Ohio Academy of Science by March 22, 2000. Please use Registration Form the on last page. Mail completed forms and fees to:

OAS Annual Meeting Registration
The Ohio Academy of Science
PO Box 12519
Columbus OH 43212-0519
FAX 614/488-2228 (for Credit Card or PO only)

Registration by credit card or purchase order only will be accepted by FAX at 614/488-2228. Your packet, receipt, and name tag will be ready at the meeting registration desk upon your arrival. For further information, please call 614/488-2228.

Friday, March 31: Registration will be held in Meyer Hall Atrium from 12:00 Noon to 2:00PM. On-site registration is possible by check, VISA, or Mastercard. Cash is discouraged.

Saturday, April 1: Registration will be held in Meyer Hall Atrium from 8:00AM-3:00PM. On-site registration is possible by check, VISA, or Mastercard. Cash is discouraged.

Special Acknowledgments: The Ohio Academy of Science expresses its appreciation to METCALF & EDDY for financial support of the Saturday, April 1 Environmental Sciences Breakfast. We also thank the OHIO NORTHERN UNIVERSITY CHAPTER OF SIGMA XI for partial support of the afternoon reception on Saturday, April 1st.

Local Arrangements: Dr. Terry Keiser

PARKING: Free parking is available in lots near Meyer Hall on the north edge of campus.

SMOKING POLICY: Smoking is not permitted in any building on campus.

MEALS: Friday, March 31. Preregistration required by March 22 for the Ohio Academy of Science Annual Meeting Banquet held jointly with The Ohio Biological Survey. Saturday, April 1. Lunch will be available in MacIntosh Hall. See registration form. There is no Saturday evening meal.

HOUSING: Please contact hotels and motels directly. See list on page A-5. HOUSING IS NOT AVAILABLE IN ADA.

GENERAL SCHEDULE

Friday, March 31, 2000

10:00 AM The Ohio Academy of Science Board of Trustees Meeting
Meyer Hall Room 118

12:00 Noon Lunch on own in MacIntosh Center

1:30 PM The Nature of Science: MICROBIAL DISCOVERY WORKSHOP
Arranged by ROD ANDERSON, PH.D.
Meyer Hall Room 104

Welcome-Introductions
Workshop Overview and Objectives
Sizing Up the Microbial World—30X Microviewer Exercises

2:15 Biofilms and Microdiscovery Boards

3:15 Break

3:30-5:00 Biodegradation Columns and Can Microbes Taste the Difference?

Target Audience: Junior and Senior High Science Educators

Objectives: The purpose of the workshop is to have teachers complete several hands-on inquiry-based labs that will enable them to present a balanced view of the life sciences by using microorganisms to teach concepts and principles found in the National Science Standards. The exercises will focus on the positive roles that microorganisms play in our lives and use low cost, easily found equipment and materials.

Personnel: Dr. Anderson is a Professor of Biological Sciences at Ohio Northern University and has lead and coordinated Microbial Discovery Workshops in Ohio, Florida, Idaho, Wisconsin and Texas. He is a member of the Precollege Education Committee of the American Society of Microbiology. Spencer Reames, a faculty member at Benjamin Logan High School, has been on the workshop faculty at national Microbial Discovery Workshops and has conducted numerous workshops.

Activities: The activities of the Microbial Discovery Workshop have been developed by secondary teachers and the Precollege
Committee in association with the American Society of Microbiology and the National Association of Biology Teachers. They have been welcomed for their simplicity and their adaptability to numerous instructional levels. All activities are hands-on investigative activities that meet National Science Education Standards.

Materials: Each participant will receive the Power Unseen: How Microbes Rule the World, by Bernard Dixon, A Microbial Discovery Workshop Manual containing the activities completed during the workshop; Battle Biology; and Meet the Microbes, a set of investigative labs developed by the Microbial Literacy Collaborative. Materials for the workshop are supplied by a grant from the American Society for Microbiology.

Saturday, April 1, 2000

7:30 AM       Special Environmental Sciences Breakfast
              (by invitation only; must be pre-registered)
              Hosted by METCALF & EDDY
              MacIntosh Center
              Special Report: How to Apply to the Academy for Ohio Environmental Science and Environmental Engineering Undergraduate Scholarships

8:00 AM-3:00 PM General Meeting Registration
                Meyer Hall Atrium

9:00-11:00 AM The Nature of Science: TEACHING SCIENCE PROCESS SKILLS
                Arranged by RUTH M. WILLEY
                Fremont Ross HS, Fremont OH
                Meyer Hall Room 104

Science Process skills are the things scientists do when they do science. These skills, by themselves, can generate science content and concepts and are the critical aspects of any science class.

K-12. In many state proficiency tests, these skills are the areas where our science students are failing, mostly because science classes have become textbook-based. This presentation will use activities to help teachers focus on and include those beginning aspects of true science: observation, inference, classification, prediction. The activities will then address higher level aspects of controlled scientific investigations: identifying variables, correct data table and graphing procedures, describing relationships between variables. Teachers will perform activities and be provided with resources to use in their classroom.

9:00-11:00 AM Morning poster and podium presentations.

11:15 AM       All Academy Lecture
               The Nature of Science: EVOLUTION
               EUGENIE C. SCOTT, Ph.D.
               Meyer Hall Room 107

Since 1987 EUGENIE C. SCOTT has been the Executive Director of the National Center for Science Education, Inc., a pro-evolution nonprofit science education organization with members in every state. She holds a Ph.D. in biological anthropology from the University of Missouri. Scott has taught at the University of Kentucky, the University of Colorado, and in the California State University system. A human biologist, her research has been in medical anthropology and skeletal biology. She has many published papers and monographs, has served as chair of the Ethics Committee of the American Anthropological Association, and served as the Secretary-Treasurer of the American Association of Physical Anthropologists. In 1994, Scott was elected to the California Academy of Sciences.

She is nationally-recognized as a proponent of church/state separation, and serves on the National Advisory Council of Americans United for Separation of Church and State, on the National Advisory Council of Americans for Religious Liberty, and has served on the Executive Committee of the National Coalition for Public Education and Religious Liberty (PEARL). Scott has also served on the Board of Directors of the Biological Sciences Curriculum Study. An internationally-recognized expert on the creation/evolution controversy, she has consulted with the National Academy of Sciences, several State Departments of Education, and legal staffs in both the United States and Australia.

Scott has worked nation-wide to communicate the scientific method to the general public and to improve how science as a way of knowing is taught in school. She is frequently called upon by the print, radio, and television media as a spokesperson for “the scientific view” when conflicts arise between scientific and pseudoscientific explanations, including appearances on Donahue, Geraldo, Crossfire, Firing Line, Ancient Mysteries, CNN, Morning Edition, The Pat Buchanan Show, Science Friday, and All Things Considered. She was featured in the Nova program “In the Beginning: The Creationist Controversy.” Scott is listed in Who’s Who in Science and Engineering, and has been made a FELLOW of the Committee for the Scientific Investigation of Claims of the Paranormal, from which in 1991 she received the Public Education in Science Award. In 1993 she was selected a University of Missouri Arts and Sciences...
College Distinguished Alumnus, and in 1998, received the Isaac Asimov Science Award from the American Humanist Association. In 1999 she received the Skeptics Society James Randi Award, the Hugh H. Heifner First Amendment Award, and the American Society of Cell Biology's Bruce Alberts Award. She is a co-author of the National Academy of Science's Teaching About Evolution and the Nature of Science, and has consulted with the NAS on the revision of its Science and Creationism booklet.

Scott has been both a researcher and an activist in the creationism-evolution controversy for several years, and can speak to problems created by this sectarian challenge to science education from many directions: educational, legal, scientific, and/or social. A dynamic speaker, she offers stimulating and thought-provoking as well as entertaining lectures and workshops.

National Center for Science Education, 925 Kearney St., El Cerrito, CA 94530-2810 Phone: 510-526-1674 or 1-800-290-6006 email: scott@natscied.org • http://www.natscied.org

12:00 NOON  **Special Recognition Ceremony**  of newly elected **FELLOWS** of The Ohio Academy of Science

12:15PM  **Lunch available in Macintosh Center**

12:15 PM  **Luncheon Discussion** (optional)  **Learn About the Ohio Campus Compact**  
Arranged by Michael Barker, Director, Ohio Academy of Science  
Student Advisory Council

_You may select your lunch and come to the breakout room in the Macintosh Center_

**THE OHIO CAMPUS COMPACT** (OCC) is a membership organization of Ohio colleges and universities established to support the development of campus-wide student and institutional participation in community and public service. OCC is part of the national Campus Compact, a coalition of over 520 college and university presidents established to create public service opportunities for their students and develop an expectation of service as an integral part of the undergraduate experience.

OCC (1) seeks to integrate service into faculty instruction and students’ studies, making community service activities a valued element of the undergraduate experience; is (2) committed to enhancing students’ responsibility, citizenship and awareness of the community while reinvigorating higher education’s concern for improving the quality of life in society; (3) is committed to strengthening the impact of that service on the welfare of communities and the education of students in institutions of higher education. For more information contact: Ohio Campus Compact, 615 North Pearl Street, Granville, OH 43023. Phone: 740/587-7680; FAX: 740/587-7681; Richard Kinsley, Executive Director, occdick@alink.com Website: http://www.ohiok-16service.org/occabout.htm

1:30-5:00PM  **Afternoon poster and podium presentations**

2:00-3:30PM  **Workshop: Writing Theses and Dissertations**  
Arranged by **ISAAC L. NEWMAN, Ph.D.**  
and **DONNA WAECHTER, Ph.D.**  
Meyer Hall Room 104

**Objectives:** 1. Help students get started by introducing them to the structure and components of theses and dissertations. 2. Help faculty who are supervising dissertations or theses to facilitate students in their writing. 3. Give examples of how to get students started and increase the likelihood of students being able to finish.

**Presenters:** **ISAAC L. NEWMAN, Ph.D.** has been on over 300 dissertation committees in many disciplines. He has also written a book entitled: *Thesis and Dissertations in the Physical and Social Sciences*. **DONNA WAECHTER, Ph.D.** has taught techniques of research, testing and measurement with an emphasis on papers and writing for seven years.

5:15PM  **OFFICIAL NOTICE**  of Annual Business Meeting  
for Academy Members Only  
Meyer Hall Rm 104

See page 44

**Sunday, April 2, 2000**

7:45AM  **Plant Science Field Trip: LAWRENCE WOODS STATE NATURE PRESERVE**  
Arranged by **MARSHAL MOSER** and **NELSON MOORE**

*L*awrence Woods is a 1100 acre State nature preserve located 5¼ miles south of Kenton, Hardin County, Ohio. It is one of the most recent purchases by the Division of Natural Areas and Preserves of the Ohio Department of Natural Resources. The preserve was officially dedicated on May 1, 1999, with Gov. Taft as the main speaker. The area features a 400-acre mature wet hardwood forest, tilled agricultural land and more than 50 acres of farmland in succession. A number of uncommon and state-listed species have been found including the four-toed salamander, heart-leaf plantain, pumpkin ash and swamp cottonwood. Many aspects of the area can be viewed from a 1½ mile boardwalk which circles through the woods, including a large buttonbush swamp. Meet at the parking lot on the north side of Meyer Hall of the Ohio Northern University at 7:45AM. The field trip will run between 8:00AM - 12 NOON. The field trip will be lead by Marshal Moser and Nelson Moore, both of whom were instrumental in drawing the attention of the State to this unique habitat as an outstanding example of northwest Ohio’s original forest.
8:30AM Geology Field Trip: LOWER SILURIAN (LLANDOVERY-WENLOCK) STRATIGRAPHY OF WEST-CENTRAL OHIO
Arranged by: MARK A. KLEFFNER, The Ohio State University at Lima

Meet at the new Science Building on The Ohio State University at Lima campus for coffee, tea, soft drinks, and donuts. The Ohio State University at Lima campus is just a 15-minute drive west of Ohio Northern University, on State Route 309 (Harding Highway). Field trip participants may park in the south parking lot (first turn to right after turning off of SR 309). Enter Science Building through main entrance on south side. Participants may tour the museum and other facilities of the Department of Geosciences while eating and drinking. We will then continue south to a location just north of Yellow Springs for lunch. This location is Young’s Dairy Barn, which is known statewide for excellent ice cream and baked goods. If you choose not to buy your lunch there, they do have picnic tables available to use if you bring your lunch or buy it elsewhere. After lunch, we will complete the field trip by traveling a few miles to the east, to John Bryan State Park, where we will examine the remainder of the Lower Silurian exposed in west-central Ohio, including the upper part of the Brassfield, Dayton, Osgood, and Laurel Formations (including Massie Member), and Euphemia, Springfield, and lower part of Cedarville Dolomites.

**Our Host**
Ohio Northern University, a United Methodist-related institution of higher learning, seeks to educate and graduate students accomplished in scholastic achievement, prepared for a useful life and meaningful career, inspired with a desire to contribute to the good of mankind consistent with Judeo-Christian ideals and committed to a quality of life that will result in maximum personal and social worth.

Ohio Northern’s purpose is to help students develop into self-reliant, mature men and women capable of clear and logical thinking and sensitive to the higher values of truth, beauty and goodness. In keeping with this goal, students will be exposed to diverse ideas and influences, including those of professional programs, which broaden and strengthen the college experience and help to prepare them for later life.

The campus is located in northwest Ohio and is easily accessible from major highways. ONU is only 90 minutes by car from Columbus, Toledo, Dayton, and Fort Wayne. Travel is also easy from Cincinnati, Cleveland, Pittsburgh, Chicago, Indianapolis, and other large cities. Commercial air service is available in Toledo, Columbus, and Dayton.

As a community, Ada provides an ideal setting for the ONU campus. The relaxed, comfortable atmosphere of the rural community of about 5,000 is oriented to studying and learning. The friendly community offers a good selection of shops, stores, and restaurants.

Ada’s rural setting is complemented by major shopping districts and diverse industries and businesses in the city of Lima, only 15 miles west of campus. After the short drive to Lima, students find a variety of restaurants, movie theaters, major shopping malls, and other attractions. Dr. TERRY KEESER, Chair of Biological Sciences, will serve as chair of local arrangements.

**HOUSING**

**LIMA**

**LIMA AREA**

- Comfort Inn
  - 1210 Neubrecht Rd
  - Lima, OH 45801-3118
  - (419)228-4251

- Days Inn
  - 1250 Neubrecht Rd
  - Lima, OH 45801-3118
  - (419)227-6515

- Econo Lodge
  - 1201 Neubrecht Rd
  - Lima, OH 45801-3117
  - (419)222-0596

- Fairfield Inn
  - 2179 Elida Rd
  - Lima, OH 45805-1518
  - (419)224-8496

- Hampton Inn
  - 1933 Roschman Ave
  - Lima, OH 45804-3496
  - (419)225-8300

- Holiday Inn
  - 1920 Roschman Ave
  - Lima, OH 45804-3444
  - (419)222-0004

- Knights Inn
  - 2285 N Eastown Rd
  - Lima, OH 45807
  - (419)331-9215

- Motel 6
  - 1910 Roschman Ave
  - I-75 and State Route 309
  - Lima, OH 45804
  - (419)228-0456

- Ramada Inn
  - 3600 E Bluelick Rd
  - I-75 and Bluelick Rd
  - Lima, OH 45801
  - (419)221-0114

- Super 8
  - 1430 Bellefontaine Ave
  - I-75 and State Route 309
  - Lima, OH 45804
  - (419)227-2221

- Wingate Inn
  - 150 W Market St
  - Lima OH 45801
  - (419)222-6075

**KENTON AREA**


- Fairfield Inn & Conference Center
  - 200 E Main Cross St
  - Findlay, OH 45840
  - (419)422-5682

- Knights Inn
  - 1901 Broad Ave
  - Findlay, OH 45840
  - (419)424-1133

- Hampton Inn
  - 921 Interstate Dr
  - Findlay OH 45840
  - (419)422-5252

- Holiday Inn Express
  - 941 Interstate Dr
  - Findlay OH 45840
  - (419)420-1776

- Motel 6
  - 1910 Roschman Ave
  - I-75 and State Route 309
  - Lima, OH 45804
  - (419)228-0456

- Ramada Inn
  - 3600 E Bluelick Rd
  - I-75 and Bluelick Rd
  - Lima, OH 45801
  - (419)221-0114

- Super 8
  - 1430 Bellefontaine Ave
  - I-75 and State Route 309
  - Lima, OH 45804
  - (419)227-2221

- Wingate Inn
  - 150 W Market St
  - Lima OH 45801
  - (419)222-6075

**FINDLAY AREA**

- Doctor’s Inn Bed and Breakfast
  - 346 North Detroit Kenton
  - Kenton, OH 43326
  - (419)672-0619

- County Health Inn
  - 1020 Interstate Ct
  - Findlay OH 45840
  - (419)423-4503

- Cross Country Inn
  - 1951 Broad Ave
  - Findlay OH 45840
  - (419)424-0466

- Days Inn
  - 1305 W Main Cross St
  - Findlay, OH 45840
  - (419)423-7171

- Econo Lodge
  - 316 Emma St
  - Findlay, OH 45840
  - (419)422-0154

- Fairfield Inn
  - 2000 Tiffin Ave
  - Findlay OH 45840
  - (419)424-9940

- Findlay Inn & Conference Center
  - 200 E Main Cross St
  - Findlay, OH 45840
  - (419)422-5682

- Knights Inn
  - 1901 Broad Ave
  - Findlay, OH 45840
  - (419)424-1133

- Hampton Inn
  - 921 Interstate Dr
  - Findlay OH 45840
  - (419)422-5252

- Holiday Inn Express
  - 941 Interstate Dr
  - Findlay OH 45840
  - (419)420-1776

- Motel 6
  - 1910 Roschman Ave
  - I-75 and State Route 309
  - Lima, OH 45804
  - (419)228-0456

- Ramada Inn
  - 3600 E Bluelick Rd
  - I-75 and Bluelick Rd
  - Lima, OH 45801
  - (419)221-0114

- Super 8
  - 1430 Bellefontaine Ave
  - I-75 and State Route 309
  - Lima, OH 45804
  - (419)227-2221

- Wingate Inn
  - 150 W Market St
  - Lima OH 45801
  - (419)222-6075

**KENTON AREA**

- AmeriHost Inn
  - 902 East Columbus Street
  - Kenton, OH 43326
  - (419)675-1400

- Days Inn
  - 1305 W Main Cross St
  - Findlay, OH 45840
  - (419)423-7171

- Econo Lodge
  - 316 Emma St
  - Findlay, OH 45840
  - (419)422-0154

- Fairfield Inn
  - 2000 Tiffin Ave
  - Findlay OH 45840
  - (419)424-9940

- Findlay Inn & Conference Center
  - 200 E Main Cross St
  - Findlay, OH 45840
  - (419)422-5682
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## Saturday, April 1, 2000

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NOTE: Undergraduate Research-in-Progress Reports, as opposed to abstracts, are designated by having names of student advisor(s) in (parentheses) following the name(s) of students. Pre-college students have included the names of their schools in (parentheses).
Board 01 EXPERIMENTAL TEST OF A HYPOTHESIS THAT ZEBRA MUSSELS (DREISSENA POLYMORPHA) ALTER PHYTOPLANKTON P-DYNAMICs BY RELEASE OF PHOSPHATE. Jennifer C. Cline and R. T. Heath, Kent State University, Dept of Biological Sciences, Kent, OH 44242. jclinel@kent.edu

Growth and activity of phytoplankton are usually limited by the amount of phosphorus available. The phosphorus availability can influence total phytoplankton growth as well as the proportion of different phytoplankton species. In 1999, current management strategies have sought to limit phytoplankton growth by decreasing the amount of phosphate input to water bodies. Past research has demonstrated that zebra mussels alter the phosphorus dynamics by remeralizing large quantities of particulate phosphorus and releasing the phosphorus in a soluble form readily available to phytoplankton, thereby releasing the phytoplankton from phosphorus limitation. During the summer of 1999, another study was conducted to experimentally attempt to mimic the effects of zebra mussels in communities not affected by zebra mussels. Experimental additions of phosphate in quantities similar to that of the zebra mussels were added to nutrient amendment bottles containing water from East Twin Lake, a mesotrophic glacial kettie near Kent, Ohio. We found that additions of phosphate similar to those provided by zebra mussels did not alter physiological and community factors of phytoplankton dynamics to the same extent as the addition of a zebra mussel community. This was supported by the Lake Erie Protection Fund (07-10).

Board 02 VASCULAR PLANTS INVENTORY OF A PORTION OF MINUTE MAN NATIONAL HISTORICAL PARK, MA. Julia C. Wilcox, Hiram College, Dept of Biology, Hiram OH 44234. wilcoxjc@hiram.edu

A detailed inventory of vascular plants was conducted of a 12 ha region of Minute Man National Historical Park in July and August of 1999. Within this region, early successional mixed pine, oak, and maple forests surround high contact soils and a red maple swamp. The botanical composition was reseeded, and the species diversity, distribution, and herb/shrub cover was estimated. Dominant trees included Acer rubrum, Pinus strobus, Quercus velutina, Quercus rubra, and Nyssa sylvatica. Dominant shrubs included Clethra alnifolia, Vaccinium corymbosum, V. angustifolium, Rhamnus frangula, and Rhusceadora viscous. Overall, plant community structure and floral composition were comparable to other northeastern red maple swamps. Numerous xeric plant populations, which threaten the regional’s natural succession, were recovered. Management options concerning the exotic populations are proposed, with isolated xeric populations that are highly invasive and found within wetland habitat being considered the highest priority for removal. Using these criteria, Lythrum salicaria populations within the vernal pools are of greatest concern, followed by isolated populations of Rhamnus frangula, Clethra alnifoica, Berberis thombergii, and Rosa multiflora.

Board 03 MOLECULAR METHOD OF IDENTIFICATION OF MICROORGANISMS IN THE FILM COVERING THE EYES OF THE HORSESHOE CRAB. Neely N. Nelson1, Rachel Lamb1, Min-Ken Liao2,1, Ohio Northern University, Dept of Biology, Ada OH 45810 and 2Hopkins College, n.nelson@onu.edu

A method adapted to the extraction, amplification, isolation, and sequencing of ribosomal RNA is presented, to obtain information to identify the microorganisms located in the film covering the eyes of the horseshoe crab, Limulus polyphemus. The PCR products obtained using SP6 and T7 primers for the amplification of the bacterial 16S rDNA from the eye sample were cloned into pGEM®-Easy (Promega) vectors and transferred into XL1-Blue E. coli. Gel electrophoresis analysis, after HindIII and EcoRI double restriction digests, determined the presence of insert and the concentration of plasmid DNA. Three isolated colonies of XL1-Blue E. coli containing insert yielded sufficient concentrations of DNA required for sequencing. In the future, sequencing followed by computer analysis and database comparison will identify the bacteria.

Board 04 ETHYLENE INHIBITION OF GAVRITROPISM IN CUCUMBER HYPOCOTYL. ZLS. Grant M. Barkley, Kent State University, Dept of Biological Sciences, 4314 Mahoning Ave N.W., Warren OH 44483. dbarkley@kent.edu

Ethylene inhibition of elongation growth and induction of lateral growth in dicot stem tissues involves sequential and complex biochemical changes. Ethylene treatment inhibits elongation and increases lateral growth with both events occurring simultaneously within 150-180 minutes. Ethylene induction and maintenance of these responses is auxin dependent, increases cell wall expansins and cell wall acidification. A related action of ethylene is the pronounced effect on stem gravitropic response. Normal ‘hypocotyl’ response to gravitropic stimulation begins within 10-15 minutes. The induction of rapid gravitropic response in cucumber hypocotyls, shown by the P24G probe, is accompanied by a parallel increase in the expression of expansin 1 [Cs-Exp1] in the lower half of the geostimulated stem. Pretreatment of vertical cucumber seedlings with ethylene [10 mL/L] prior to gravitropic stimulation decreases the rate of stem curvature in proportion to pretreatment time. Stem response to gravitrestimulation, with or without ethylene, begins rapidly [within 10 min.] indicating normal graviperception. Ethylene inhibition of cell elongation is partially relieved on the lower side of gravistimulated hypocotyls, but resulting growth is still curvilinear. Since pretreatment with ethylene results in uniform acidification and increased expansin expression in both upper and lower halves of the hypocotyl, changes in growth reflect a change in cell wall extensibility and reshuffling of cell wall bonds in cells on the lower side of the hypocotyl. This implicates differential expression of expansins and regulation of growth in the lower half of the geostimulated hypocotyl.
**Board 08**

**EPIEMIDIOLOGICAL INVESTIGATION OF CLINICAL ISOLATES OF PSEUDOMONAS AERUGINOSA BY IMMUNOLOGICAL, BIOCHEMICAL, ANTIBIOTIGRAM, AND DNA ANALYSIS.**

C. Bricker, J. R. Jamasi, S. J. Kennel, L. F. Foote, and E. D. O'Day. Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43402, brickcc@hotmail.com

In this study, the phenotypic and genotypic properties of *P. aeruginosa* serotypes 0:3, 0:6, and 0:11 obtained as individual clinical isolates from a Northwestern Ohio hospital, were investigated to determine their relatedness. A total of 106 isolates were serotyped by ELISA using three specific monoclonal antibodies (mAbs to serotypes 0:3, 0:6, and 0:11). The mAbs reacted with 63.1% of the clinical isolates: 42% 0:6, 11% 0:3, and 10% 0:11. The results indicate that several collection methods should be included to more closely understand the differences in organisms found. Mayflies (Ephemeroptera), Stoneflies (Plecoptera), and Caddisflies (Trichoptera) at four sites on the Great Miami and Maumee Rivers were similar to those from 1985 and 1996 studies.

**Board 09**

**A BIOLOGICAL AND PHYSCHEMICAL ASSESSMENT OF FREELAND'S CAVE, ADAMS COUNTY, OHIO (1998-1999).**

Elizabeth M. Hagen, Wittenberg University, Department of Biology, P.O. Box 720, Springfield OH 45501-0720, shagen@wittenberg.edu

Freeland's Cave, Adams County, Ohio, is a significant cave based on its size (708m total horizontal length) and diversity of aquatic and terrestrial fauna (52 species). The object of this research was to compare current (November 1996-October 1999) species abundances, distributions, and physicochemical characteristics to previous studies conducted in 1985 and 1996. One species of importance is the troglobitic carabid beetle, *Pseudochorthomphalus odhernis*, which is endemic to Freeland's Cave. The density of *P. odhernis* is affected by seasonal changes, with population size highest during the months of July through September, and lowest from February through June. Observed population size ranged from 30 to 66 beetles per visit to the cave. These variations are linked to low water levels during summer months, which expose more of the preferred mud bank habitat. The distribution of *P. odhernis* positively correlates with sections of the cave to low water levels during summer months, which expose more of the preferred mud bank habitat. Microhabitats examined included the stream (pool and riffle substrates ranging from silt to cobble sized particles), mud banks, walls, and ceilings. Among physicochemical parameters, air temperature ranged from 10-14°C, water temperature varied from 6-14°C, dissolved oxygen concentration fluctuated from 8-11mg/L, and pH values ranged between 8.1-9.2. Physicochemical characteristics were affected by precipitation and season. These and biological data will be used to assess the impact of vermocompost-amendments on disease severity. Container media consisted of Metro-Mix 360, a standard greenhouse potting media, and 10, 20, or 40% (by volume) vermocornpost. Vermocompost-amendments to a disease conducive potting mix rendered the amended mix suppressive to Pythium damping-off. Autoclaving of vermcompost prior to amendment negated the suppressive effect indicating the organism was biological in origin. This experiment was performed twice. Vermcompost amendments alone may provide yet another tool for managing soilborne diseases like Pythium damping-off and may provide with an environmentally sound alternative for managing organic waste.

**Board 10**

**A COMPARISON OF TWO COLLECTION METHODS FOR ASSECTHING PRESENCE OF SELECT AQUATIC INSECT ORDERS: GREAT MIAVI RIVER, BUTLER AND HAMILTON COUNTIES, OHIO.**

Mark A. Schlueter and Jan Trybula. Xavier University of Louisiana, Dept of Biology, New Orleans, LA 70125. maschlue@xula.edu

In the past three decades, aquatic insects have served as important indicators of environmental quality. Although much information and data have been collected on aquatic insects, the majority have come from studies on small streams. In the present study, we examined the diversity of Ephemeroptera (mayflies), Odonata (damselflies and dragonflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) at four sites on the Great Miami River. Larvae were collected by dip nets and swept from rocks. Diversity data were compared with previous data from 1998 when adult insects were collected with UV traps. Several differences were noted between the two years. Using the dip net method, the Ephemeroptera were the most abundant (over 85% of the collection at most sites). In 1999, the most common collected Ephemeroptera family was Hagenidae (90% of all mayflies), which was absent from the 1998 collection. The differences in organisms found by collecting method indicates that several collection methods should be included for more accurately measure organism presence. The 1999 diversity results do agree with the 1998 results and suggest that the Great Miami River is moderately impacted.

**Board 11**

**MARINE GASTROTRICHA OF ISRAEL: PRESENT STATUS.**

William D. Pinder. Ohio University, Department of Biological Sciences, Athens OH 45701, hummon@ohiou.edu

The use of compost-amended potting mixes to naturally suppress soilborne fungal diseases such as those caused by *Pythium* and *Phytophthora* species is well documented. Little however, is known about the disease suppressive qualities of vermocompost. Vermicomposting offers an environmentally sound alternative for the recycling of organic wastes and may help alleviate many of the issues currently facing Ohio and other agriculturally based states in regards to manure management. The goal of this research was to determine the ability of vermicompost-amended potting mixes to naturally suppress *Pythium* damping-off caused by *Pythium ultimum*. A cucumber-*P. ultimum* bioassay was used to assess the impact of vermocompost-amendments on disease severity. Container media consisted of Met-Mix 360, a standard greenhouse potting media, and 10, 20, or 40% (by volume) vermocompost. Vermocompost-amendments to a disease conducive potting mix rendered the amended mix suppressive to *Pythium* damping-off. Autoclaving of vermocompost prior to amendment negated the suppressive effect indicating the organism was biological in origin. This experiment was performed twice. Vermocompost amendments alone may provide yet another tool for managing soilborne diseases like *Pythium* damping-off and may provide with an environmentally sound alternative for managing organic waste.

**Board 12**

**IMPACT OF VERMICOMPOST-AMENDMENTS ON DEVELOPMENT OF PYTHIUM DAMPING-OFF OF CUCUMBER.**

Andriana M. Brickner1,2, R. M. Atreyeh, Michael J. Boehm1, and Clive A. Edwards. Miami University, Dept of Zoology, Oxford, OH 45056-1301, Ohio State University, Dept of Entomology, Dept of Plant Pathology. bricknak@muohio.edu

Phytophthora causes damping-off disease in cucurbits; the disease is most pronounced in spinach and cucumbers. Several factors have been shown to reduce damping-off disease in these crops, including the use of compost-amended potting mixes. This study evaluated the effects of compost-amendment on the development of Phytophthora damping-off disease in cucumber, using a bioassay conducted in a growth chamber. The results indicated that the addition of compost to the potting media had a significant effect on the development of damping-off disease, with higher compost levels resulting in lower disease incidences. This study provides evidence that compost-amendment can be an effective tool for managing Phytophthora damping-off disease in cucumber production.
production and oxidation processes contribute to observed differences in CH4 emissions between cultivars under identical growing conditions. In order to more accurately interpret 13C data for this purpose, it is necessary to quantify the degree to which carbon isotope fractionation results from plant-mediated transport is dependent on cultivar type and plant age. A laboratory experiment, in which rice roots were immersed in an aqueous CH4 solution while the remainder of the plant was contained in a chamber, allowed the differential fractionation due to transport to be determined without interference from other fractionating processes. Samples taken by this method from Mars and Lemont cultivars, grown hydroponically in a greenhouse, showed δ13C fractionation to be independent of cultivar type. However, the degree of fractionation was found to increase with plant age. At approximately 70 days after germination, Lemont plants suffered a δ13C of emits methane to values which are 12.6 ± 1.1% (n=6) lighter than the initial methane pool. At the same age, the shift observed for the Mars cultivar was 12.2 ± 1.7% (n=5). At 103 days after germination, the degree of isotope fractionation had increased to 14.1 ± 0.8% (n=6) for Lemont and to 14.5 ± 0.7% (n=5) for the Mars cultivar.


The streams of Hawaii are becoming dewatered for anthropogenic demands, which interrupts the life cycle of several amphidromous species (four gobies, one eel, one shrimp, and one lampreys). The amphidromous life cycle involves full reproduction in streams where eggs hatch, and larvae are swept to the ocean for a period of obligatory growth and development. Postlarvae migrate back into the streams for growth to reproductive stage. In this study, we address the effects of water removal compounded by drought on the recruitment of the returning postlarvae in five streams on the island of Maui. We quantified postlarval migration from the ocean using modified Breder traps. When all streams were flowing simultaneously, there was a significant positive relationship between mean daily discharge and recruitment. Migration in the stream with the highest mean daily discharge (i.e. Hanawi Stream) was from one to two orders of magnitude greater than the streams with discharge almost one order of magnitude lower. Further, recruitment into all streams was greatest in early July and steadily decreased through October corresponding to periods of high and low discharge, respectively. By the end of October, fish recruitment was near zero in all streams except Hanawi. The decrease in recruitment over the study period is related to flow stream conditions due to the drought. This explanation is consistent with our hypothesis that increased stream flow acts as a cue for upstream migration from the ocean and previous studies correlating adult reproduction with increased stream flow.

**Board 17 A REVIEW OF THE STYGOTIC CRAYFISHES OF NORTH AMERICA WITH NOTES ON A NEW SPECIES FROM MISSOURI. Horton H. Hobbie III, Wittenberg University, Dept of Biology, F.O. Box 720, Springfield OH 45501-0720, hhobbie@wittenberg.edu**

Currently, 38 species and subspecies of stygobitic (obligate cave species) crayfishes are described from North America (inclusive of Mexico and Cuba) and are assigned to one of four genera: Cambarus, Orconectes, Procambarus, and Troglolepotes. Within the contiguous United States these cave-adapted crustaceans occur primarily in the karst regions of the Appalachians, interior Lowlands, Florida, Midwest, and the Ozarks. Eleven species of Cambaridae (4 subgenera) are known from the Ozarks, the interior Lowlands, and the Appalachians; seven species and subspecies of Orconectes are found in ground water systems, the interior Lowlands; 14 species and subspecies of Procambarus are known from Florida and Alabama; and the monotropic Troglolepotes is limited to ground waters in north-central Florida. The genus Procambarus also is represented in subterranean waters in Cuba (one species) and Mexico (four species assigned to two subgenera). During August 1999 two adult (female and form I male) individuals of an undescribed, blind, anabiotic species of Orconectes were captured from a stream pool in a cave in the Caney Mountain Conservation Area, Ozark County, in south-central Missouri. These specimens represent the first stygobitic member of the genus found outside of the Interior Lowland Plateau and, importantly, west of the Mississippi River. The locality for this species lies geographically between the known ranges of the disjunct populations of Cambarus (Erebcbambarus) hubricht Hobbis and Cambarbus (Jugicambarus) seirius Faunin. Additional field work will lead hopefully to the discovery of other populations and the description of the new species is in progress.

**Board 18 GENETIC ANALYSIS OF CAVE AND SURFACE CRAYFISH. Jason D. Moon (Margaret A. Goodman), Wittenberg University, P.O. Box 720, Springfield OH 45501-0720. jmoon@wittenberg.edu**

Cave crayfish are generally thought to belong to isolated populations, that is, they make only with crayfish in the cave system itself and not with crayfish on the surface or in other caves. Recently, cave crayfish have been found in well water, suggesting that populations may be more closely related. By comparing genetic markers from crayfish populations from surface and cave systems and streams in Indiana, we will develop a measure of the relatedness of cave crayfish, and hence, determine whether cave populations are completely isolated. This summer, pleopods and chelicerae from Orconectes rusticus, a crayfish in the same genus as the cave-dwelling species O. pelliculosus, were collected from Buck creek, located downstream of the C.J. Brown reservoir north of Springfield, OH, and DNA was isolated. RAPD-PCR (Randomly Amplified Polynucleotide DNA – PCR), a process used to amplify random regions of the DNA, was performed to compare the relatedness of individual crayfish. These techniques were developed over the summer and fall of 1999 and will be used to compare cave crayfish and crayfish from surrounding streams.

**Board 19 POPULATION DYNAMICS OF SIX OF OHIO'S BREEDING GRASSLAND BIRDS. Claudia R. Steele1, James S. McCormac, Michael A. Hoggard1, Otterbein College, Department of Life and Earth Sciences, Westerville OH 43081 and 1Ohio Department of Natural Resources, Division of Natural Areas and Preserves. ClaudiaRS@otterbein.edu**

Historically, grassland birds nested in farm fields in the flatter areas of glaciated Ohio. In the last several decades, however, many of these agricultural habitats have been developed into residential and commercial areas. Agricultural areas that have not been developed have been plowed and harvested several times a year, thus disrupting the nesting habits of grassland birds. Reclined strip-mines in eastern, unglaciated Ohio currently provide the largest contiguous grassland habitat for this avifauna. This study documents the population dynamics of six grassland birds in a total of eight counties in the state of Ohio over the past one hundred years. The grassland birds used in this study were the bobolink (Dolichonyx oryzivorus), dickcissel (Spiza americana), hermit thrush (Ammodramus hermit), grasshopper sparrow (Ammodramus savannarum), northern harrier (Circus cyaneus), and short-eared owl (Aio flammeus). The four glaciated Ohio counties examined were Ashtabula, Clinton, Lucas, and Paulding, while the unglaciated counties surveyed for these species were Belmont, Coshocton, Lawrence, and Muskingum. Current population data were collected during a survey of four wildlife areas, which contain reclined strip-mines, in the above mentioned unglaciated Ohio counties. Historic population data for these grassland birds were obtained from a literature review of many Ohio ornithologists. It was found that during the first half of the century, the populations of grassland avifauna were highest in the glaciated Ohio counties where agricultural grasslands provided abundant nesting habitat. In contrast, the reclined strip-mines of unglaciated Ohio have provided the necessary habitat for these large populations of grassland birds over the last several decades. These findings suggest possible management options for reclined strip-mine grassland habitat.

**Board 20 CHANGES IN FOREST DYNAMICS OF A SOUTHWEST OHIO STAND OVER A 21-YEAR PERIOD. Melanie A. Baker, Kristin M. Bolzman, Timothy L. Lewis, Wittenberg University, Dept of Biology, Springfield OH 45501. mbaker@wittenberg.edu**

Small, isolated woodlots cover much of the Midwest. Long-term studies of forest dynamics are useful for management of these areas in Ohio. We measured dominance (as evidenced by basal area), density, and frequency of such a typical beach-maple forest at Alwold Audubon Center and Farm in Montgomery County, Ohio. All trees greater than 10 centimeters DBH in 65 five-meter radius plots were measured in 1978 and then again in 1999. We measured each tree’s diameter at breast height, distance from the center of the plot, and recorded the species of the tree. Results showed that maples (Acer spp.) remain the most dominant over a 21-year period occupying 32% of the forest basal area. The relative dominance of the maple (Acer spp.) declined from 37% to 32%. The relative dominance of American beeches (Fagus grandifolia) increased from 18.5% to 19.3%. Analyzing frequency data showed that black cherry (Prunus serotina) and ash (Fraxinus spp.) were the most frequent in 1978 but maples were the most frequent in 1999. Possible explanations for these changes include interspecific competition, the presence of pollution, and the influence of the woodlot surroundings.

**Board 21 THE EFFECT OF FLOWERING PHENOLOGY ON REPRODUCTION IN LUPINUS PERENNIS. Constance E. Hausman1, Helen J. Michael2, and Randall J. Mitchell1. Bowling Green State University, Dept of Biological Sciences, Bowling Green OH 43403, romanc@bgsu.edu, and 2University of Akron, Dept of Biology, Akron OH.**

Variation in flowering time may influence reproduction through effects on plant-pollinator interactions and/or resource availability. We examined the effect of within-plant variation in flowering time on components of offspring reproduction in Lupinus perennis, a threatened herbaceous perennial of Midwestern oak savannas. We classified all inflorescences on 15 individuals into discrete pheno logical classes. To prevent seed dispersal, we bagged the inflorescences after senescence of all flowers. Fruit production per flower varied among genets, but was not affected by inflorescence phenology. However, early flowering inflorescences produced significantly fewer seeds per fruit, and had significantly heavier seeds. In a greenhouse experiment seedlings from early inflorescences developed significantly taller and had significantly more leaflets, while cotyledon leaf area was significantly smaller in seedlings from late inflorescences. These results are consistent with the notion that pollinator limitation may be more important than resources early in the flowering season.

**Board 22 COLD TOLERANCE IN SEMI-AQUATIC AND TERRESTRIAL SPRINGTAILS (INSECTA: COLLEMBOLA). Richard L. Stewart Jr. and Joseph D. Varner, Malone College, Dept of Science and Mathematics. 515 25th Street N. W. Canton OH 44709. stewartrl@malone.edu**

Insects within the order Collembola are among the most abundant and widespread terrestrial arthropods. They can be found on every continent, including Antarctica, making it the arthropod group with the most southerly location. While many Collembola species reside within the leaf litter layer, others may live their entire lives on the surface of water. Besides their use for a fecal fluid for both semi-aquatic and terrestrial Collembola share a great tolerance to endure sub-freezing temperatures. To measure cold tolerance fifty individuals were collected from a local source near the edges of a stream during...
Board 23 ABSTRACTS OF A BIOTIC AND ABiotic CHANGES IN A DECIDUOUS FOREST AFTER THE REMOVAL OF LONICERA MAACKII. Cybil R. Franz and Carolyn Hoes-Kaffer. Miami University, 4200 E. University Blvd, Middletown OH 45542.

Lonicer maackii, An non-indigenous shrub that is invading many areas of southwestern Ohio. In 1997, thousands of L. maackii stems were removed from two forested plots (33m x 33m ea) at Miami University, Middletown. Stems and roots were removed whenever possible, however some larger shrubs were cut and a systemic herbicide (Crossbow) was applied to the cut surface of the remaining stumps. Treatments consisted of removing all above ground debris from one plot, leaving the other plot as the control. Ploots were monitored for 4 months to determine the frequency of reoccurrence by L. maackii. Results indicated that more re-growth occurred in the plots where the cut debris had remained in the plot. A floristic survey and changes in microclimate (soil moisture, temperature, pH, light intensity) were measured within the plots and compared with an uncut control plot. Soil moisture, and pH, were determined to be significantly higher (P < 0.05) in the control plots compared with the two cut plots. The fire and temperature were much lower in control plots. There were no significant differences (P > 0.05) in light intensity and temperature between the two cut plots. Species diversity was much lower in the cut plots when compared to the control plots. However, survey results two years after removal indicated that diversity and density increased in the disturbed plots while the control plot remained unchanged. It appears that the experimental plots are slowly recovering from the disturbance associated with the cut/removal activities.

Board 24 THE DROSOPHILA GENOME PROJECT: ANALYSIS OF THE 36B Locus. Leokadia K. Okres (Dr. Charles E. Rozeck, Case Western Reserve University; Cathleen M. Jenkins), Cuyahoga Community College, Western Campus, 11000 W. Pleasant Valley Rd, Parma OH 44199.

The Drosophila Genome Project originating out of Berkeley, California was started to sequence the genome of Drosophila melanogaster, commonly known as the fruit fly. As a component of this project the goal is to create a restriction map of fragments of the Drosophila genome. These restriction fragments are smaller pieces of the 120 mb genome and comprise chromosomal locus 36B. This area is vital to understanding gene function and regulation within the muscular and circulatory respiratory systems of the fruit fly. These fragments are formed by restriction digests into a much more manageable size. The resulting 3 kb fragments are then subcloned into a vector plasmid to create a recombinant plasmid. This recombinant plasmid is formed through plasmid DNA isolation, restriction enzyme digestion, alkaline phosphatase and ligation reactions, and a final enzyme digestion using EcoR I. The resulting fragments are then sized according to molecular weight standards and analyzed by gel electrophoresis to uncover overlapping fragments. Through the repetition of this process a restriction map can be formed and the location of each respective fragment can be obtained. My work has encompassed the procedures mentioned above, as well as computer analysis of the fragments formed by the EcoR I digest. This work has yielded one successfully subcloned and analyzed restriction fragment to date.

Board 25 MEMORY DEFICITS IN WOMEN SUFFERING FROM POSTTRAUMATIC STRESS DISORDER RESULTING FROM CHILD ABUSE. Kelly A. Zander, Scott H. Maurer, Cathy L. Pederson, Patricia L. Kamiski; Wittenberg University, Dept of Biology, P.O. Box 720, Springfield OH 45501.

Posttraumatic Stress Disorder (PTSD) is a mental ailment that is prevalent in victims of childhood abuse. PTSD patients present a myriad of problems including intense fear, avoidance of stimuli related to the traumatic event, and recurrent nightmares implicating abnormalities of the brain responsible for memory (Bremner et al. 1997). The increasing need for PTSD research focusing on both child abuse and women is apparent. Thus far, we have examined 12 women who will fit into one of three groups: 1. History of childhood abuse resulting in PTSD (n=3). 2. History of childhood abuse not resulting in PTSD (n=4), and 3. No history of abuse (n=4). Each subject was screened using Childhood Trauma Questionnaire, Trauma Symptoms Inventory, and Milon Clinical Multiaxial Inventory. Third Edition and clinically interviewed to confirm group assignment. Subjects were demographically matched between groups and received a magnetic resonance imaging (MRI) scan of the brain. Results indicated the MRI scans were not significantly different for the three groups. Interestingly, the Working Group determined that women with a history of childhood abuse (Group 1) compared with Groups 2 and 3. Repeated measures ANCOVAs of demographic data showed that there were no significant differences between groups in age (p=0.822) and body mass index (p=0.639). MANCOVAs analysis of smoking (p=0.739) and alcohol use (p=0.210) showed no difference between groups.

Board 26 NITROGEN MINERALIZATION UNDER DIFFERING AMOUNTS AND TYPES OF LITTER. FALL Thomas G. Bauer (Dr. Charles McClaghehty), Mount Union College, 172 Clark Ave, Alliance OH 44601.

The objective of this research is to determine how the quality and quantity of litter fall affect rates of Nitrogen (N) mineralization. I hypothesized that N mineralization values would be higher in a succesional forest than in an old growth forest due to difference in litter quality. I also hypothesized that N mineralization would be proportional to quantity of litter input. Two forests were studied, an old growth Beech-Maple Forest (Fagus grandifolia-Acer saccharum) and a nearby successional forest dominated by red maple (Acer rubrum). Two forests were located in eastern Clark County, Ohio. Litter input has been manipulated in both forests annually for the past five years by removing all litter from a circular plot (5m radius) and transferring it to an adjacent plot. A third adjacent plot served as a control. A fourth adjacent plot served as a control. The average annual litter fall transfer for the old forest are 537 g/m², and for the successional forest, 566 g/m². Soil cores (9 per plot) were collected during June and August of 1999 resulting in a total of 54 initial and 54 incubated samples per month. Cores were collected from randomly located points within each plot and were incubated for 30 days in the laboratory. N was extracted from initial and incubated samples using 2N KCl per 50g of sample for 48 hours. N mineralization was determined as the net change in extractable ammonia and nitrate during the incubation. I anticipate higher values for N mineralization as litter fall amount and forest age increases.

Board 27 DEVELOPING FIELD MAPPING TECHNIQUES FOR FRACTURE IDENTIFICATION AND SPACING IN NATURALLY OCCURRING OUTCROPS-AN EDUCATIONAL EXPERIENCE. Julie Weatherington-Rice, Ann D. Christie, Gary McKenzie, Bennett W. Williams Environmental Consultants, Columbus OH 43231 and The Ohio State University, Columbus OH 43210.

While the Fracture Flow Working Group has developed methodologies for discovering and mapping fractures in freshy dug pits, the Group is still struggling with suitable techniques for uncovering and mapping fractures in natural outcrops. Natural faces present different challenges; they are usually weathered, covered with slumped materials, and steeply angled. This provides poor footing and vertical faces higher than the 1 meter bench recommended in pit construction. However, outcrops offer the potential to map continuous fractures for significant vertical distances. They also present the opportunity to map across glacial contact boundaries and through paleosols. Accordingly, the Working Group undertook a series of field trips to Clermont County, Ohio in the fall of 1998 to study Illinoian and pre-Illinoian glacial materials in a natural streamcut outcrop. To overcome the physical challenges created by the natural cut, several methodologies were utilized including lading, angled trenching shovels, and long-handled hoes. Since the field team was comprised of geologists, soil scientists and agricultural engineers, both professionals and students, the trips were also cross-disciplinary learning experiences, reemphasizing the need for a multi-disciplinary team in solving the fracture question.

Board 28 A QUANTITATIVE CONOCODONT BIOSTRATIGRAPHY FOR THE SALAMONI DOLOMITE AND THE SALINA GROUP (SILURIAN) OF THE NORTHERN INDIANA SUBSURFACE. Mark A. Kleffner, Carl B. Ruxendt. The Ohio State University at Lima, Dept of Geological Sciences, 4240 Campus Dr, Lima OH 45804-3576 and Indiana Geological Survey, kleffner-f@osu.edu

Previous attempts to determine a conodont biostratigraphy for the upper part of the Salamone Dolomite and the Salina Group in the northern Indiana subsurface have been

IQ, a significant difference was shown between groups in auditory memory (p=0.010) with a significant deficit for Group 1. No significant differences were found between groups for visual memory (p=0.47) or working memory (p=0.849).
hampered either by a paucity of conodonts, scarce representation of diagnostic conodonts, or a lack of a high-resolution Silurian conodont biostratigraphy for that part of the Silurian to correlate with. Restudy of hundreds of conodont samples processed from cores drilled through the Silurian Dolomites and Salina Group in northern Indiana in the 1960's and early 1970's indicates that although diagnostic conodonts are scarce, they are present in enough samples from some of the cores to provide the data required to determine a quantitative biostratigraphy and correlation for those units with high-resolution Silurian conodont biostratigraphies recently developed. Ten conodont chronozones and five subchronozones are provisionally recognized for the Silurian Dolomites and Salina Group in northern Indiana. Ranging from the uppermost Ludlow/Anisian andoporignathoides Amorphognathoides Chazone to the lowermost Pridoli lower Oszkodina remacheschidiensis remacheschidiensis Subchronozone of the O. remacheschidiensis oostemmianensis Chronozone. The Ludlow/Pridoli boundary is recognized near the top of the Louisville Limestone Member of the Pleasant Mills Formation or in the lower part of the Wabash Formation, just slightly above the first-appearance datum of Kockelelia variabilis. The Ludlow/Pridoli boundary is recognized near the top of the Wabash Formation (Kenneth M., when possible to identify), although the top of the Wabash has apparently been eroded below that boundary in many cores.

Board 31 IMPlications of Flow and Water Source on NITrate Concentrations in a Fen. Sky Schelle. (Dr. John Ritter); Wittenberg University, Dept of Geology, P.O. Box 720, Springfield, OH, 45501. ss08@schelle.wittenberg.edu

Located in central Ohio, the Wittenberg Fen is located on the boundary between glacial till and outwash along the lower Mad River system and functions to filter chemicals out of that system. Wenrick is presently surrounded by farmland. The purpose of this study is to evaluate wetland function as it relates to changes in water source and flow direction. The objectives are threefold: to investigate the relation of flow stage to water source, the influence of different water sources on water quality, and change in water quality along a flow path that intersects areas of water from different sources. Data collected for this project includes continuous recording of water level and condition, manual sampling of water using a field spectrophotometer for water analysis, nitrate analysis uses the codium reduction method. Stage data are collected during each visit so that the relation between nitrate's concentration, water source, and flow stage can be understood. Initial observations have shown that flow through the wetland is dominated by groundwater but may also be influenced by flow stage in an adjacent drainage ditch. The wetland is a fen-like wetland during base flow and a riverine wetland during flood. Flow direction is influenced by groundwater during base flow and water stage and outwash flow during flood stage. Depending on flow stage, water sources may include combinations of groundwater flow and/or overland flow. The potential for multiple sources of water that are stage-related leads to the hypothesis that nitrate concentrations and water quality in general are dependant on source of water and different flow patterns.

Board 32 An EFFECTIVE METHOD OF AMENDMENT DISTRIBUTION FOR IN-SITU BIOREMEDIATION OF CIS-1,2-DICHLOROETHENE AND VINYL CHLORIDE. Joseph M. Warburton and James A. Peeples, Metcalf & Eddy, Inc., 2800 Corporate Exchange Dr Suite 250, Columbus OH 43221. Joe.warburton@metcalfandeddy.com

A shallow glacial outwash aquifer at an industrial site in central Ohio was contaminated with cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride (VC), soluble petroleum compounds, and residual light non-aqueous phase liquids (LNAPLS). The impacted aquifer had a saturated thickness of approximately 20 feet. Extensive in-situ and in situ soil amendments were chosen as the remedial alternative. A non-recirculating pilot cell was constructed using two injection wells located six feet apart, on an axis parallel to groundwater flow. 150 pounds of sodium bromide was injected as a tracer. Nutrients injected into the dogleg well entered the center section of the pilot cell, and nutrients injected into the upgradient well were distributed along the sides of the cell. Amendment injection was alternated between each well, with groundwater extracted from outside the plot area injected into the opposing well. A grid of observation wells was monitored for concentrations of bromide, contaminants of concern, and the nutrient amendments. Nutrient and groundwater injection methods were varied to optimize the distribution of amendments in the aquifer. Sampling results indicated a lateral nutrient distribution of approximately 120 feet, and a longitudinal distribution of approximately 600 feet. Effective treatment of the contaminants of concern occurred as far as 400 feet from the injection wells.

Board 33 NEW STACK-UNIT MAP OF DAYTON REGION DEPICTS PLEISTOCENE SEDIMENTS ABOVE BEDROCK. C. Scott Brockman, Gregory A. Schmacher and Douglas L. Shrike, ODNR Division of Geological Survey, 4383 Fountain Sq Dr., Columbus OH 43224-1362. scott.brockman@dnr.state.oh.us

A new map, "Surficial geology of the Ohio portion of the Dayton 1:100,000-scale quadrangle," depicts the 'sick' or thickness and stratigraphic sequence of geologic units (materials such as till, gravel, sand, silt, and clay) from the land surface down to and including the base of Pleistocene buried bedrock units. Delineation of drainages, soils, and land use was mainly from county soil surveys, COOT and Ohio EPA boring logs, engineering logs, water wells, logs, and theses. Mapping was partially funded by an Ohio EPA 319 grant. The map reveals many previously unrecognized regional trends. For example, in the northern 90% of the map area, upland till generally ranges from 30-50 feet thick. The few upland areas of exposed bedrock or thin drift are significant in that several contain narrows of the Great and Little Miami Rivers. In the southern 10% of the area thin or patchy till dominates, this trend continues southward to the Wisconsinan glacial margin. Drift in the Whitewater Interlobate Plain, centered on Preble County, is primarily thick till (>120 feet) with smaller areas of sand and gravel (<50 feet thick) that lack significant interbedded till. In contrast, thick sand and gravel (>200 feet thick) predominate in the buried valley of the Great Miami River system. Patchy, interbedded till is generally present only within the upper 70 feet of the column, erosion or nondeposition has mostly eliminated earlier tills at depth.

Board 34 STABILITY OF SOIL TEST pH, PHOSPHORUS AND POTASSIUM IN A GRID SOIL TEST SYSTEM. Steven C. Prochaska, Ohio State University-Extension, 117 E. Mansfield St., Bucyrus, OH 44220. prochaska.1@osu.edu

Grid soil sampling (GSS) has recently been implemented by a number of Ohio farmers with the purpose to gather soil test information on small areas of a field. By GSS, field points are geo-referenced thus permitting measuring of treatments of fertilizer or lime to be applied. Further, by GSS, geographic information systems (GIS) can be used to overlay yield maps, soil type maps, topographic maps, etc. Traditional agricultural crop soil tests (most were of 10 acres in size or larger) and their concomitant results were often quite variable. Thus GSS on 0.3 acre grids was conducted to examine the stability of soil test P, K, and pH. Variable rate P and K (low 200 lbs/acre to 500 lbs/acre) of 18-46-0 and 0-60-0 were applied 4/23/97 after initial grid soil testing. Six grids were randomly selected from 15 total grids to be further analyzed. Soil samples were taken in the middle of the grid (4 soil probes 8” deep around the all-terrain vehicle equipped with global positioning system equipment) for each test in 1997 and 1998. P soil test levels went up in every grid, K soil test levels actually went down in 3 grids. Average phosphorus values went up 13.3 ppm Place and average potassium values went up by 1 ppm Place in the area of variable rate fertilizer applications. The impact of P and K applications. Soil pH did not change significantly. GSS may allow for more precise applications of fertilizer and lime and thus better protect the environment while improving farm profitability.

Board 35 THE ECONOMICS OF SUSTAINABILITY: TURNING TREE TRIMMINGS INTO CRAFT AND PROFIT AT A FARMER'S MARKET. Frederick John Kloth, 1060 Deloone Dr, Kent OH 44240. fjk@apk.net

The economics of sustainability was investigated by turning tree trimmings into craft items that were then offered for sale at the local 'Kent farmers market'. The sustainable aspect was emphasized by using only hand tools and no glue or finish of any kind. Because many different objects were produced the study took the form of a market survey to determine which products could be most profitably produced. For each object the time to produce it and the sale price were recorded, and from these the 'hourly rate was calculated. The hypothesis was that these rates could be compared to the minimum wage and that there would be differences that could indicate a direction for profitability. Two categories of items were produced, decorative and useful. Within each category, there were several types of products, for a total of 73 individual items in 28 types. A total of 140.75 manufacturing hours resulting in total sales of $70.26 and rates ranging from $3.90 to $8.00 per hour. Decorative items resulted in a rate of $3.53 per hour while useful items had a rate of $2.36 per hour but the difference was not significant. The overall average rate of $2.81 was not significantly different from a minimum wage of $5.60 per hour. The results, though interesting, are not significant, so the study is worth repeating over a longer time period during which more items can be made and sold.

Board 36 THE EFFECT OF LITTER ADDITION AND REMOVAL ON CO2 EFFUX IN A FORESTED ECOSYSTEM. Tonia L. White (Charles Claughtonay), Mount Union College, 1400facebook.com. t.onia.white@mtu.edu

Carbon dioxide efflux from forest soils is an important component of the global carbon budget. It is also a significant indicator of respiratory and decay rates in a forest soil. Carbon dioxide efflux is thought to change with the amount of leaf litter supplied to the system. In this experiment, the amount of CO2 efflux from the ground measured for six sites in a forested ecosystem using a Li-Cor 6400 portable photosynthesis system. Two sets of plots 5 meters in diameter each were treated as follows: double litterfall (2x), control (1x) and removal (Ox). One set was located in a climax Beech (Fagus grandifolia) - Sugar Maple (Acer saccharum) community while the other set was located in a younger successional stand of Red Maple (A. rubrum) - Black Cherry (Prunus serotina) that had been clear cut for pasture 150 years ago. The two communities were then compared to see if any differences in CO2 efflux were noticeable for both the agricultural land use legacy and treatment method (2x, 1x, and Ox). Soil cores were taken in June and August to determine total percent carbon and to note any differences in plots by treatment method and agricultural land use legacy. Preliminary efflux data suggests that the climax forest shows higher rates of CO2 discharge than the successional forest. For each plot respectively, the 2x plots seemed to exhibit greater CO2 efflux than the 1x and Ox. In each plot there appears to be a significant difference between the 2x and Ox plots, while the efflux of the 1x plot appears to closely parallel the data collected for the Ox plots.

Board 37 LIMITING FEATURES FOR A SMALL HEADWATER STREAM TO SUPPORT FISH LIFE. Nathan A. Moyer (Dr. Lin Wu); Mount Union College, Box 1448, 1972 Clark Ave, Alliance OH 44601. Myeemax@muc.edu

The current biological criteria used for identifying and protecting rivers and streams in Ohio relies upon fish and benthic macroinvertebrates as indicators. This includes small headwater streams, which often do not support any fish life. The goal of this project is to examine one headwater stream and determine features that limit its ability to support fish life. The hypothesis of this study is that poll dynamics and accessibility to the pool will be important. A small headwater stream in the Cuyahoga Valley Recreational Area was selected for this
study because it is good fish habitat. The study was carried out between August and November 1999. Flags were placed at ten-meter stream intervals marking the research area. Using a compass and the flags, a detailed map was drawn showing the stream shape and marking all of the pools present in the stream. The pools were then numbered and the parimeter shape was drawn. The length, width, and depth at many places were recorded for each pool with a meter stick. On October 19 or 23 the number of fish seen in each pool were recorded and using a dip net for ten minutes as many fish as possible were captured. The number captured and length of the fish were also recorded. The percent gradient was recorded at every twenty-meter stream interval and the actual distance between the marks was measured with a 50-meter tape measure. A longitudinal profile of the stream marking pools with and without fish will be made.


Two contrasting areas of disturbed lands were investigated by the analysis of soil characteristics (pH, conductivity, nitrate, and phosphate) and determination of a vascular plant diversity index. Two sites in the Bear Creek watershed of southern Stark County, Ohio, were investigated. The Bear Creek watershed contains a large acreage of abandoned surface coal mine spoils that have produced acid mine drainage. The first site was overgrown and showed evidence of artificial reclamation. Scoops of spoils were planted in the second area in an effort to reclaim the site. The vascular plant diversity index of site 1 was higher than site 2. An increase in diversity was noted with an increase of pH, a decrease in conductivity, as well as a decrease in phosphorus levels. The lime ponds of PPP contain waste from soda ash production which consists of fine-grained lime spoil that was alkali, lacked nutrients, and was unable to support vegetation. Reclamation efforts included mixing the waste with sewage sludge, regrading, and planting of mixed herbaaceous and woody vegetation. Test sites included undisturbed as well as younger and older reclaimed sites. Higher vascular plant diversity indices were seen in the undisturbed land as well as the older reclaimed site. Conductivity was highest in the area of recent reclamation and lowest in the undisturbed area. Phosphorous was lowest in the undisturbed and highest in the older reclamation areas. Phosphate showed no significant trend. This study indicates that the reclamation efforts at the PPP lime lakes site were more successful than the reclamation efforts at the Stark County abandoned coal mine site.

Board 39  ASSESSMENT OF VEGETATION CHANGES AFTER 13 YEARS OF RESTORATION AT THE MOUNT ST. JOHNBERGAMO PRAIRIE. Amanda L. Wischmeyer1, Leanne M. Jablonski, Denis R. Conover2, Donald R. Geiger3, Mariann Environmental Center, University of Dayton, Department of Biology, 309 College Park, Dayton OH 45469-2320, wischmald@flyernet.ohio.edu

Evaluation of prairie species establishment is being used to determine if management intervention is necessary on the Mt. St. John/Bergamo Prairie (Greene County, OH). Restoration began on the 1-acre sand and gravel borrow pit from 1986-88 with 52 species, 82% of these being native. Burning has occurred every 3 years, and more than 120 additional native and nonnative species have volunteered or been hand-transplanted. Burning has occurred every 3 years, and more than 120 additional native and non-native species have volunteered or been hand-transplanted. Complete species lists were compiled in 1988, 1995 and 1999. From these, plant community traits of total species number, diversity, and native species composition have been analyzed. Floristic quality (FQA) is being assessed to incorporate species richness and the coefficient of conservatism of the native prairie species. After 13 years, 77% of species present are native. For each interval between surveys, native species additions outnumbered nonnative volunteers. Largest increases since the initial planting were found in the functional groups of forbs, sedges and vines. The increase in number of native species suggests that the restoration is progressing towards a mature, diverse prairie.

Board 40  ANGULAR MOMENTUM CONSERVATION IN SIMPLE PARTICLE HYDRODYNAMICS. Ivan Tornes, Michael L. Fisher. Ohio Northern University, Dept of Physics, Ada OH 45810, mfisher2@onu.edu

Smooth Particle Hydrodynamics, SPH, uses integral interpolation theory to solve the equations of fluid dynamics. The equations of SPH are designed to ensure mass, linear momentum and angular momentum conservation. Unfortunately, the SPH method fails to conserve angular momentum for a simple rigid rotator. Fisher and Owen (1995) developed a reformulation of the SPH method based upon mass averaging instead of volume averaging of normal SPH. The new methodology is called Mass Averaged Smooth Hydrodynamics, MASH. The methodology has been shown to correct some of the deficiencies of the SPH method. This paper presents numerical results and validation of the MASH methodology for simple rigid rotators. MASH correctly conserves angular momentum for a simple rigid rotator. Fisher and Owen (1995) developed the methodology has been shown to correct some of the deficiencies of the SPH method. This paper presents numerical results and validation of the MASH methodology for simple rigid rotators. MASH correctly conserves angular momentum for a simple rigid rotator.

Board 02  LACTATE DEHYDROGENASE ISOZYME ACTIVITIES IN TWO SPECIES OF BATS. John J. Leskoski (Dr. Sheafor) Mount Union College, 1972 Clark Ave, Alliance OH 44601, leskoyj@mu.cc

Lactate dehydrogenase (LDH) is an enzyme that catalyzes the reversible reaction between pyruvate and lactate. In vivo, LDH occurs in two forms, LDH1 and LDH2, as noted for the abundance of this isozyme found in heart tissue, and LDH1, typically for the large quantities found in skeletal muscle LDH. However, the conversion of lactate to pyruvate and the production of pyruvate from other tissues containing high levels of this isozyme favors the use of oxidative metabolic pathways. Tissues containing eleveld levels of LDH can facilitate the use of aerobic pathways. This would decrease the buildup of lactate in muscle tissues and limit consequent "acid-base" imbalances. In this experiment, the composition of LDH isozymes in six major muscles from two common species of bats (Myotis lucifugus and Eptesicus fuscus) was examined. Native gel electrophoresis will be performed on the extracted tissues and the percentage of each isozyme will be quantified. In addition, spectrophotometric assays will be performed to determine total LDH activity in all tissues. The authors hoped that this study will increase our understanding of general muscle physiology as well as the specific adaptations that have evolved in conjunction with unique locomotion in mammals.

Board 03  SIGNAL TRANSDUCTION PATHWAYS INVOLVED IN THE CATECHOLAMINERGIC DIFFERENTIATION OF AVIAN NEURAL CREST-DERIVED CELLS IN VITRO. Xiaodong Wu, Martha J. Howard, Medical College of Ohio, Dept of Anatomy and Neurobiology, Toledo OH 43614, xwu@mc0.edu

Growth factors have a pivotal role in the differentiation of neural crest-derived cells into catecholaminergic (CA) neurons. Molecules derived from the neural tube and found in chick embryo extract (CEE), transforming growth factor-β1, ciliary neurotrophic factor and bone morphogenetic proteins (BMP) all support the differentiation of CA neurons in vitro under growth conditions which alone will not support expression of this phenotype. Each of these identified growth factors binds a cognate receptor whose signal transduction pathways are partially understood. Two broad groups of growth factor receptors, those which have an intrinsic receptor tyrosine kinase or activate soluble tyrosine kinases and those which are serine/threonine kinases and activate the transcription factor SMAD, both of which can influence transcription of the tyrosine kinase or SMAD, both of which can influence transcription of the tyrosine kinase or SMAD, both of which can influence transcription of the tyrosine kinase or SMAD, both of which can influence transcription of the tyrosine kinase or SMAD, both of which can influence transcription of the tyrosine kinase. Differentiation of CA neurons was increased 202% in response to added PD98059, a MAP kinase kinase inhibitor. This would help to rapidly enhance glycolytic ATP synthesis. It has been shown that pikas and hummingbirds (oxytically stressed endotherms) maintain elevated levels of LDH, in skeletal muscle. Due to extremely high energetic demands placed on bats during flight, we hypothesize that high levels of LDH would be found in their flight muscles. High LDH would help to rapidly synthesize ATP without a reliance on anaerobic pathways. This would decrease the buildup of lactate in muscle tissue and limit consequent "acid-base" imbalances. In this experiment, the composition of LDH isozymes in six major muscles from two common species of bats (Myotis lucifugus and Eptesicus fuscus) was examined. Native gel electrophoresis will be performed on the extracted tissues and the percentage of each isozyme will be quantified. In addition, spectrophotometric assays will be performed to determine total LDH activity in all tissues. The authors hoped that this study will increase our understanding of general muscle physiology as well as the specific adaptations that have evolved in conjunction with unique locomotion in mammals.
**Board 04** EFFECT OF CHRONIC COCAINE EXPOSURE ON BENZODIAZEPINE (BZ) ANTICONVULSANT AND AMPHIOXIC ACTIONS AND GABA, RECEPTOR (GABAR) SUBUNIT EXPRESSION. S.M. Lilly, E.I. Tietz, Medical College of Ohio, Dept of Pharmacology, 3335 Arlington Ave, Toledo OH 43614, slilly@mcdo.edu

Cocaine exposure has been shown to alter rat seizure susceptibility and affect EZ binding density, hypnotic actions, and potential for abuse. Since BZs are used to treat anxiety related to cocaine withdrawal, and also cocaine-induced seizures, we studied the effect of chronic cocaine exposure on the anticonvulsant and anxiolytic actions of diazepam (DZP, a prototype EZ). Changes in GABAR subunit protein expression were also assessed since they also play a role in EZ activity. GABAR subunit expression results are analogous to the situation in yeast, where activation of the p38 homolog under conditions that induce hyperosmotic stress (HOSR) activate GABAR subunit expression.

**Board 05** RESPIRATORY AND CARDIAC RESPONSES TO GRADED HYPOXIA IN THE LUNGLESS SALAMANDER, DESMOCANTHUS FUSCUS. Elizabeth A. Shearow, Stephen C. Wallach, and James T. Tattersall, Kent State University, Dept of Biological Sciences, Cunningham Hall Room 256, Kent OH 44242, shearow@kent.edu

The hypothesis that lungless salamanders (Desmognathus fuscus) actively respond to hypoxia was tested. Buccal activity (apneic period lengths, minutes/hour of buccal pumping and buccal pumping frequency), heart rate, and metabolic rate were determined during a control period (21% oxygen), hypoxic exposure (2, 5, 6.5, 8 or 10% oxygen), and a recovery period (21% oxygen) following hypoxic exposure. During hypoxic exposure, increases in buccal pumping frequency and duration were observed, while heart rate was not significantly altered.

**Board 06** OSMOTIC STRESS AND p53 MAPK ACTIVATION IN THE BRAIN. Julie M. Niswander, Linda A. Dokas, Medical College of Ohio, Dept of Neuroscience, Rm. 1450 Ruppert Health Ctr, 3120 GlenIade Ave, Toledo OH 43614-5865, juliiniswander@mcdo.edu

Activation by phosphorylation of p53, a member of the mitogen-activated protein kinase (MAPK) family, acts to transduce stress-related signals in eukaryotic cells. In the brain, p53 function has been linked to apoptosis and neurodegeneration, as well as providing a pro-survival response. In this study, the effects of osmotic stress on activation of p53, measured by immunoblotting with a phospho-specific antibody, and on protein synthesis were determined. Osmotic stress was produced in brain slices by the addition of sorbitol to the incubation buffer, producing a hyperosmotic environment. Hyperosmotic stress of brain slices activated p53, most prominently in the hippocampus and cortex. This effect is seen within one hour of onset of osmotic stress and increases over three hours. Although hyperosmotic stress diminishes total protein synthesis in the brain regions studied, as detected by in vivo incorporation of [3H]leucine into protein during treatment, synthesis of a 35 kDa protein increased in response to osmotic stress. These results are analogous to the situation in yeast, where activation of the p38 homolog under similar osmotic conditions mediates a survival response by inducing glycerol phosphate dehydrogenase (GPDH), the enzyme that generates glycerol, a biologically compatible osmolyte. Of interest to this study, the molecular mass of GPDH is 35 kDa. While the multiple roles of p38 activity in the brain remain under investigation, we offer the suggestion that p38 activation may be an adaptive response to osmotic stress.
have a fusion of lacZ (the gene for beta-galactosidase) with the sfiA promoter. This construct allows the amount of DNA damage, which is modulated by the cell’s ability for DNA repair, to be measured by assaying for beta-galactosidase. E. coli strains P230 (wildtype), P235 (raf), P237 (raf, recA) and IN237 (recB) were treated with various amounts of radiometric agents, allowed to grow for two hours, then beta-galactosidase assays were performed. The ability of the strains to survive was determined using plating experiments. The strains had different repair abilities due to specific mutations, resulting in different levels of SOS induction and survival compared to the isogenic wildtype bacteria. After exposure to UV, MMC, or cisplatin, survival was depressed in wildtype and recA mutants, but not recB mutants. Mutations in the recO or recN gene caused a decrease in the SOS response after cisplatin, whereas mutations in the recO genes caused an increase. R values were > 50.

Board 11 STRAIN DIFFERENTIATION OF CLINICAL ISOLATES OF PSEUDOMONAS AERUGINOSA BY SEROTYPING, ANTIBIOTIC SUSCEPTIBILITY TESTING, AND BETA-GALACTOSIDASE PRODUCTION. Eric M. Proudfoot, Courtney Brickner, Roudabeh J. Jamasbi; 545 Sandalee Dr, Toledo OH 43612 3344, eric.proudfoot@yahoo.com

Over a one year period, 261 clinical isolates were collected from Northwest Ohio teaching hospital by standard microbiological techniques. The strains were serotyped by ELISA and/or slide agglutination techniques using specific monoclonal or polyclonal antibodies produced against the 17 out of 20 International Antigenic Typing System (IATS) of P. aeruginosa. From the 261 isolates, approximately 53% were typed by these antibodies. The O:11 serotype predominated in frequency (33%) followed by serotypes O:2 (9%), O:1 (18%), O:5 (9.5%), O:15 (7.5%) and O:19 (7%). During the testing and beta-galactosidase production of these strains were determined to further differentiate the strains among the same serotype. No consistent susceptibility patterns were observed among and within the serotypes. However, it was noticed that resistance to one or more antibiotics increased over time in patients with re-infection and multiple isolation of P. aeruginosa. Approximately 51% (53 isolates) of serotype O:11 were found to possess beta-galactosidase enzyme capable of cleaving ortho-nitrophenol beta-galactosidase (ONPG) substrate. It was noted that some strains of O:15 serotype b:3:20 were also ONPG positive, a finding that has not been previously reported. No obvious connection between the site of infection and specific serotype has been detected. We concluded that the combination of several phenotypic characteristics is useful for the initial strain differentiation of P. aeruginosa in epidemiological study. Statistical analyses and genotyping studies are currently underway to further differentiate the strains with similar phenotypic characteristics.

Board 12 RELATIVE EFFECTS OF AGE, BODY WEIGHT, AND/OR DIET ON BLOOD GLUCOSE RESPONSE TO INSULIN. Kathryn E. Klinger, Kathryn T. Knecht. Ohio Northern University, 525 S. Main St, Ada OH 45810. k-klinger@onu.edu

Insulin sensitivity in white mice, as measured by blood glucose levels after insulin injection, may be affected by the age and weight of the animal. The purpose of these experiments was to distinguish the relative effects of age and body weight on insulin response, and further to determine if age and weight can affect blood glucose response to pharmacological agents. In these experiments, increased insulin response corresponded with increased length of fasting (p<0.05 for changes from 16 to 18, 18 to 20, and 20 to 24 hours, n=4 per group) and decreased with increased age and body weight (5-13 weeks, 23-34 g, p<0.05, n=4 least 4 per group). In 13-week-old mice that had been fed a calorie-restricted diet for 4 weeks to restrict weight gain, insulin responsiveness was more similar to that of 5 week-old animals of similar weight to heavier 13-week-old animals fed ad libitum (p<0.05 between calorie-restricted and ad libitum) (34). There was no significant difference between calorie-restricted and young mice, n=7 least 7 per group). In 5-week-old mice, blood glucose levels of insulin-treated mice were elevated approximately 50% after ethanol (4.9 kg, p<0.05, n=4 least 4 per group) vs. saline treatment. In 13-week-old mice, blood glucose levels of insulin-treated mice were decreased 10% lower after ethanol (4.9 kg, p<0.05, n=4 least 4 per group) than after saline treatment. Insulin administration in 13-week-old mice did not restore the hyperglycemic response of ethanol which occurred in young mice (n=4 least 7 per group). The difference between young and old mice will be further studied with the oral anaplytherapeutic agent metformin in the presence and absence of insulin. It is hypothesized that older, heavier white mice, which model the insulin unresponsiveness characteristic of type 2 diabetes, will respond more profoundly to this drug than young mice, and that this drug will ameliorate the hyperglycemic response of ethanol by increasing insulin response.

Board 13 POSSIBLE MECHANISMS OF ETHANOL-INDUCED INCREASES IN BLOOD GLUCOSE IN YOUNG WHITE MICE. Stephanie A. Zank, Kathryn T. Knecht. Ohio Northern University, 525 S. Main St, Ada OH 45810. s-zank@onu.edu

Diabetes is a chronic disease that affects millions of people worldwide. It is characterized by high blood sugar levels, which can lead to serious health problems if left untreated. There are two main types of diabetes: type 1 and type 2. Type 1 diabetes is an autoimmune disorder where the body's immune system mistakenly attacks and destroys the insulin-producing cells in the pancreas. Type 2 diabetes, on the other hand, is characterized by insulin resistance, where the body's cells do not respond well to insulin. Over time, the pancreas may become less effective at producing insulin, leading to high blood sugar levels.

In this study, we investigated possible mechanisms of ethanol-induced increases in blood glucose in young white mice. We hypothesized that ethanol administration could affect insulin or glucose metabolism, leading to hyperglycemia. To test this hypothesis, we performed experiments in which young white mice were injected with ethanol. Our results showed a significant increase in blood glucose levels after ethanol treatment compared to saline injections. These findings are consistent with previous studies demonstrating that ethanol can impair insulin sensitivity and increase hepatic glucose production.

In conclusion, our study suggests that ethanol-induced increases in blood glucose in young white mice are mediated through mechanisms affecting insulin or glucose metabolism. These findings highlight the importance of understanding the underlying mechanisms behind ethanol-induced hyperglycemia and the potential implications for diabetes prevention and management.
Board 17 EQUAL OPPORTUNITY TO ACQUIRE NEW KNOWLEDGE. Dionna Stewart, Debbi Broughton, Joseph F. Fagan, Ph.D., Case Western Reserve University and Cynthia R. Holland, Cuyahoga Community College, Cuyahoga Community College, 11000 Pleasant Valley Rd, Parma OH 44130. Cindy.Holland@trc-cc.co.edu

Conventional IQ tests are based on how much a person knows. But how much a person knows, and how much a person thinks, are not the same. Thus, experience always plays a role in estimates of IQ. For example, children born before or after a particular date to enter school vary in IQ. People of different birth orders vary in IQ. All of these differences in IQ have to do with differences in experience not actual differences in thinking or intelligence. Different racial groups vary in IQ. They also vary in experience. In the present study, 100 students, whites and blacks, were tested for their knowledge of vocabulary, on a standard IQ test. Prior to testing, all participants received training that meant all of the words of the test varied. Each racial group had an equal opportunity to learn half the words. For words that were not trained: the whites knew more than the blacks, a standard finding. But, for equally trained words, whites and blacks were equal in knowledge. Results indicate that IQ differences between whites and blacks have to do with experience. Blacks and whites have had different experiences; as have people of different birth orders or people whose birth dates put them in one grade or another. Results of the present study dispel any notion of genetic differences in intelligence between races. They indicate that standard IQ tests are culturally biased and, in many cases, are an inappropriate measure of a person’s capability.

Board 19 WHAT GOES INTO MUSICAL ABILITY? Rhea McKinley (Dottor, Bowling Green State University, Psychology Dept, 530 Manville Ave,, Bowling Green OH 43402, tutts@bgnet.bgsu.edu. 

The project focuses on the topics of forgiveness and repentance, particularly on their facilitators and barriers. The purpose of the project is to determine what factors impact on a victim’s willingness to forgive. A few of the factors under consideration and the closeness of the relationship between the victim and the transgressor, and whether or not the transgressor admits guilt and asks for forgiveness. The work involves carefully reading narratives and open-ended questions of approximately 50 undergraduate participants. The investigators will be seeking out patterns and categories of factors which impact upon a victim’s willingness to forgive their transgressor. There will be qualitative coding of responses into those categories. A series of analyses will then be run on these data. Graphs will then be made to show comparisons among the categories and the possible effects of the categories on forgiveness.

Board 20 TO FORGIVE OR NOT TO FORGIVE. Trinidad Morales (Roy Baumeister, Ph.D., Julie Exline, Ph.D., Case Western Reserve University and Cynthia R. Holland, Ph.D., Cuyahoga Community College, Cuyahoga Community College, 11000 Pleasant Valley Rd, Parma OH 44130. Cindy.Holland@trc-cc.co.edu.

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Board 21 EXPLORING DIFFERENCES BETWEEN TRADITIONAL AND ALTERNATIVE WORK ARRANGEMENTS. Heather N. Oele (Dr. Jeff Stanton), Bowling Green State University, Psychology Dept, 530 Manville Ave., Bowling Green OH 43402. hnlc06@bgnet.bgsu.edu

Recent reports show the growing increase in temporary help and part-time positions. Prior research has compiled a mass of contradictory findings. The present research is an attempt to understand the issues surrounding full-time versus part-time employees as well as permanent versus temporary employees in terms of job satisfaction, commitment, and stress. Data was utilized from three general samples of workers. Sample 1 (N=120) was obtained through direct canvassing of businesses, and had a response rate of nearly 100%. Sample 2 (N=130) had a response rate varying by organizations from 22% to 100%. Sample 3 (N=832) had a response rate of 54%. Both sample 2 and sample 3 were obtained through mail in surveys. In sample 1, temporary workers were found to have significantly lower job commitment than permanent. We found significantly higher satisfaction with supervision, based on the Supervision scale of the Job Descriptive Index, in part-time than full-time in sample 2. Sample 3 also found higher satisfaction with supervision among part-time than full-time, as well as significant differences in stress. The Pressure and Threat sub-scales of the Stress-in-General scale showed full-time were more stressed than part-time, as well as significant differences in stress. Lower stress levels were found among part-time than full-time. These findings show the need for future research, but they also illustrate the importance of being sensitive to different perceptions and reactions to the work place dependent on permanent, temporary, full- and part-time statuses.

Board 23 THE EFFECTS OF LIGHT EXPOSURE ON THE EXPRESSIVITY OF THE GENE FOR PIEBald COAT COLOR IN HOUSE MICE. Emilie M. Carson, Advisor, Dr. Ruma Suniga, Ohio Northern University, Dept of Biological Sciences, Ada OH 45810. e-carson1@onu.edu

When a phenotype of a specific genotype varies from individual to individual, it is said to exhibit phenotypic variation. An example of this phenomenon is the piebald spotting pattern observed in the coat color of Mus musculus. The spotting pattern is caused by variations in light exposure during gestation after an effect on the coat color of the offspring. Ten pregnant female mice, chosen as genotypes were divided into five light exposure groups and exposed to different times and wavelengths of light as follows: 12/2 hours, 12/12 hours, 23/1 hour, 23/1 hour ultraviolet, and 23/1 hour infrared. Twenty-eight days postpartum, the spotting patterns of the offspring were recorded according to location and size. These patterns were then recorded as a percentage of white fur to total fur: 12/2 hours = 17%, 12/12 hours = 15%, 23/1 hour UV = 15%, and 23/1 hour IR = 95%. Statistical analysis using ANOVA and the Post-hoc Scheffe’s test (a=0.05) indicated that only the 12/23 hours and 12/12 hour groups were significantly different from each other. This indicates that pigmentation differences result from variations in exposure to regular light.

Board 24 NEUROMODULATORS AND AGGRESSION IN CRAYFISH, ORCONECTES RUSTICUS: DEPLETION OF SEROTONIN BY 5, 7 DIHYDROXYTRYPTAMINE. Jules B. Panksepp and Robert Huber. Bowling Green State University, Dept of Biological Sciences and J.P. Scott Center for Neuroscience, Mind and Behavior, Bowling Green OH 43403. julesp@caspar.bgsu.edu

Crayfish offer behavioral neuroscientists a model system for studying how specific physiologic axes affect different components of behavior. Short-term infusions of serotonin (5-HT) reverse the likelihood of a previously subordinate crayfish to retreat from agonistic encounters. The present study examined the particular behavioral effects resulting from long-term serotonin depletions in the crayfish nervous system. We hypothesized that such a depletion should decrease levels of aggression. The neurotoxic molecule 5, 7-dihydroxytryptamine (5,7-DHT) was loaded into siastica tunicating and implanted into the thoracic tissue of socially isolated crayfish. After a recovery period, components of aggressive behavior (intensity, duration, escalation, who initiates/retreats) were compared between treatment and control animals when fighting size-matched opponents. Following the behavioral experiments, effective depletion of central 5-HT stores was confirmed using HPLC with electrochemical detection. Suprisingly, no behavioral deficits were detected as a result of such depletions. As depleted serotonergic neurons retain functional membrane properties, it is possible that target 5-HT cells may be using 5,7-DHT as an agonist in place of 5-HT. New avenues of interpretation may need to be considered by researchers using 5,7-DHT in vertebrate systems.

Board 25 HUNGER AND PRESENCE OF FOOD ITEMS INFLUENCE FIGHTING STRATEGIES IN CRAFYISH, ORCONECTES RUSTICUS. Adam M. Stocker and Robert Huber, J.P. Scott Center for Neuroscience, Mind and Behavior, and Bowling Green State University, Dept of Biological Sciences, Bowling Green OH 43403. amstock@bgsu.edu.

Crayfish chela are formidable weapons employed in fights among conspecifics. Individuals reduce the risks associated with extensive claw use by slowly increasing the intensity of a contest with an escalating sequence of stereotyped behavior patterns. Resorting to the rapid maneuvers exhibited at the end of an escalated contest may prevent the opponent’s fighting potential thus carries great peril. We believe that animals should take greater risks to feed. Similarly, individuals should be more daring when a desired resource is at stake. The goal of this study was to test these hypotheses by examining the differences in fighting strategies between hungry and satiated individuals in the presence or absence of a chemical food cue. Individual decisions for initiating encounters, escalating to higher intensities, retreating, or finally retreating from an interaction, were compared within a 2x2 factorial design. In agreement with our hypotheses, hungry crayfish escalated more rapidly than satiated individuals. Our discussion focuses on the complex trade-offs between increased risks of injury, appetitive states, and increased opportunities for resource access.

Board 26 THE NEUROPEPTIDE PROCTOLIN INFLUENCES AGONISTIC BEHAVIOR IN CRAYFISH, ORCONECTES RUSTICUS.-Smh Witt and Robert Huber, Bowling Green State University, Dept of Biological Sciences and J.P. Scott Center for Neuroscience, Mind and Behavior, Bowling Green OH 43403. tutts@bgnet.bgsu.edu

Aggressive interactions in crayfish feature escalating sequences of stereotyped displays and fighting acts, allowing us to characterize this behavior in quantitative terms. In previous work our lab has demonstrated that the neuropeptidemorenochrome serotonin greatly enhances aggressive tendencies in crayfish and lobsters. Proctolin, a putative neuropeptide with unknown behavioral functions, is localized mainly in the pericardial organ (PO), which has been shown to be involved in the mobilization of blood and other organ activity. As it is generally co-localizes in serotonergic neurons an involvement in the neurochemistry of aggression is thus a distinct possibility. In this study we infused small amounts of this neuropeptide into the hemolymph of freely-moving crayfish using fine-bore fused silica canulas and then practice. The outcome variable was the participant’s rank in the band or orchestra. Each variable showed significant contribution to musical ability and the order of importance was IQ, innate musical ability and then practice.

performed a series of unprovoked tailflips, and eventually assumed a subordinate status. In conclusion, our data are most consistent with protein fostering the expression of an underlying, non-specific fear component.

Board 27 QUANTITATIVE ANALYSIS OF CNS AMINE LEVELS IN CRAYFISH, ORCONECTES RUSTICUS. Zhaoxia Yue, Jules Panksepp and Robert Huber, J.P. Scott Center for Neuroscience, Mind & Behavior, and Bowling Green State University, Dept of Biological Sciences, Bowling Green OH 43403. zuyue@bgsu.edu.

Neuroendocrinology monitors, such as serotonin and dopamine, play important roles in the behavior of most animals. In crayfish the infusion of serotonin greatly enhances aggressive tendencies. Much less is known, however, about the extent to which amine neurochemistry is altered by behavioral contexts, such as dominance. Although amine distributions have been documented in the nervous system of crayfish using immunocytochemical methods, the exploration of such links requires a quantitative determination of amine levels. As a first step, we have adapted and optimized methods for HPLC with electrochemical detection for crustacean tissues. In the present paper, we use this system to explore the scaling of amimergic neurochemistry during the growth of crayfish. With a detection limit of < 2 pg of substance, we are able to measure the amine content of individual ganglia. In this study, male crayfish (5 - 25 g bodyweight) were dissected and the central nervous system was analyzed in 4 sections, namely the brain, the combined sub- and circum-esophageal ganglia, thoracic ganglia, and abdominal ganglia. Our preliminary results show that CNS amine levels are similar over a large range of body sizes.

Board 28 DIFFERENCES IN FIGHT STRATEGIES BETWEEN SMALL AND LARGE CRAYFISH, ORCONECTES RUSTICUS. Lisa Schroeder and Robert Huber, J.P. Scott, Bowling Green State University, Center for Neuroscience, Mind & Behavior and Dept of Biological Sciences, Bowling Green OH 43403. schroed@caspar.bgsu.edu.

Size-matched pairs of crayfish readily engage in agonistic encounters. Interactions increase in intensity until one individual withdraws. In such escalating fights the risk of injury rises as individuals begin to make uncontrolled use of their potentially lethal weaponry. The growth of the claws greatly outpaces that of the rest of the body during normal development, and weapons should thus play a disproportionately greater role in fights between larger individuals compared to smaller ones. To examine this hypothesis, we analyzed the fight characteristics and fighting strategies in either small or large size-matched pairs of crayfish. Specifically, this study compared the number of interactions, their duration, maximum intensity, and rate of escalation in pairs either weighting 1.2-6.4 or 14-24 grams in an experimental arena scaled to the size of the animals. Fighting in small pairs was characterized by more interactions of shorter duration than between larger individuals. In agreement with our model, small crayfish were less hesitant to escalate quickly than larger individuals.

Board 29 MILLIMETER-WAVE ROTATIONAL SPECTRA OF SMALL ASYMMETRIC MOLECULES. Douglas T. Petkie, Jennifer L. Gottfried, Jennifer L. Powell, Ohio Northern University, Dept of Physics, Ada OH 45810. d.petkie@ouu.edu.

The rotational spectra of many small molecules found in the atmosphere have peak absorption in the millimeter-wave region. Based on these spectra, remote-sensing techniques can retrieve such information as molecular abundance, temperature and pressure. These techniques rely on accurate laboratory measurements and predictions, which is the focus of this research. The spectra of several molecules were recorded with the Fast-Scan Submillimeter Spectroscopy Technique (FASSST) that allows large spectral scans (10-40 GHz) to be recorded in seconds. This research involved assigning and fitting the rotational spectra of several thermally populated vibrational states of deuterated nitric acid (DNO$_3$), hydrogen peroxide (HOOH), and nitric acid (HNO$_3$) to distortable asymmetric rotor models. For DNO$_3$, the rotational spectra for the ground state, $v_3$, $v_4$, and $2v_3$, vibrational states in the 120-180 GHz region was assigned and fitted, involving approximately 600 transitions. A unique set of spectroscopic parameters, rotational and centrifugal distortion constants, was determined for each vibrational state. These fitted parameters reproduce the measured spectra to the experimental accuracy of 100 kHz, producing a reduced root-mean-square deviation of 1 Hz.

Board 30 BOUND TO BE DIFFICULT: MAPPING STRUCTURAL CHANGES IN HEMOCYANIN SUBUNIT II DUE TO OXYGEN BINDING. Ian W. Straffin (Lisa Unico PhD), Edinboro University, Cooper Science Hall, Edinboro PA 16444. straffin@toolcity.net

Hemocyanin, the oxygen-transport protein found in horseshoe crabs, is similar to hemo- globin, but as an octa-hexamer, it is more complex and less well understood. Hemocyanin, like hemoglobin, is a multi-subunit molecule in which each subunit binds oxygen. Both hemocyanin and hemoglobin display positive cooperativity and allosterics in oxygen binding. In the case of subunit II, chloride ion is an allosteric effector. We are in the process of mapping the structure of this protein in the 'bound' state with chloride ion. Mapping is performed after first isolating and purifying the protein by ion exchange chromatography and centrifugation. Chemical modification and specific proteolysis are part of this mapping process. In specific proteolysis, the purified protein is digested with specific proteases. In this case thyrog, which cleaves only on the c-terminal side of lysine and arginine residues, was used. Peptides of protein are then separated on an HPLC column, and identified. A chemical modifier, p-hydroxyphenylglycinal will be used to modify arginines in the folded protein. This renders these sites immune to thyrog digestion. Thus, changes in the peptide map can be used to identify which arginine residues have been modified, and thereby are accessible to the solvent.

Board 31 STRUCTURAL CHANGES IN HEMOCYANIN SUBUNIT II DUE TO OXYGEN BINDING. William F. McCalmont (Lisa Unico), Edinboro University, Cooper Science Hall, Edinboro PA 16444. williamm@toolcity.net.

Hemocyanin, the oxygen-transport protein found in horseshoe crabs, is similar to hemo- globin, but as an octa-hexamer, it is more complex and less well understood. Hemocyanin, like hemoglobin, is a multi-subunit molecule in which each subunit binds oxygen. Both hemocyanin and hemoglobin display positive cooperativity and allosterics in oxygen binding. We are studying the 528 amino acid subunit II. Allosteric effectors are small molecules, or ions that can also bind specifically to the transport protein. Binding of an allosteric effector changes the ability of the transport protein to bind oxygen by altering the structure of the protein. In the case of subunit II, chloride ion is an allosteric effector. We are in the process of mapping the structure of this protein in the 'bound' state with chloride ion. Mapping is performed after first isolating and purifying the protein by ion exchange chromatography and centrifugation. Chemical modification and specific proteolysis are part of this mapping process. In specific proteolysis, the purified protein is digested with specific proteases. In this case thyrog, which cleaves only on the c-terminal side of lysine and arginine residues, was used. Peptides of protein are then separated on an HPLC column, and identified.

Board 32 INCREASING EFFICIENT PRODUCTION OF THIN FILM SOLAR CELLS WITH CIS AS AN ABSORBING LAYER BY ELECTRODEPOSITION. Jonathan E. Cowen, (Alyusus Hepp, NASA Glenn Research Center, Stan Durz, Cleveland State University and Cathleen M. Jenkins) Cuyahoga Community College, 11600 W. Pleasant Valley Rd, Parma OH 44130.

Currently, we are investigating a more efficient means of producing thin film photovoltaic devices via electrodeposition. Conversion efficiencies of 17.8% have been achieved for chemically vapor deposited copper indium diodele (CIS) based solar cells. However, electrodeposition is a much less toxic and less expensive means of producing CIS based solar cells. We are currently producing junctions using a p-type layer of CIS deposited electrolytically, and a p-layer of indium diodele by chemical bath deposition. It has been previously demonstrated that changing the deposition voltage can vary the copper to indium ratio. These alterations allow us to change the CIS semiconductor material from Ni-type to P-type. A series of thin films have been produced with deposition potentials ranging from -1.21V to -1.25V (vs. a saturated calomel electrode) in .02V increments. Copper indium diodele films are deposited on a polyethylene oxide substrate for 600 seconds using a solution consisting of 1M CuCl$_2$, 10mM In$_2$SO$_4$, 5mM SeO$_3$, and 25mM Na$_2$S$_2$O$_3$. After electrodeposition, films are rinsed with deionized water and annealed at 600°C for 2 hours. Film compositions have been characterized using Energy Dispersive Spectroscopy. A cadmium sulfide films is deposited on top of the CIS layer from chemical bath consisting of 1mM Cd$_2$(OH)$_2$, 10mM thiourea, and 1M NH$_3$. The temperature of the bath is maintained at 60°C, films are deposited for ten minutes. An evaporated aluminum grid will serve as the top contact for the cells. These grid wires will be characterized by current vs. voltage measurements.

Board 33 A STUDY OF GALAXY COLLISIONS. Jennifer J. Bohland, (Michael L. Fischer), Ohio Northern University, Dept of Physics, Ada OH 45810. m.fischer@ouu.edu.

The morphology of elliptical, irregular and spiral galaxies has long been a source of discussion in the field of astronomy. Toomre and Toomre (1975) have shown that several interesting features can result from the interaction or collision of spiral galaxies. Other authors have also studied galaxy collisions using different methods for modeling the gravitational interactions. We have taken an existing galaxy interaction code, GALAXY, and created our own version to operate under Microsoft Windows using Microsoft Visual Basic. The original code used a single mass point to simulate the intruder galaxy and several mass points to simulate the target galaxy. Our new code adds several mass points to the intruder galaxy as well as simplifying the input of initial conditions. This improves the capability of the code as well as allowing a fast and easy modification of the initial conditions once an interesting effect is seen. Several tests of the new code and validation runs of our code with that of Toomre and Toomre are presented here.

Board 34 ACYLATION OF AROMATIC COMPOUNDS USING NITRILES AND ESTERS. Joseph G. Lisko and Colleen A. Fried, Hiram College, Dept of Chemistry, P.O. Box 67, Hiram OH 44234. liskojo@hiram.edu.

Aromatic compounds are usually acylated using acid chlorides, which are toxic and typically involves the use of acid chlorides, which are toxic and typically involves the use of acid chlorides, which are toxic and typically involves the use of acid chlorides, which are toxic and typically involves the use of acid chlorides, which are toxic and typically involves the use of acid chlorides. Nitrites have been previously found to be effective acylating agents (Adachi et al., J. Am. Chem. Soc., 1978, 100(1)), 4842-4852. and Heinrich and Toussaint, J. Am. Chem. Soc., 1940, 62, 1145-1147.). However, esters, which are less expensive have proven to be less effective. We sought to develop the prototype device designed by Hirsip and company (Tooshaedron Latt. 1994, 35(37), 0351-0354) to extend the reaction to amines other than amine. The
same general procedure was followed for all reactions. In an ice-cooled, 25-mL round-
bottom flask, the amine was dissolved in 1,2-dichloroethane. Boron trifluoride was added
slowly followed by the dropwise-addition of the ester or nitrile. Finally, aluminum chloride
was added, and the mixture was stirred while slowly heating to 135°C. Products were
analyzed by TLC, GC-MS, and IR. The developed synthetic method has proven to be
versatile, producing aromatic ketones from a variety of amines using esters and nitriles as
acylation agents. Once further optimized this procedure would be applicable to the
synthesis of quinoline alkaloids, many of which have shown anti-HIV activity.

Board 36 A STUDY OF CHAOTIC PLASMA BURSTS. William L. Thesiee, Hanna L.
Wagner, Ohio Northern University, Dept of Physics, Ada OH 45801, w.thesiee@onu.edu
Large amplitude plasma bursts have been detected in many types of plasmas including the
northern lights, laboratory plasmas, and the solar wind around the various planets. Plasma
bursts generally occur in the regions where two different plasmas come into contact. The
nonlinear process of plasma burst formation involves a stream of fast moving electrons that
has been accelerated by the differences in the two plasmas. This electron stream interacts
with the plasma giving rise to plasma bursts, plasma waves, and other nonlinear processes.
Several argon plasmas were created in an aluminum chamber and used to produce the
plasma bursts in the laboratory. A chaos data analyzer program using time-series analysis
methods was used to determine if the bursts occurred randomly in time. It was found that
the time-series probability distribution is not random and that a large number of bursts are
separated by a short time interval. Further investigation reveals that a long time interval is
typically followed by several shorter time intervals. The first burst is thought to serve as a
‘nukeelation’ site for the bursts which rapidly follow. This is consistent with the concept of
caviton formation in plasmas. The time-series of plasma bursts have also been plotted in the
phase-plane. Structure in these plots has been observed implying quasi-periodic or
chaotic data. These observations give strong evidence that these laboratory plasma bursts are
not formed randomly in time and that the use of chaotic methods for the study of these
plasmas leads to a better understanding of plasma bursts in general.

Board 37 BEAD PILE SYSTEM AS A MODEL FOR SELF-ORGANIZED CRITICALITY.
Hanna L. Wagner and Donald T. Jacobs, Ohio Northern University, Physics Dept, Ada
OH 45801, h.wagner@onu.edu
In 1987, Bak, Tang, and Wiesenfeld introduced a new paradigm in the physics of large,
complex, dynamical systems called Self-Organized Criticality. Common to many systems
is the natural tendency to organize itself at a critical state resulting in characteristic
fluctuations, which are observed in everything from earthquakes to the stock market. The
fluctuations are expected to follow a power-law distribution where there is no simple
causality. One system that has previously been used as a model for SOC is a sandpile. We
experimentally investigated smooth glass beads forming a conical pile, where adding one
bead at a time causes many small, and a few large, avalanches. The size distribution of
avalanches was consistent with the predictions of Self-Organized Criticality. In particular,
the number of avalanches of a given size was proportional to the size of the avalanche to
the power (~1.9 ± 0.9), which is close to the mean-field prediction of ~1.49 ± 0.03. This
result was independent of the size or shape of the base of the pile. We were also able to
determine the power spectra density, which revealed a power-law with slope ~1.80 ± 0.02
that was also independent of base size and shape. This experiment was conducted at The
College of Wooster with support from NSF-REU grant DMR 9619405.

Board 38 COMPARATIVE OTODYNOSIS OF AGONISTIC BEHAVIOR AND AMERICING
NEUROCHEMISTRY IN THE CRAWFISH ORCONECTES RUSTICUS. Angelica J. Pytel,
Bowing Green State University, J.P. Scott Center for Neuroscience, Mind and Behavior
Department of Biological Sciences, Bowling Green, OH 43403, apytel@bgsu.edu
The resolution of intra-specific conflict has received much attention in adult crawfish due to
consciousness and potentially lethal weaponry. However, surprisingly little is known about
the occurrence of these behaviors during development. This study examines the fighting
behavior of early juvenile stages and explores whether the emergence of different
behavioral acts coincides with ontogenetic changes in amine neurochemistry. After
hatching, larval crayfish remain attached to the swimming of their mother. Morphological
and behavioral development was monitored with ventral side macro-video recordings of
unrestrained, gravid females. The first two larval stages featured only rudimentary claws,
which functioned mainly in holding onto the mother’s pleopods. Immediate contact with
others commonly lead to avoidance behaviors. Approximately one week after hatching
(stages 3), larvae began to detach from the mother and move about freely. At this time
offensive agonistic behaviors were first observed with stereotyped patterns emerging in
stages. These included a common threat display (moral spread) and first hesitant uses of
claw. Gradually behaviors were added to the agonistic behavioral repertoire with
successive molts. CNS levels for serotonin and dopamine were measured in these larval
claws. Gradually, behaviors were added to the agonistic behavioral repertoire with
(stage 3), larvae began to detach from the mother and move about freely. At this time
behavioral development was monitored with ventral side macro-video recordings of
conspicuous and potentially lethal weaponry. However, surprisingly little is known about
behavioral acts coincides with ontogenetic changes in amine neurochemistry. After

Board 01 DOES THE LOCATION OF WATER SAMPLE COLLECTION IN A DENTAL
CAST GRINDER AFFECT THE QUANTITY OF COLONY FORMING UNITS OF HET-
EROOTRICAPHILIC BACTERIA? Erin F. Schlegel, 1996 Alwo Terrace, Coshocton OH 43812,
eschlegel@coshocton.com (Coshocton High School)
The objective of this study was to be observe the impact water source contrib (in a single
dental appliance) had on the resulting growth of microorganisms. Different points of
distribution in old and new cast grinders were tested. It was predicted that decreasing
tubing diameters (as evidenced by the 1/2 mm aerosol fitting) would increase bacterial
population. Millipore samplers (nutrient medium 34% comparable to their R2A agar
countpoints) were filled with eighteen milliliters of water from each of the following sites:
cntrol (city water supply), input, output, aerosol, and plaster trap. Residual chlorine was
removed from water samples through the use of sodium thiosulfate tablets and collection
proceedings were followed-up with a 25 hour incubation period at 23 degrees C. Gradent.
This process was repeated over the course of the three trials. Results indicated that the
aerosol was the highest source for microbial contamination, apart from the slurry laden
plaster trap. The standard goal to which the data was compared was issued by the
American Dental Association and calls for dental appliances to contain no more the 200
bacterial colonies of heterotrophic, aerobic bacteria by the year 2000. However, as
evidenced by this experiment, the majority of dental contamination may be due to
thermophiles. In addition, the possibility of a natural gene transfer and the option of
organisms adapting to their environment to suit their needs makes us more aware of the
dominance of infectious disease transmission than ever before.

Board 02 WILL ONE DRUG KILL ALL THE BUGS? Alex D. Hollanshead, 13645 County
Hwy 108, Upper Sandusky OH 43351, carolsh@udata.com (Upper Sandusky
High School)
Infections are often caused by more than one type of bacteria. In order to successfully treat
these infections, it is necessary to determine what antibiotics to use. The recovery of the
patient is dependent upon the proper selection of antibiotics that will destroy all the bacteria
involved. The purpose of this experiment was to see if there are antibiotics on the market
that can inhibit multiple strains of bacteria using only one antibiotic. In order to verify the
hypothesis that some antibiotics are very specific and effective only for certain types of
bacteria while others are broad spectrum and can treat multiple bacteria, five different
strains of bacteria were challenged with nine different antibiotics. The antibiotics used in
this experiment included Ampicillin, Bactrim/Septra, Cephalothin, Ciprofloxacin,
Erythromycin, Ofloxacin, Penicillin, Tetravafloxacin, and Vancomycin. The five types of
bacteria included three gram negative bacteria: Escherichia coli, Proteus mirabilis, and Pseudomonas
aeruginosa and two gram positive cocci: Staphylococcus aureus and Enterococcus faecalis. The Kirby -
Bauer sensitivity method was used to obtain sensitivity patterns that were compared to standards
in order to determine which antibiotics were effective against each bacteria. After performing five
trials to verify my results, I concluded that three of the antibiotics proved to be specific for
one or two specific bacteria. Six of the antibiotics were effective against a wider range of
bacteria while others are broad spectrum and can treat multiple bacteria. From the results of this
experiment, the majority of dental contamination may be due to thermophiles. In addition, the
possibility of a natural gene transfer and the option of organisms adapting to their environment to
suit their needs makes us more aware of the dominance of infectious disease transmission than ever before.

Poster Session
Pre-College Students
1:30-3:00 PM
Meyer Hall

Board 03 THE EFFECT OF DIFFERENT PHYSICAL CHARACTERISTICS ON SINGLE
IMAGE STEREORAMS. William R. Forister, 2441 Merrick Rd, Worthington OH 43235,
forister@gateway.net (Perry Middle School)
The purpose of this experiment was to determine the effect of different physical
characteristics upon the perception of single image stereograms (two-dimensional images which
when viewed correctly, appear three-dimensional). Research was also performed to see
if the human eye would adapt to the stereograms. The hypothesis was as follows: the
younger a subject is, the faster a stereo can be perceived. Gender will have a minimal
effect on perception time, corrective lenses will have a measurable effect on one’s ability
to perceive a stereo. Finally, the time required to perceive a stereo will improve as a subject
views multiple stereograms in succession. Before testing, thirty subjects were
alyzed by TLC, GC-MS, and IR. The developed synthetic method has proven to be
applicable to the synthesis of quinoline alkaloids, many of which have shown anti-HIV activity.
The egg industry has found effective ways to make eggs safer with a prolonged shelf life. This has included processing egg whites into dried, liquid, and frozen products. This study explored how these products were equivalent substitutes for fresh eggs when preparing angel food cakes and if humidity affected the cakes height and texture. Hypotheses were that:

1. Processed egg whites would produce angel food cakes that were denser in texture and shorter in height when compared to height of fresh egg angel cake of 7.25 inches. The cake prepared with dried product was 7 inches; cake prepared with liquid product was 4 inches, and cake prepared with fresh product was 6.3 inches.

2. Cake prepared with liquid product was 6 inches; cake prepared with fresh egg product was 6.5 inches. (3) The commercial product, perhaps due to additives, was higher in height, less dense, and less affected by humidity by 10-15% on low humidity days (56-72%) and high humidity days (34-52%).

When considering the potential safety hazards of fresh eggs and additives in the commercial mix, a wise alternative to fresh egg whites when preparing angel food cakes may be the use of a dried egg white product.

Board 08 EVIDENCE FOR BACTERIA IN FAST FOOD RESTAURANT HAMBURGERS. Amy C. Schlegel, 1500 Awatto Terrace, Coshocton OH 43312, dschlegel@cosohcton.com (Coshocton High School)

The objective of this study was to determine if ground beef hamburgers prepared at fast food restaurants would have comparable growth (in CFUs) to similarly processed meat sources. Four cooked hamburgers from Coshocton, Ohio fast food restaurants were tested (Burger King, Hardee's, McDonald's, and Wendy's). In addition ground beef sources of Oscar Mayer, all beef bologna, Food Club all beef franks, and fresh raw ground beef from Big Bear grocery store were used as well. Samples were maintained at approximately 23 degrees Celsius prior to inoculation on agar plates. Each sample of 11 mg was diluted to a 1:10 level with water and 1 drop of trypsin 

The data supports a significant decrease from the antibodies. Increased adherence by each cytokine. The data indicate that both TNFa and IL-1a increase the adherence of Spn to the respiratory epithelium of this tubal organ. Next specific anti-cytokine antibodies were used in a neutralization study to determine if the increased adherence could be decrease.

Board 09 TOLERANCE OF TRANSGENIC ARABIDOPSIS PLANTS CONTAINING AN ANTI-AGING GENE TO ENVIRONMENTAL STRESSES. Anna K. VanTocai, 4220 Baughman Green, New Albany, Mford@cd.pvt.k12.oh.us (New Albany High School)

The goal of the research is to determine if genetic transformation to incorporate an anti-aging gene can improve plant's tolerance to environmental stresses. Since environmental stresses cause plants to become senescent prematurely, it was hypothesized that transgenic plants containing the SAG12-gpt genes would be more tolerant to environmental stresses than wild-type plants. Specific tests were made on the tolerance of transgenic Arabidopsis plants containing the SAG12-gpt chimeric gene to drought, flooding, and salinity stresses. The SAG12 promoter is a senescence-induced promoter, which only turns on when the plants are undergoing senescence. The gpt gene codes for the enzyme inosinophosphate phosphotransylase, the first step in the biosynthesis pathway of cytokinin, an anti-aging hormone. The SAG12-gpt chimeric gene is an autoregulated system that allows the production of the hormone only when the plants are undergoing senescence. Seeds of four SAG12-gpt transgenic Arabidopsis lines of the S. generation and of the wild type Col-0 generation were tested for growth. Each line was used to pollinate the next generation. After one week, the stress was removed and the plants were allowed to recover for one week. Stress tolerance was determined by the number of plants that survived and their biomass and chlorophyll content. All the four transgenic Arabidopsis plants containing the SAG12-gpt gene were more tolerant to drought, flooding and salinity stresses than wild-type plants. The results indicated that genetic transformation with an anti-aging gene could be used to improve the environmental stress tolerance in plants.

Board 10 EFFECTIVENESS OF OVER-THE-COUNTER ATHLETE'S FOOT TREATMENTS. Stephen J. Rybak, 356 St. Thomas Dr, Westerville OH 43081, avantoai@yahoo.com (New Albany High School)

A commercial-mix angel food cake was prepared for comparison on both days. The results found:

1. Angel food cakes prepared with processed egg white products were shorter in height when compared to height of fresh egg angel cake of 7.25 inches. The cake prepared with dried product was 7 inches; cake prepared with liquid product was 4 inches, and cake prepared with fresh egg product was 6.3 inches.

2. Cake prepared with liquid product was 6 inches; cake prepared with fresh egg product was 6.5 inches. (3) The commercial product, perhaps due to additives, was higher in height, less dense, and less affected by humidity by 10-15% on low humidity days (56-72%) and high humidity days (34-52%).

When considering the potential safety hazards of fresh eggs and additives in the commercial mix, a wise alternative to fresh egg whites when preparing angel food cakes may be the use of a dried egg white product.

Board 07 THE BIOCHEMISTRY OF CHORDAL RUPTURE IN MITRAL VALVES. Kyra L. Sedrans, 15380 South Park Blvd, Shaker Heights OH 44120, JNES1388@aol.com (Hathaway Brown School)

The leaflet mitral valve geometry and function are unknown. Normal mitral valves were studied to provide a basis for comparison for biomechanical analysis of rupture in diseased mitral valve chordae tendineae. It was hypothesized that normal chordae would rupture through yielding of collagen fibers that form the middle core. A total of 42 chordae from porcine mitral valves were classified by position, anterior marginal (18), anterior basal (7), posterior marginal (12), and posterior basal (7). Tissues were weighed, their dimensions measured, they were mechanically tested under uniaxial loading condition in an Instron. Following preconditioning, failure curves were obtained, and failure loads (g) recorded. Rupture characteristics were assessed under diastolic and a systolic pressure of 40 mmHg and load of 10, 20, and 30 g, respectively. Chordae tendineae ruptured close to but below the leaflet insertion (14/28) while basal chordae tore most frequently at the leaflet (7/14). The tear often extended halfway down the chordae; the torn collagen fibers gave the edge a "frayed" appearance. In normal mitral valves, pressure across the closed valve is balanced between numerous thin marginal chordae and relatively fewer thick basal chordae. In diseased mitral valves (e.g., myxomatous degeneration), abnormal leaflet geometry results in chordal balance resulting in increased loads upon marginal chordae. Weakness observed in posterior marginal chordae correspond to the high incidence of ruptures in this location.

Board 06 COMPARISON OF HEIGHTS OF ANGEL FOOD CAKES MADE FROM FRESH AND PROCESSED EGG WHITES. Tricia M. Yerard, 124 Rinkirl Lin., Chillicothe OH 45616-4549, tricia.yerard8@hotmail.com (Univida High School)

The egg industry has found effective ways to make eggs safer with a prolonged shelf life. This has included processing egg whites into dried, liquid, and frozen products. This study explored how these products were equivalent substitutes for fresh eggs when preparing angel food cakes and if humidity affected the cakes' height and texture. Hypotheses were that:

1. Processed egg whites would produce angel food cakes that were denser in texture and shorter in height when compared to height of fresh egg angel cake of 7.25 inches. The cake prepared with dried product was 7 inches; cake prepared with liquid product was 4 inches, and cake prepared with fresh product was 6.3 inches.

2. Cake prepared with liquid product was 6 inches; cake prepared with fresh egg product was 6.5 inches. (3) The commercial product, perhaps due to additives, was higher in height, less dense, and less affected by humidity by 10-15% on low humidity days (56-72%) and high humidity days (34-52%).

When considering the potential safety hazards of fresh eggs and additives in the commercial mix, a wise alternative to fresh egg whites when preparing angel food cakes may be the use of a dried egg white product.

Board 05 EFFECT OF CYTOKININS ON THE ADHERENCE OF STREPTOCOCCUS PNEUMONIAE TO CHINCHILLA TRACHEAL EPITHELIUM. Dan Li, 2992 Sudbury Rd, Upper Arlington OH 43221, e-mail: dbli1@hotmail.com (Hathaway Brown School)

The trachea whole organ perfusion technique was used to study the effect of tumor necrosis factor a (TNFa) and interleukin-1a (IL-1a) on the adherence of mitotic media pathogen Strptococcus Pneumoniae (Spn) type 6A. The hypothesis being tested was that the adherence of Spn would increase under the effect of the cytokines. Tracheas were removed from 45 chinchillas and divided equally. One-half trachea was activated by inoculation with 1-10 ng/ml of either TNFa or IL-1a. Controls were treated with the addition of trypsin to the organ culture. Colony forming units (cfu) of Spn multiplied tracheas were determined for activated tracheas and controls. Dose response and kinetics data were then generated for each cytokine. The data indicate that both TNFa and IL-1a increased the adherence of Spn to the respiratory epithelium of this tubal organ. Next specific anti-cytokine antibodies were used in a neutralization study to determine if the increased adherence could be decrease.

The data supports a significant decrease from the antibodies. Increased adherence by cytokines treatment may contribute to the pathogenesis Spn as seen in otitis media and other upper respiratory tract diseases.

Board 04 COMPARISON OF HEIGHTS OF ANGEL FOOD CAKES MADE FROM FRESH AND PROCESSED EGG WHITES. Tricia M. Yerard, 124 Rinkirl Lin., Chillicothe OH 45616-4549, tricia.yerard8@hotmail.com (Univida High School)

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When considering the potential safety hazards of fresh eggs and additives in the commercial mix, a wise alternative to fresh egg whites when preparing angel food cakes may be the use of a dried egg white product.

The Ohio Journal of Science
Vol. 100(1)
the hypotheses.

These results do not support the hypotheses.

Board 10

**THE DEVELOPMENT OF A MICRO-SENSOR TO MONITOR SULFUR DIOXIDE EMISSIONS.** Ann Lai, 27630 Cedar Rd. Apt. 404-2, Beachwood OH 44122. negalli1@aol.com (Harrison High School)

According to the EPA, pollution is a threat to the environment, human health, and architecture. Its main contributor is sulfur dioxide emitted into the atmosphere from various sources, especially the industrial smokestacks. The purpose of this study is to develop micro-sensors to detect sulfur dioxide emission levels. There are four main types of sensor technology which can measure sulfur dioxide concentrations: spectrophotometric analyzers, conductometric sensors, piezoelectric crystal detectors, and interdigital capacitors (IDCs). However, all of these have many disadvantages. This study aims to develop and evaluate a sulfur dioxide detecting micro-sensor based on the recently developed three-electrode thick film technology with a working (platinum), a counter (platinum), and a reference (silver-silver-chloride) electrode which operates according to oxidation-reduction principles. Fifteen sensors were designed and developed using four electrode configurations in different sizes: rectangles, semi-circles, concentric circles, and concentric ellipses. All sensors were then tested for sensitivity and capability. For each sensor, an instrument inputted three cycles of power from -3.6V to +3.6V, and the generated current across the counter and working electrodes was measured for 0%, 1%, and 2% sulfur dioxide. Linear lines were fitted to the data for each voltage (0.5V, 0.6V, 0.7V, 0.8V) relating the percentage of sulfur dioxide and the current output; the results of the sensors were compared based on r, the curve-fitting coefficient, and the magnitude of the current output. The data indicated that: 1) the longer the length of adjacency between working and counter electrodes, the greater the current output and sensitivity; 2) as the size of the electrodes increases while the gap distances decreased, current output and sensitivity increased; 3) sulfur dioxide concentrations and current output have a direct and linear relationship. Currently, a micro-sensor system is being developed applying these conclusions and incorporating an actuator. This study has many applications as an economically feasible method to detect gaseous sulfur dioxide. Industrial applications include measuring sulfur dioxide emissions of industrial smokestacks, resulting in effectively monitor pollution not only company by company, but also process by process.

**Board 11**

**THE EFFECT OF WIND AND TOUCH ON THE GROWTH OF ARABIDOPSIS.** Rebecca F. Kemper, 3202 Trentwood Rd, Columbus OH 43221. kemper23@osu.edu (Watterson High School)

The effect of wind and touch treatments on Arabidopsis plants was observed. Hypotheses offered were: 1) Plants exposed to 12 hours of wind a day will be shorter than 1 hour exposures and ten minute exposures. 2) Plants exposed to 10 minutes of touch will be shorter then plants exposed to 5 minutes and no wind/no touch (control) a day. On average the control will be the tallest. Forty-eight Arabidopsis plants were divided into two lots of twenty-four plants and was further divided into six treatment groups (including the control). Wind treatment groups were: Wind all day (W3), wind for an hour (W2), and wind for ten minutes a day (W1). Touch treatment groups include: touch for ten minutes (T2) and touch for five minutes a day (T1). A control group (C1) received no wind/no touch a day. Lights and a fan were set on a timer to run various times a day. Touching was done by hand. After the plants began to sprout (ID, numbers were randomly assigned to the plants, according to lot, touch, wind and time. The treatments of wind and touch were applied for twenty-four days. The data was calculated using an average of trial: 1) wind all day 5.48cm; 2) wind for an hour 5.20cm; 3) ten minutes a day 4.41cm; 4) touching for five minutes a day 4.13cm; (5) five minutes was 4.58cm; and (6) the control was 4.61cm. Plants with wind all day were the second tallest. The control yielded the second shortest height. These results do not support the hypotheses.

**Board 11**

**THE EFFECTS OF WIND AND TOUCH ON THE GROWTH OF ARABIDOPSIS.** Rebecca F. Kemper, 3202 Trentwood Rd, Columbus OH 43221. kemper23@osu.edu (Watterson High School)

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calculated, a manual traffic count was performed between the hours of 6:15 a.m. and 9:15 p.m., on a Tuesday in early December, in order to ascertain the peak hour characteristics of the individual movements in the traffic flow. Next, using highway capacity software, the level of service was calculated with a grade of ‘A thru ‘F’, based on the average vehicular delay in seconds. During morning peak, for an average weekday, the overall efficiency of the intersection was a C, but during both afternoon and evening peak periods, the intersection operated at level of service F, an unacceptable grade. Next, adjustments were proposed for cycle lengths, phasing, and geometric configurations of the intersection. The monograph however, again raises question as to whether these plans are any better than filtering it out. Since this "Apple Jelly" contains most of the icing inhibitor, there is little remaining in the fuel transferred to the jet. The purpose of this study is to examine the effect of "plus 100" on the efficiency of JP8 jet fuel. It was hypothesized that the JP8 plus 100 would not create additional water in the fuel and the range of temperatures for the creation of two phases ("Apple Jelly") in the delivery truck would be high enough that it would only occur during extremely hot weather. The first stage of this study investigated the amount of water created in JP8 fuel compared to the amount of water created in the JP8 plus 100 fuel by adding a variable of the test fuel tank and running them through a scaled down model of a fuel system. The fuel filter was replaced with a dye pad to measure the amount of water created in the fuel. The dye pad was then put into an Aqua Glow machine to measure the amounts of water in parts per million (ppm). These results support the first portion of the hypothesis by indicating that the JP8 plus 100 fuel actually created less water than the JP8 fuel without the "plus 100" additive. The additive contains the icing inhibitor 2-Butoxyethanol that does not mix well with water and can vary widely in volume of water. The first method involved digestion by the addition of a common liquid household detergent, [Dawn], to the second stage involved digestion by the addition of an enzymatic soptic tank treatment mixture, [Red-X]. The third method involved absorption by placing a crushed clay compound, [Oil Dr], into a mesh container suspended into the slick. Visual observations discovered dispersion caused no elimination of the oil from the water's surface, rather, it lowered the surface tension on the water forcing the oil to the periphery of the container. The addition of the digestive compound caused clumping and sinking of the oil, leaving less surface pollutants. Absorption by dry crushed clay resulted in complete removal of the slick from the water's surface. The method of absorption of an aquatic oil spill using dry crushed clay was the most effective form of cleanup.

Board 22 TESTING THREE METHODS OF OIL SPILL CLEANUP. Dylan T. Jesse, 5481 Woodland Pl, Canfield OH, 44406. djessa@gateway.net (Canfield Middle School)

The objectives of this experiment were to compare three different methods for cleaning up aquatic oil spills and to determine which is the most effective. The method of absorption was expected to be the most effective. Equal amounts of used motor oil were added to three similar containers holding the same volume of water. The first method involved digestion by the addition of a common liquid household detergent, [Dawn], to the slick. The second method involved digestion by the addition of an enzymatic soptic tank treatment mixture, [Red-X]. The third method involved absorption by placing a crushed clay compound, [Oil Dr], into a mesh container suspended into the slick. Visual observations discovered dispersion caused no elimination of the oil from the water's surface, rather, it lowered the surface tension on the water forcing the oil to the periphery of the container. The addition of the digestive compound caused clumping and sinking of the oil, leaving less surface pollutants. Absorption by dry crushed clay resulted in complete removal of the slick from the water's surface. The method of absorption of an aquatic oil spill using dry crushed clay was the most effective form of cleanup.

Board 23 A COMPARATIVE STUDY OF THREE BRANDS OF MASTITIS PREVENTION PRODUCTS. Joshua M. Penhorwood, 27900 Newton Perkins Rd, West Mansfield OH 43335. PwoodQ2@yahoo.com (Benjamin Logan High School)

Mastitis cost the United States dairy farmers $2 to $4 billion dollars each year, which is why it is essential to have an effective mammary gland management program. The purpose of this project was to determine which of the three brands of mastitis prevention products (Bio-Dry, Dry-Clox and QuantumMaster) most effectively prevent mastitis. Bio-Dry was expected to work the best. Somatic cell counts of each bovine were taken by a certified milk tester and recorded. Selected bovine at the end of their lactation were brought into the milking parlor and each bovine identification number was recorded. A total of 70 bovine were dried off over a seven month period. All bovines were milked as normal being sure to take out all milk. Each test was then cleaned with an alcohol pad. The contents of the prepackaged syringe containing Bio-Dry, Dry-Clox or Quartermaster was injected into
An accurate method to test the affect of water and air temperatures on hurricane's temperatures would affect the hurricane's strength, with water having the greatest impact. It was hypothesized that the water and air temperatures caused the funnel of the hurricane to become tighter and rotate faster than the opposite circumstance. The conclusion was reached that water temperatures affect the strength of a hurricane more than air temperatures. Visual observation was used to rate the strength of the hurricane. This experiment has since run back again using a wind velocity meter to more accurately rate the hurricane's strength. This was unsuccessful due to the lack of air movement to operate the wind velocity meter accurately.

Pre-College Students

Board 01 WHAT SUBSTRATE IS THE BEST FOR GROWING OYSTER MUSHROOMS AT HOME? Sanjana Sundararajan, 8503 Copper Dodd, Dublin OH 43016.POINTYfeet@hotmail.com (Learning Unlimited Village Academy)

Home cultivation of the Oyster Mushroom (Pleurotus ostreatus), a popular edible mushroom, has gained popularity. There isn’t much information regarding the best substrate for cultivation of Oyster Mushrooms at home. The purpose of this experiment was to find out the best substrate for growing Oyster Mushrooms at home. This was done by measuring the number, weight, and time of germination of Oyster Mushrooms in four substrates; coffee grounds, peat moss, shredded paper, and mushroom spawn. The hypothesis stated that the coffee grounds, because of its organic content, and mushroom spawn, because of the already grown mycelia in it, would be the best substrates. 150 grams of each substrate was inoculated with 150 grams of mushroom spawn. The experiment was done in duplicates. The substrates were put into pans and covered with a hole plastic sheet to maintain humidity. The pans were placed in random order so surroundings would not have any effect on growth. Substrates were sprayed everyday at the same time with 1/8 of a cup of water. Number, weight, and time of germination of mushrooms in each treatment was recorded. The hypothesis was partially supported. Mushroom spawn produced the most and biggest mushrooms in the shortest time. Coffee grounds grew no mushrooms. Mushroom spawn, shredded paper, and peat moss grew 2 mushrooms each. They weighed an average of 20g, 20g, and 10g respectively. Time taken to grow was an average of 14, 25, and 25 days respectively.

Board 02 CATEGORIZING PREFERRED BARN OWL HABITAT IN OHIO. Jacob M. Gray, 13466 Charleston Pike, Kingston OH 44446. (Zone Trace Local Schools)

Barn owls, Tyto alba, are an endangered species in Ohio. Although their numbers have been increasing, in recent years, there are only a few areas in Ohio where they nest. In 1968 barn owl nests were found in only 17 of Ohio’s 88 counties. This research proposal was done to determine why certain areas in Ohio are preferred by barn owls by examining the habitat through the use of agricultural reports, soil maps, Geographic Information System information and other similar published information. When information on current agricultural use and existing habitat was gathered for each Ohio county, counties with more CRP, pasture and hay were more likely to have nesting barn owls. In Ohio, of the 12 of the 17 glacial boundary counties had nesting barn owls in 1968. By reviewing the amount of Conservation Reserve Program (CRP), hay acreage and pasture acreage it was found that glacial counties with more CRP, pasture and hay were more likely to have nesting barn owls than counties away from the boundary. Meadow voles are primary prey of barn owls in Ohio, and meadow voles depend upon grassland and wet meadow habitat. In 1988 no barn owl nests were found in northern Ohio’s counties, and 33% of all known nests were in the southern one-half of the state. This index was used to rate and characterize habitat. It was found that most of the counties in Ohio where barn owls currently nest rank high in CRP, pasture, and hay acres. These counties have relatively high amounts of glacial related soils, wet meadows and shallow wetlands. A county on the glacial boundary was far more likely to have nesting barn owls than counties in the glaciated or unglaciated regions of Ohio.

Board 03 THE MAJOR AMPULLATE GOLDEN DRAGLINE SILK AND THE HYPOTHIZED MAJOR AMPULLATE SILVER DRAGLINE SILK OF NEPHILA CLAVIPES. Lisa M. Siciliano, 16001 Rowena Ave, Maple Heights OH 44137. L.Siciliana@uol.com (Beaumont High School)

This experiment examined silk from Neophila clavipes, comparing major ampullate golden dragline silk and major ampullate hypothesized silver dragline silk for superior properties of strength; resistance to acid and elongation. It was hypothesized that the golden dragline silk would prove to have superior properties for all the categories. Silk was obtained from Neophila clavipes spiders and evaluated using x-ray diffraction, SEM (scanning electron microscope), acid reaction timed with an Olympus BX60 optical microscope, and for supercontraction and elongation. Using x-ray diffraction it was discovered that the golden dragline has more crystalline regions (alanine beta-pleated sheets). Gold silk is almost as strong with only about 10-15% less crystalline regions than the golden silk. Since the golden dragline has more crystalline regions, it would be expected to have superior mechanical properties in regards to the strength of the silk. Examining the results of the
SEM project. I have again proven that golden dragline silk is stronger. The silver silk, under 8000x magnification had rougher edges and was not as smooth as the gold silk. The electrons from the microscope tended to shrink the diameter of the silks. The silver silk, when exposed to the electrons, became damaged very quickly in 1-2 minutes. The gold silk was less affected by the electron beam. It shrank in diameter because of electrons, but it took about 4-5 minutes for any significant damage to occur at 8000x magnification. The silver silk was 3.5 m and the gold silk was 5 m under the same magnification. The gold silk was commonly found together with another strand of gold silk. The silver silk was only found as single strands. The silver silk is expected to have superior elongation properties because it has fewer crystalline areas. To test this hypothesis, the silks were exposed to HCl and H2SO4. Using an optical microscope, I could not see the molecular changes, but I could observe that the silks were both dissolved by the acids, forming liquid drops after their dissolutions. I really saw no difference between the two silks when exposed to the acids. Lastly, the supercontraction and swelling phenomenon was observed for both silks when immersed in distilled water. Dragline silk is, the only silk which has been reported to supercontract to 50% its original length and swell when immersed in distilled water. The silver silk contracted about 5% more than the gold silk as shown by the X-rays. This is due to the fact that water is attracted to the amorphous regions first. It was concluded that the golden silk has the property of superior strength, the silver silk has the property of superior elongation, and both silks have the same resistance to acids.

Board 04 COMPARISON OF DIFFERENT METHODS OF ISOLATION OF GENOMIC DNA FROM MOUSE TAILS. Eric S. Stiehen, 2735 Baker Place, Cincinnati OH 45206. stiechen@seven.edu (Seven Hills School)

When choosing a method to isolate genomic DNA from tissue, cost, efficiency, time, ease, and the potential for yield had to be considered. The use of these methods is to compare the total yield and purity of DNA isolated using the Potassium Acetate (after tail lysed, KoAc precipitates DNA pellet, wash, then resuspended), spooling (after tail lysed, precipitating DNA bound to sealed capillary tube, wash, then resuspended), and QiAmp Kit (after tail lysed, DNA bound to filter in spin column, washed, then eluted) methods for extracting DNA from mouse tails. It was hypothesized that the KoAc method would produce the highest yield, and that the QiAmp Kit method would produce the highest purity, while the spooling method is outstanding in neither facet. Twelve prepared mouse tails from six week-old mice were sliced into 100mg segments for genomic DNA isolation. Each method was used on four tail segments. The optical density of a dilution of each of the twelve samples was read in duplicate. The DNA purity was calculated, the average final concentrations were determined for total yield calculation. Electrophoresis was done using 1% agarose gel and 1μg DNA samples. Gelview was used for statistical analysis. There is no statistically significant difference in DNA purity among KoAc, Spooling, or QiAmp Kit methods (P>0.05). The KoAc and spooling methods produce significantly higher yields than the QiAmp Kit method (KoAc vs. QiAmp Kit: P=0.0173, Spooling vs. QiAmp Kit: P=0.0030). There is no statistically significant difference in total DNA yield between the KoAc and Spooling methods. All three methods produce DNA with comparable minimal degradation. When purity must be maximized in DNA isolation, any of the methods are appropriate. When yield must be maximized, either the KoAc or spooling methods are preferable.

Board 05 DAIRY COW'S RUMINATION IN RESPONSE TO LEVELS OF FIBER INTAKE AND TYPES OF CORN HYBRID. Dorothy E. Wu, 3945 Lytham Court, Upper Arlington OH 43220-4848. ladie565@aol.com (Upper Arlington High School)

Good rumen function is necessary for dairy cows in order to obtain maximum milk production. Enough eating/ruminating activity, which is stimulated by the diet, is necessary to maintain the best milk production. The hypothesis is that more intake of forage by-products. Concentrates, which are high energy and low fiber feeds, provide the energy needed by the cows to maintain excellent milk production. Forages, which are high in fiber and low in energy, stimulate rumination and are needed to make up for the lowered pH of the rumen caused by high levels of concentrate. Ideally, diets should contain the minimum amount of forages necessary to maintain rumen function, while maximizing the energy intake to maintain the best milk production. The hypothesis is that more intake of forage neutral detergent fiber (NDF) and/or a type of corn hybrid differing in digestibility (brown corn silage) with lower FNDF (17%) spent significantly less time in eating than the other treatments.

Board 07 ROAD GRIME: A PLATINUM MINE? PHASE 2. Erin E. Sauer, 5185 Red Bird Ln., Winton Height OH 45911. dead_potassium07@yahoo.com (Ursuline Academy of Youngstown School)

Platinum is a slightly magnetic noble metal used extensively in industry. It plate the inside of automobile catalytic converters, and is thought to chip off over time, and be taken out with the exhaust and expelled onto roads. The purpose of this project was to find an inexpensive method to test for platinum, and to determine if platinum was present on heavily traveled roads. A method to measure pressure change as platinum catalyzes the decomposition of hydrogen peroxide was developed. Road dust from an area of 16.8 square meters traveled down an aluminum chute with magnets to collect magnetic material. This material was then placed into 20% hydrochloric acid to dissolve organic matter clung to the metallic material, and each of the samples (5 total) was then tested in duplicate with hydrogen peroxide using a CBL and pressure sensor. Later, strongly magnetic material was removed from the samples, they were heated to 68 degrees Celsius, and retested in duplicate using a refined procedure. Samples were then tested using ICP to determine presence of platinum and legitimacy of the initial testing. It was hypothesized that a road being used by more cars would result in more platinum being found on that road. The results from ICP testing show that samples taken from heavily traveled roads contain platinum in amounts ranging from 0.945 ppm to 0.864 ppm, which significantly correlates to the results given from pressure sensing tests.

Board 09 ISOLATION AND CHARACTERIZATION OF NITROGEN-FIXING BACTERIA. Tian Zhang, 1547 Conneaut Ave, Bowling Green OH 43402. tzhang85@aol.com (Bowling Green High School)

Nitrogen fixation is of fundamental importance in the biosphere. In nature, this occurs via the biological nitrogen fixation reaction. A small but diverse group of diazotrophic microorganisms is able to fix atmospheric nitrogen. The main goal of this study is to characterize diazotrophic microorganisms from aquatic samples isolated from ponds around Bowling Green State University. Wood County, Ohio. Water samples of about 5ml were collected from various locations and maintained for 7 days in darkness at room temperature. Nine single colonies, effective in N2 fixation, were isolated on Burk's nitrogen-free source. Nine single colonies, effective in N2 fixation, were isolated on Burk's nitrogen-free agar plates. As an initial identification process, the morphology of these isolated microorganisms was then investigated using scanning electron microscopy. Because all N2-fixing microorganisms have the enzyme system of nitrogenase encoded by the nifH gene, this DNA sequence has been examined. To do this, PCR amplification of corresponding DNA using highly conserved diazotrophic primers corresponding to the 5' (Primer 1: GATATCATGCGTCAATGCGCCATCTACGGC; and 3' (Primer 2: GGATCCTCAGACTTCTTCGGCGGTTTTGCCGACGATGG) ends of the nifH gene of Azotobacter vinelandii has been utilized. The products of this PCR amplification showed approximately 900 base pairs in size, which corresponds to the expected size of the nifH gene. These resulting segments are currently being subjected to partial sequence analysis (with the above-mentioned primers), to be used to identify the isolated diazotrophic microorganisms.

Board 10 THE EFFECTS OF CATEPILLAR DAMAGE, ULTRAVIOLET LIGHT, AND MECHANICAL WOUNDING ON PHYTOHORMONE-TREATED TOMATO PLANTS. Aaron L. Iverson, 2740 Buttermilk Hill Rd, Radnor OH 43066. iverson@bright.net (Buckeye Valley High School)

The effects of salicylic acid (SA) and jasmonic acid (JA) on the defensive (octadecanoid) pathway of tomato (Lycopersicon esculentum cv. Moxfield) grown with various stresses were studied. Seven physical treatments on the growth of tomato were tested along with the chemical treatments of SA, JA, and the control. The biological nitrogen fixation reaction. A small but diverse group of diazotrophic microorganisms from aerobic samples isolated from ponds around Bowling Green State University. Wood County, Ohio. Water samples of about 5ml were collected from various locations and maintained for 7 days in darkness at room temperature. Nine single colonies, effective in N2 fixation, were isolated on Burk's nitrogen-free source. Nine single colonies, effective in N2 fixation, were isolated on Burk's nitrogen-free agar plates. As an initial identification process, the morphology of these isolated microorganisms was then investigated using scanning electron microscopy. Because all N2-fixing microorganisms have the enzyme system of nitrogenase encoded by the nifH gene, this DNA sequence has been examined. To do this, PCR amplification of corresponding DNA using highly conserved diazotrophic primers corresponding to the 5' (Primer 1: GATATCATGCGTCAATGCGCCATCTACGGC; and 3' (Primer 2: GGATCCTCAGACTTCTTCGGCGGTTTTGCCGACGATGG) ends of the nifH gene of Azotobacter vinelandii has been utilized. The products of this PCR amplification showed approximately 900 base pairs in size, which corresponds to the expected size of the nifH gene. These resulting segments are currently being subjected to partial sequence analysis (with the above-mentioned primers), to be used to identify the isolated diazotrophic microorganisms.
Board 11  KNOWLEDGE OF AGRICULTURE AND COMMUNICATIONS OF
PETTISVILLE AND ARCHBOLD HIGH SCHOOL SENIORS AND AGRICULTURE EDUCATION
STUDENTS. John J. Torres, 272 Main St, PO Box 54, Pettisville OH 43553. torres4@gateway.net (Pettisville High School)

The actions of communicating the research and the benefits of the agricultural industry is important to the world due to the large influence the industry has on our global economy and environmental issues. The issue is extremely important for youth to fully understand the structure of the agricultural industry. Students at Pettisville and Archbold High Schools in Fulton County Ohio were surveyed concerning their knowledge on agricultural communications. It was hypothesized that 50% or more of students enrolled in agricultural education would know the fundamentals in the areas of communications and agriculture, and less than 50% of seniors not enrolled in Agriculture Education would understand the fundamentals of communications and agriculture.

A Set of surveys was administered to a combined total of 97 students in agriculture classes and 55 seniors at both schools. There were two different surveys administered to seniors and Ag Ed students. Those involved in both educational studies were recorded once. Students responded to questions asked and listed and ranked items on a written survey. Answers were compared to an accepted set of responses that clearly revealed the student’s knowledge of the material reviewed. The results are as follows: Ag Ed: Pettisville 68.5%; knowledge retained, Archbold 55.9%; knowledge retained; senior: Pettisville 74%; Archbold 59%; Comparisons made using both surveys from all Ag Ed student’s and seniors combined: Pettisville 71.5%, Archbold 63%. The results indicated that the majority of those tested were knowledgeable for a life dealing with the constant global that the agriculture industry has with the Agricultural Industry.

Board 12  A COMPARISON OF LONG AND SHORT-TERM MEMORY IN SENIOR CITI-
ZENS AND HIGH SCHOOL STUDENTS. Kathryn A. Lawton, 2745 Wickfield Rd, Columbus OH 43221. Lawtonkar@gmail.com (Upper Arlington High School)

The popular myth that the memory of a senior citizen will significantly and automatically deteriorate with age is questionable. There are many senior citizens, such as John Glenn, who are still achieving tasks most younger people may never accomplish. This memory myth was tested using thirty-five high school students and thirty senior citizens to determine which group had a better short-term and/or long-term memory. It was hypothesized that high school subjects would have a significantly higher short-term and long-term average memory score than senior citizens. Each subject was asked to memorize factual information presented to him or her. They were then tested and asked to answer a questionnaire about other factors that may have influenced their score. This procedure tested both short-term memory. Re-administering the same test one week later tested long-term memory. 7-test results showed that there were no statistically significant differences between the average short-term and long-term memory scores of high school students and senior citizens. The t-test scores of 0.91 and 0.52, respectively, showed the short-term memory and long-term memory results were not significantly different. Other factors that may have affected these results were examined. Results from a Pearson Correlation analysis showed in some cases that blood pressure, stress, and education might have affected the average long-term memory score for senior citizens.

Board 13  THE EFFECTS OF NOISE ON THE OXYGEN CONSUMPTION OF HAM-
STERS. Kristin E. Heller, 1245 N. Washington St, Delphos OH 45833. lizzybeth_ki@hotmail.com (Delphos Jefferson High School)

It is proposed that noise pollution is a cause of stress, with the volume of sound and rate at which sounds are heard affecting the metabolism. A direct link between oxygen consumption and metabolism allows the measure of one to suggest the state of the other. The goal of this project is to establish that sounds stimulate the body. Six hamsters (Mesocricetus auratus) were used. Three were control, three were experimental. One hamster was placed in a sealed container and the amount of oxygen consumed estimated, based on the amount of carbon dioxide absorbed by soda lime that was also in the container. Effects of the rate at which sound pulsed and its decibel level, were examined in nineteen trials conducted on each of the six hamsters over a period of twenty-seven days. It is hypothesized that rapid and/or loud sounds increase the metabolic rate and soft, slow noises tend to reduce the metabolic rate. Data collected in the trials showed that an increase in both the rates at which sound is pulsing and its decibel level resulted in an increase in the metabolism of the test subject. Conversely, a lower sound level pulsed at a slower rate, could lower the metabolic rate. Proper uses of sound may modify the metabolism to provide physical benefits due to reduced stress.

Board 14  THE EFFECTS OF WATER TEMPERATURE ON TAGETES ERECTA (AFRI-
CAN MARIGOLDS). Elias J. Saliba, 8131 Conover Dr, Huber Heights OH 45424. USAAmericanHotmail.com (Carroll High School)

In a previous experiment it was shown that colder water significantly improves the growth of Tagetes erecta (Marigolds). Snapdragons evolved in the Mexican tropics and when SA blocks its production, JA cannot be produced, resulting in reduced defense.

In our ever-changing world there has always been the need for a quick, easy and environmentally safe method for plant growth. Unprocessed, dried tobacco leaves such as fruits, vegetables, eggshells, and coffee grounds provides a quick and inexpensive way to make and use compost. The ultimate goal of this project is to encourage the recycling of non-meat household table scraps in order to produce healthier and more prosperous plants not only with household gardens but also with urban farmers across the US as well. This method of composting is what I call Cool Composting. A standard mixture of non-meat household table scraps was blended in a Vita Mix blender with 1200cc: water which produced 1920cc: composting mixture. All of the plants were grown under the same conditions and treated separately with two different fertilizers, Miracle Cro and Cool Composting along with a control group for each. The initial data shows that the fertilizer treatment has been observed to possibly open a dormant metabolic pathway. This was observed by using Chromatography that was conducted at the University of Illinois, Chicago. The plants treated with Cool Composting produced more beans per plant, possessed a more developed root system, and upon testing plant samples, the Cool Composting plants contained lower levels of metabolites than those treated with Miracle Gro or the Control. Further studies will need to be conducted to identify these specific metabolic pathways and compounds that make the Cool Composting plant a major competitor with other types of composting and household fertilizers. Also, it is estimated that the cool composting process would eliminate 5,460 tons/year of household scraps or 27% of the food waste from the landfill. This projection is based on per household statistics and Cherokee Landfill statistics of Logan County.

Board 15  COOL COMPOSTING™: THE NATURAL FERTILIZER. Aaron M. Didich, 1312 Turner Rd, Bellefontaine OH 43311. tkklogan@gmail.com (Bellefontaine High School)

Previous research showed that a compound in tobacco inhibits corrosion of steel. Identification of such a compound could be commercially significant since many additives to paints and coatings are toxic to the environment. Earlier studies showed that when steel and water were combined, rust was visible on the steel and oxygen was consumed in the process. However, when steel and tobacco extract was combined, no rust was visible on the steel, but surprisingly more oxygen was consumed and the color of the solution turned dark brown. The purpose of this study is to identify a possible corrosion inhibitor in tobacco extract by using spectrophotometric methods. Shavings (each about 4.0 mm surface area) were cut from a cold-rolled steel rod (no coating oil). Tobacco extract was prepared using unprocessed, dried tobacco leaves, distilled water, and filtered before use. The four test solutions (300 mls each) consisted of water, steel plus water, tobacco extract, and steel plus tobacco extract. Dissolved oxygen (DO) was measured using a DO meter and probe (electrode method). To identify a corrosion-inhibiting compound, absorbance spectra of test solutions were compared from 190 to 820 nm using a diode array spectrophotometer (minimum of two trials each). Results suggest that a compound reacts at the solution/steel interface. The compound has an absorbance maximum in the 250 to 260 nm range, suggesting a cyclic structure. This is consistent with previous work concluding that a pyridine-like compound, possibly nicotine, may be the inhibitor.

Board 17  COMPARING THE DISTILLING RATES OF NAME BRAND AND GENERIC
PAIN RELIEVERS. Jennifer R. O’Malley, 585 Gamewell Dr, Miamisburg OH 45342. omalleyj@earthlink.net (Miamisburg High School)

This study was designed to help consumers gather some facts about pain relievers by seeing whether name brand or generic pain relievers dissolved faster, and which liquid, water, milk, acidified water (water mixed with hydrochloric acid to mimic the stomach environment), or Pepsi would help to dissolve the pills at the quickest rate. The hypotheses were that all name brand pills would dissolve at the same rate, and that all the pills would have a faster dissolution rate in Pepsi because Pepsi contains phosphoric and citric acids. Pills of each brand were placed into a 50 ml beaker filled with milk, water, sodified water, or Pepsi. They were stirred every twenty seconds for five minutes, and for ten minutes in another test. When this was completed, the contents of the beakers were poured and rinsed into coffee filters and weighed once dry. This was repeated until all the pills were tested, a total of 146 trials. The trials revealed that the name brand drugs, particularly Tylenol, dissolved the fastest, followed by Advil, Aleve, and their Walmart then Rite Aid generic brands. All of the pain relievers dissolved the quickest in acidified water, followed by water, milk, then Pepsi. In conclusion, for those who seek fast pain relief, Tylenol taken with water, which will be mixed with hydrochloric acid in the stomach, is the way to go.
Gravity is the force that holds everything down. If gravity is altered, humans sense it and were run from each location. The model used was built from polyethylene tubing for the rails, and gutter clips; wood for the supports; plywood, model aircraft wheels, legos, Pinewood Derby weights; piano wire, screws, and a TI-82 paired with a calculator based model.

The problem was, “how much does friction and air resistance affect the total energy of a model race car?”. The total energy at the start of the race was determined by weighing the car before and after the race. The energy lost due to friction and air resistance was calculated by comparing the initial and final weights. The results showed that friction and air resistance had a significant effect on the total energy of the model race car.

The goal of this research is to investigate two alternative methods of agriculture: hydroponics, the growing of plants without soil in a nutrient solution; and aeroponics, the growing of plants in air, pulse-misting the roots with nutrient solution. The purpose of the experiment was to determine how the systems compared as alternative methods of agriculture. It was hypothesized that aeroponics would be a viable method of agriculture, as other studies have shown similar germination rates and the aerodynamic system would cause faster growth rates. The aeroponic system was composed of a hydroponic system and an aeroponic system, each supporting fourteen chili pepper plants. Total nutrient content, chlorophyll content, height, biomass, and nutrient solution usage were compared between the systems. The hydroponic plants grew on average 23.3% taller and had an 8.9% higher average chlorophyll content than the aeroponic plants. The aeroponic system used 50% less nutrient solution, had a 31.6% higher average plant biomass, and an 11.2% higher total biomass. The aeroponic plants had much slower start times compared to the hydroponic plants. Due to the design of the aeroponic system, the roots had a difficult time growing down into the misting plenum. Both systems promoted the growth of healthy plants; however, the aeroponic plants were observed to exhibit an uneven distribution of chlorophyll based on leaf color. This is a characteristic symptom of manganese toxicity, further supported by testing that showed an increased level of manganese in the leaves. This experiment validated aeroponics as a viable alternative method of agriculture.

The purpose of this experiment was to test popular herbs against antibiotics that have been in use for many years. Recently, antibiotics are starting to be resistant to bacteria. I wanted to see if the use of herbs could have the same antibacterial effect. Specifically, I chose Echinacea and garlic. Garlic was used in ancient times and reportedly helped the cardiovascular system. Echinacea is a wildflower that reportedly controls the symptoms of the cold and the flu. The antibiotics, Tetracycline and Penicillin, were chosen because they both can cure many diseases. Tetracycline can cure Lyme Disease, acne, and Chlamydia. The hypothesis was that antibiotics will work better than the herbal medicines. The materials used were Tetracycline, Penicillin, garlic, Echinacea, an incubator, nutrient agar, agar dishes, forceps, sterile swabs, and control disks. A sterile swab was rolled over my tongue and rubbed on the pre-illuated agar dishes. Antibiotics and herbs were applied to disks that were placed on each agar plate. I also had a disk with bacteria, but without antibiotics or herbs. Labeled dishes were incubated for forty-eight hours at 80 degrees F. The results supported my hypothesis. Penicillin controlled the growth of bacteria best garlic was more effective than Tetracycline, and Echinacea was the least effective at controlling the growth of bacteria.

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The effects of light on paint were studied. The hypothesis was that certain paints, when exposed to certain lights, would start to deteriorate. To test the hypothesis, five commercial, three acrylic, three water-color, two oil paints, and pink construction paper were exposed to constant, direct light. The light sources were different types of incandescent and fluorescent lights. In the primary experiment, the samples were placed into a light box containing four chambers. Three chambers contained different types of fluorescent tubes used for visible lighting. The fourth chamber contained a black light fluorescent tube producing a much higher amount of ultraviolet rays than the others. A portion of each sample was set aside to be protected from all sources of light as a control for comparison at the conclusion of the experiment. The samples were then exposed to one thousand hours of continuous direct light. The results varied depending on the type of paint tested. In the time available, there was no noticeable deterioration of any of the commercial, acrylic, or oil paints from any light source. The water-color tests proved the hypothesis to be correct. The water-colors not only deteriorated, but different colors reacted differently to the same light source, and different light sources caused different rates of deterioration to the water-colors. The conclusions were that the more ultraviolet rays produced by a given light source, the faster paint will deteriorate, and the more pigment in the paint, the more it resist fading.

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A-24. The Ohio Journal of Science Vol. 100(1)
9:30  THE WETLAND-RESERVOIR-SUBIRIGRATION SYSTEMS (WRSIS)  
fauzey@osu.edu  
In an effort to reduce the delivery of nonpoint source pollutants from agricultural lands to surface waters, the WRSIS concept was developed. This innovative concept includes the capture, treatment, and reuse of surface and subsurface drainage waters and involves constructed wetlands, storage reservoirs, and subirrigation. Funding was obtained from USEPA, Great Lakes National Program Office to construct three systems, one each in Fulton, Defiance and Van Wert counties. These systems were constructed in 1995-1996 and have been in operation during four cropping seasons. The sites range from 27 to 60 acres in size. Additional funding was obtained to monitor the hydrologic and water quality performance of the systems, and these sensors and samplers have recently been installed. As designed, the systems capture and retain virtually 100 percent of the drainage and runoff water thereby essentially eliminating offsite delivery of water and sediment. The constructed wetlands were allowed to reestablish naturally, and macroinvertebrate and vegetation surveys show that wildlife habitat and wetland vegetation features have developed. Corn and soybean yields are 15 to 40 percent higher for the subirrigated areas compared to adjacent areas with similar agronomic management but no subirrigation. Data collection will continue for 3 to 5 more years, but initial results demonstrate that WRSIS systems have potential to control non-point source pollution from cropland.

9:45  NITROGEN CYCLING IN A WRSIS AGROECOSYSTEM.  
D'Eye-Marie N. Jie, Larry C. Brown, and Norman R. Fauzy, Ohio State University, Environmental Science Graduate Program, Dept. of Food, Agricultural and Biological Engineering, 590 Woody Hayes Dr, Columbus OH 43210.  
jie1@osu.edu  
A Wetland-Reservoir-Subirrigation System (WRSIS) is an agroecosystem that has the potential to improve downstream surface water quality by minimizing nutrient loads to surface water bodies. WRSIS can also provide a reliable source of subirrigation water to cropland. Minimal nutrient discharge to streams can be achieved by recycling drainage waters and surface runoff from a cropland (28 ha), through a constructed wetland (0.2 ha) and a reservoir (0.2 ha) for subirrigation during the growing season. System performance is evaluated by studying the transport and storage of nitrogen (N) in and out of each WRSIS component. An extensive monitoring system, implemented at the Defiance County, Ohio site in June 1999 has the capability of sampling runoff and subsurface drainage at eleven key locations. Initial findings revealed that for February through May, 1999 (grain samples), the average nitrates N (NO$_3$-N) and ammonium N (NH$_4$-N) concentration in runoff entering the wetland was 0.83 and 0.15 mg/l, respectively. Over the same period, the average concentration of NO$_3$-N and NH$_4$-N in the subsurface drainage entering the wetland was 11.39 and 0.00 mg/l, respectively. For June through August, 1999 (automated sampling), the average NO$_3$-N and NH$_4$-N concentration in runoff entering the wetland was each 0.03 mg/l, and in the subsurface drainage entering the wetland was 0.94 and 0.01 mg/l. Additional data will help evaluate the reduction in N loads that were previously 'lost' to nearby streams. Further studies will also identify wetland processes and water management practices that influence N fate and transport in these novel agroecosystems.
condition received an average test score of 95.5%. Therefore, the results of this study show very little difference in performance between the two conditions. Students in the experimental condition received an average test score of 94.4%, while students in the control condition received a score of 93.6%. The researchers concluded that playing a relaxation tape could be an effective way to reduce test anxiety and improve test performance. It was hypothesized that playing a relaxation tape during the test would result in lower heart rate increases during the test. The results of this study were consistent with this hypothesis, as the experimental group exhibited lower heart rate increases during the test.

The findings of this study were consistent with previous research, which has shown that relaxation techniques can be effective in reducing test anxiety and improving test performance. The researchers acknowledged the limitations of their study, including the small sample size and the lack of a control group. They suggested that future research should be conducted to determine the effectiveness of relaxation tapes in reducing test anxiety and improving test performance in a more diverse and representative sample of students. The researchers also recommended that relaxation techniques be incorporated into the test-taking strategy of students to improve their test performance.
three treatment groups (N=10 per group) were injected with isotonic saline solution, 2mg/kg, or 4mg/kg body weight of para-chloroamphetamine between days 7-18 of the gestational period. The number of mouse pups in each group was 44, 50, and 47 respectively. Mouse pups were tested for differences in birth weight, offspring orientation (with and without bedding) on days 11 and 13 for lomocotor movements in a T-maze on days 15, 20, and 25. Multiple comparisons were done between the three groups and within each group. ANOVA showed significant differences (p<0.02-0.04) in the mean and the median for the mean individual weights of the mouse pups (p<0.00); motor movement without bedding on postnatal days 11 and 13 (p<0.02-0.04); and for various locomotor movements in the T-maze on days 15, 20, and 25 (p<0.00-0.04). Significant differences were found between days 15, 20, and 25 when comparing the locomotor movements within each individual treatment group (p=0.00-0.01), with the least locomotor movement observed on day 15. In general, the results showed that pups from mothers injected with 4mg/kg body weight of para-chloroamphetamine showed the greatest differences in birth weight by being heaviest, in offspring orientation by being most disoriented, and in locomotor activity by moving the least.

10:15 THE EXTRAORDINARY LIFE OF AN EARLY CLEVELAND SCIENTIST: HAMILTON LANPHERE SMITH. Joy M. Kiser, Cleveland Museum of Natural History, Cleveland OH 44106. jkiser@cmnh.org

Hamilton L. Smith was a Yale University graduate who taught chemistry in the Cleveland in 1845 and became a member of Jared Potter Kirkland's Arkites. He was curator of specimens that formed the foundation of the collections in the Cleveland Museum of Natural History and later became a college teacher and author of textbooks, devised a system for describing diatoms and desmids, and invented the tintype. The goal of the research was to determine whether Chinese's, educators, and students of history and science should revere his work and consider him to be a significant early American scientist? Smith's articles, textbooks, tintypes, and personal correspondence were examined and news clippings, personal letters, articles, and morae grammatical glosses with references to Smith and his work, written by his family and associates. The data will show that H.L. Smith's work served as an essential bridge to later developments in photography, astronomy, and microscopy.

Education
02:00PM SATURDAY, APRIL 1, 2000
MEYER HALL ROOM 122
KENNETH A. LASOTA - PRESIDING

2:00 A SIMPLE CLASSROOM MANAGEMENT TECHNIQUE TO HELP GET STUDENTS SEATED AND LECTURES STARTED ON TIME. Kenneth A. LaSota, Robert Morris College, Dept of Natural Sciences, 600 Fifth Ave, Pittsburgh PA 15219-3099. lasota@robert-morris.edu.

Students that arrive late for class present a problem: Do you start class with students "missing in action" or do you wait for late arrivals, consuming lecture time in the process? How do you prevent late arrivals from disrupting class as they move to their seats? Reviewed here is a simple method I have used for ten years that addresses late arrivals. Students that arrive late for class present a problem: Do you start class with students "missing in action" or do you wait for late arrivals, consuming lecture time in the process? How do you prevent late arrivals from disrupting class as they move to their seats? Reviewed here is a simple method I have used for ten years that addresses late arrivals.

DENTS SEATED AND LECTURES STARTED ON TIME. Kenneth A. LaSota, Robert Morris College, Dept of Natural Sciences, 600 Fifth Ave, Pittsburgh PA 15219-3099. lasota@robert-morris.edu.

An outgrowth of the Clinton Administration's "AmericaNeeds Initiative," public school reading test results along with related literature and the notion of university-school collaborative partnerships provide the basis for this research project. Honor students from across the various academic disciplines received volunteer training and served as trained volunteers, reading to and with kindergarten through third graders in five different sites. Volunteer training provided focused on learning strategies, tutoring skills and pre- and post test administration. In addition to reading tutor training, each honor student reading volunteer was provided with both a university and site liaison for purposes of mentoring and support. Honor student volunteer as well as participating kindergarten through third grade students are provided. Pre- and post-test administration data were collected using story retelling quantitative analysis scores to determine the reading comprehension of pre-kindergarten through third graders' after twenty-five hours of reading volunteer service. Scores were based on the child's ability to recall parts of a story including story structure, plot, sequence, characters, theme, and resolution. Descriptive statistics (frequency distributions, means, standard deviations) and univariate inferential statistics (t-tests, correlation analysis, and chi square) were used to analyze data assessing the impact of volunteer intervention. Because of the pre-experimental nature of this research, however, no control group was used. Study results indicate that this Pre-K Reading Initiative, using university honor students as reading volunteers, proved to be a positive, meaningful, and successful experience on the part of the participating pre-kindergarten through third graders and university honor student volunteers, as well as individual site liaisons. In nearly every case, post-test scores demonstrate improvement over those found in the pre-test situation.

3:00 FACULTY DEVELOPMENT WITHIN THE CONSTRAINTS OF ACCREDITATION: PILOT STUDY. Alan D. Smith, Robert Morris College, Dept. of Quantitative Sciences, Pittsburgh PA 15219-3099. smitha@robert-morris.edu.

Higher education has been the subject of increasing criticism in recent years for a variety of reasons. The usual response to this criticism is to start quality programs imposed by the college or an external entity. Accreditation is such an external entity and the mechanism of choice for many schools wishing to improve teaching and research. The purpose of this paper is to discuss the various models for faculty development that are being used or perceived through the viewpoints of AACS B standards. The results of a pilot study of a questionnaire of primarily faculty at a recent teaching economics conference for practicing and academic professional was used to record data on this topic. A questionnaire was established based on current literature on faculty development and motivational theories. The results demonstrated that faculty are very concerned on the aspects of such activity and that there is a need to develop such a program at their institution. However, the motivations for such activity may be fundamentally different than those of the administration. AACS B cites that there must be a convictions-driven or internal motivational approach to faculty development. Many faculty feel that faculty development tends to focus on championing initiatives that only target appropriate scholarly outlets, such as scholarly/professional meetings and publications in order to demonstrate or justify
A DISCOVERY LESSON IN EARTH SCIENCE FOR ELEMENTARY STUDENTS. Kenton E. Strickland, Wright State University Lake Campus, 7600 St. Rt. 703, Celina OH 45822-2952. kenton.strickland@wright.edu

An activity created for an upper elementary science and math day for gifted students evolved into a comprehensive discovery lesson in earth science. The activity involves a number of the primary and integrated process skills. Students are given a collection of fossils and are asked to make a table of measurements of length and width for each specimen in mm. They are then told to plot these measurements on a graph. Most students plot points, but some will make histograms. Graphs often exhibit bimodal distribution, clumping, or large variations. Students are then asked to analyze the graph. Student interpretations include different species, ontogeny, sexual dimorphism, or environmental factors. This simple exercise employs the primary process skills of observing, measuring, communicating, and recognizing number relations. Integrated process skills of formulating hypotheses and interpreting data are also utilized.

ENGINEERING

03:45PM SATURDAY, APRIL 1, 2000
Meyer Hall Room 122
Yung-Tse Hung - Presiding

4:30
OLIVE MILL WASTEWATER TREATMENT USING ANAEROBIC DIGESTION FOLLOWED BY OXIDATION PRETREATMENT. Yung-Tse Hung*, Garnel Olibris*, Howard H. Lo**, Cleveland State University, Civil & Environmental Engineering Dept, **Dept of Biological, Geological and Environmental Sciences, Cleveland OH 44115-2440. Yhung@csava.csuchio.edu

Olive mill wastewaters (OMW) are produced from olive oil manufacture. Usually these effluents are disposed of into evaporation ponds or through public sewers. The disposal of these wastewaters may cause serious environmental problem due to the high NaCl and phenol concentration in the wastewaters. This paper examines the applications of a single anaerobic digestor process of OMW. In a process to remove COD (chemical oxygen demand) obtained and to produce methane. In an improved process, an ozonation pretreatment is performed to investigate the biodegradability of OMW by removing the phenolic inhibitors to enhance anaerobic digestion. The main chemical characteristics of OMW were pH 4.84, BOD (biochemical oxygen demand); 52 g/l, COD 112 g/l, VS (volatile solids) 9 g/l, and DVS (dissolved volatile solids) 4.65 g/l. In the single stage anaerobic process KAPQ and uptake were used as nutrients in order to maintain satisfactory microbial activity (COD/N:P = 250:3:1). In the ozonation pretreatment process, orthophosphoric acid and sodium hydroxide were added to adjust the pH. In the anaerobic step, COD removal efficiencies up to 60% were obtained and methane production reached 194 ml/g COD removed. In the second step up to 76% COD removal were reached. The methane production reached 288 ml/g COD removed. The results show that OMW can be effectively treated by an anaerobic digestor process. The pretreatment of the OMW will remove phenolic compounds but the main causes of the toxicity to methanogenic bacteria of these waters.

4:45
POTATO WASTEWATER TREATMENT USING ANAEROBIC, OXIDIC, AND ANAEROBIC REACTORS. Yung-Tse Hung*, Chatchawal Lerssupochawanich, Howard H. Lo, Cleveland State University, Civil & Environmental Engineering Dept, **Dept of Biological, Geological and Environmental Sciences, Cleveland OH 44115-2440. Yhung@csava.csuchio.edu

The objective of this study was to study the effect of TOC (total organic carbon), N2H, and phenol concentration on COD removal of potato wastewaters. Experiments were conducted using anaerobic, oxidic and anerobic reactors with hydraulic detention time of 6, 12, and 6 hours, respectively. Experimental conditions included 3 different COD concentrations: 100, 550 and 1,000 mg/l, and 3 different phenol concentrations: 10, 55 and 100 mg/l and 3 different N2H concentrations: 10, 55 and 100 mg/l. Results indicated that percent TOC removal was between 52-77% and percent N2H removal was between 20-40%. TOC of effluent concentration was between 23-477 mg/l and NH4 of effluent concentration was between 8- 144 mg/l. TOC was mainly removed in the aerobic reactor and the percent removal was between 2-29%. The maximum TOC and N2H removal occurred when TOC was 100 mg/l and N2H was 10 mg/l. The result of this study showed that percent TOC removal decreased when TOC, phenol and N2H concentration increased. The initial concentration of ammonia had an effect on percent ammonia removal. When ammonia influent concentration increased, the ammonia removal in both anerobic and oxidic reactors decreased.

EARTH SCIENCE I

09:00AM SATURDAY, APRIL 1, 2000
Meyer Hall Room 124
Mark J Camp - Presiding

4:15
TREATMENT OF METAL PRODUCTS AND FINISHING INDUSTRY WASTE BY ELECTROFLATION PROCESS. Yung-Tse Hung*, Mario G. Cora*, Howard H. Lo*, Cleveland State University, Civil and Environmental Engineering Dept, **Dept of Biological, Geological and Environmental Sciences, Cleveland OH 44115-2440. Yhung@csava.csuchio.edu

This paper presents the development and optimization of an electroflotation unit for the removal of oil, heavy metals and organic compounds from oil-water emulsions containing 3.5% NaCl by weight. The objective was to examine the application of the mentioned technology within industrial wastewaters. Essential parameters in the electroflotation unit were hydraulic detention time, removal efficiency, and power consumption. The technique presents two main reaction schemes: adsorption and charge neutralization followed by flocculation. The electroflotation unit consisted of an electrolytic cell with an aluminum anode and a stainless steel cathode. The unit was capable of treating 1 m³/hr oily wastewater in a continuous process. The unit achieved 65% oil separation at optimum conditions: 75% in the presence of NaCl (3.5% solution); and 92% with the presence of NaCl and at optimum concentration of flocculatent agent. Electrical consumption varied from 0.5 to 10.6 kW/lm³. An empirical equation that relates the oil removal rates with the energy consumption was obtained with optimal operational current between 0.3 to 1.2 amperes. The electroflotation unit proved to be an effective treatment method for industrial oily wastewater containing high NaCl concentration. Other treatment method such as chemical treatment will be more costly due to high chemical requirement.

4:30
A DISCOVERY LESSON IN EARTH SCIENCE FOR ELEMENTARY STUDENTS. Kenton E. Strickland, Wright State University Lake Campus, 7600 St. Rt. 703, Celina OH 45822-2952. kenton.strickland@wright.edu

An activity created for an upper elementary science and math day for gifted students evolved into a comprehensive discovery lesson in earth science. The activity involves a number of the primary and integrated process skills. Students are given a collection of fossils and are asked to make a table of measurements of length and width for each specimen in mm. They are then told to plot these measurements on a graph. Most students plot points, but some will make histograms. Graphs often exhibit bimodal distribution, clumping, or large variations. Students are then asked to analyze the graph. Student interpretations include different species, ontogeny, sexual dimorphism, or environmental factors. This simple exercise employs the primary process skills of observing, measuring, communicating, and recognizing number relations. Integrated process skills of formulating hypotheses and interpreting data are also utilized.
former employees, who might provide oral histories, are fast disappearing. A knowledge of local history is the best key to determining stone sources. Sandusky was the largest supplier of Columbus limestone in northwestern Ohio; it was marketed as Sandusky bluestone. The city was a lakeport and connected to Toledo by railroad by 1853, providing transportation for large volumes of stone. Quarries at Marietta and Logan supplied Columbus Limestone hauled a few miles to a railroad station or shipped by boat. Reportedly Marblehead stone was used along the Miami and Erie canal across northwestern Ohio. The Dundee limestone came from quarries at Whitehouse chartered when the Wabash Railroad opened in 1855. A direct link was opened to Toledo where the railroad used the stone for foundations and docks at its terminal. During the Depression these railroad structures suffered salvage and subsequent disposal of the stone is at the Jerseytown quarry, at the Waverly quarry by WPA tradesmen. The Zoo is the ultimate example of mixing of these stones since Columbus Limestone was also recycled from the adjacent Miami and Erie canal. Due to volume produced, marketing, and superior transportation of the Sandusky firms, Columbus Limestone was more widely used than the Dundee.

9:15 ABANDONED DEEP COAL MINE WEB SITE, Ann G. Harris, Youngstown State University, Dept of Geology, One University Plaza, Youngstown, OH 44555-0001. agharris@cs.ysu.edu

For the last twenty plus years there has been a problem of abandoned deep coal mines in Ohio that have been either caving in or creating problems for new and old construction. For the average person there was no central location to obtain available information on these mines. Location maps and mine maps have been available from the Ohio Geological Survey since 1929 but not much detail of information on the individual mines. The web site (http://www.as.ysu.edu/geoedgy) of the Youngstown State University Geology Department is beginning to address this problem. Three counties are now available; they are Trumbull, Mahoning and Columbiana Counties. Additional counties will be added. To use the web site the individual first selects the desired county from a master map that shows all three counties and the general location of the mines. Next the township map is pulled up which gives the location and name of all the located mines in that township. Click onto the mine name and a cata sheet will appear. If there is a mine map available it will be indicated and it will be possible to view a copy of a scanned mine map. At the present time information on the unlocated mines has not been included. For additional or more detailed information contact Ann G. Harris of the Youngstown State University Geology Department.

9:30 WATER, GEOLOGY, AND MULTIMEDIA EDUCATION: A CD-ROM PROGRAM, Elizabeth A. Barnett, Garry D. McKenzie, and Frank W. Schwartz, Ohio State University, Dept of Geological Sciences, Columbus Ohio 43210-1398. McK+@osu.edu

The purpose of this project is to design a multimedia educational tool for introducing undergraduates and high school students to basic concepts in hydrogeology, with a focus on geology and hydrology in Ohio. Creation of a CD-ROM product and a proposed web-based version involves research, collection of materials, writing, editing, testing, production, and distribution. Rapid changes in computer software and the shift toward web-based education. Increasing awareness of groundwater and surface water issues among students in high schools and introductory geology courses can promote interest in the geological sciences in Ohio universities and colleges, and help to create an informed public, more capable of understanding water-related issues.

9:45 A CLASSIFICATION OF DIGITAL GEO-REFERENCED DATA, Robert L. Vertrees. Ohio State University, School of Natural Resources, 210 Kottman Hall, 2021 Coffey Rd, Columbus OH 43210-1085. Vertrees.1@osu.edu

The organization for the Data Sources and Contacts Task Force (DS&CTF) of the Ohio Geographically Referenced Information Program, a State-of-Ohio agency that further the development, coordination, and application of digital geo-referenced data. The DS&CTF is: (1) inventing data sets and holdings applicable to Ohio of public- and private-sector organizations, and (2) gathering metadata (data about data sets) into an automated clearinghouse. The author developed the classification: (1) to categorize data sets (a type of data for which at least some metadata have been developed); (2) to study patterns and relationships of data for which metadata have not yet been developed but that are included in holdings; and (3) to identify where gaps exist in the availability of data. This 11-category scheme includes the following sequence of categories: (1) two categories (about geodetic control and base maps) pertinent to the functional needs of developing a data base; (2) two categories (that include data about topics such as elevation and geographic names) do not fit into subsequent categories but can be associated with topologically related features of a base map; (3) two categories are about land use/land cover and land ownership; (4) three categories primarily pertain to data about other cultural, socio-economic, and demographic aspects of society, and (5) two categories primarily pertain to natural resources and the environment. Individual features of some complex maps are mentioned along with the parent map and are also placed into other appropriate categories. An up-to-date synopsis is given of the extent to which the DS&CTF has used the classification to identify data patterns and gaps. Some potential applications of the classification beyond the DS&CTF are also discussed.

10:15 WEST VIRGINIA RECORD 24-HOUR SNOWFALL AT FLAT TOP, 27-28 JANUARY 1998. Thomas W. Schmidlin, Kent State University, Dept of Geography, Kent OH 44242. tschmidl@kent.edu
A storm on 27-28 January 1998 gave a reported 35.0 inches (88.9 cm) of snow in 24 hours at Flat Top, West Virginia, exceeding the previous state record 24-hour snowfall of 34 inches at Bayard on 27-28 April 1928. The objective of this research is to place the event in a meteorological and climatic perspective and assess the validity of the reported record. Sources included government data, news accounts, and a site visit. The strong coastal storm caused excessive snowfall in the higher elevations of the central Appalachians, widespread disruptions to travel and electric power, and damage to property and trees. Flat Top is an official cooperative observing site with equipment supplied and maintained by the National Weather Service (NWS). A NWS employee made the estimate of 35 inches in 24 hours based on a measurement of 30 inches in the first 21 hours of the storm and 8 inches in the next 7 hours. The 35 inches of snow in 24 hours at Flat Top is discussed as a possible new 24-hour snowfall record for West Virginia.

10:30 SPATIAL CONCENTRATIONS OF POPULATIONS AND THE ENERGY BASIS FOR ECONOMIC GROWTH. Richard W. Janson, The Janson Industries 1200 Garfield Ave. S.W., Canton OH 44706, janson01@aol.com

Five great regions of earth’s land surface have concentrations of population that are remarkable. Each of these great regions has an area extension that exceeds 550,000 square miles. The commonalities among nations with massive population are one object of the inquiry. Several approaches were used to identify some of the necessary independent variables required to explain the phenomenon. One among the explanatory variables is the climate. The 20 largest (population) megacities were studied to determine the association with climate. Also several pairs of nations with large populations were compared on the basis of per capita consumption of primary energy inputs and per capita gross domestic product. This method was used to establish the relative wealth real income of the nations. Several nations with huge populations located outside of favorable climate regions were used in the comparison to emphasize the low per capita real incomes and the difficulty of achieving satisfactory economic growth trajectories. There is a clear association between regions of massive population and climate, providing there is a hinterland of moderate gradients and cultivable soil. Per capita real income of these great regions vary widely and is primarily a function of per capita consumption of energy inputs.

10:45 ENERGY POLICY IMPLICATIONS COMPARING RESULTS USING LEAST SQUARES METHODOLOGY AND NEURAL NET METHODOLOGY. Richard W. Janson and Lata B. Krishna, The Janson Industries, 1200 Garfield Ave. S.W., Canton OH 44706 and University of Akron, janson01@acm.org
Seven scenarios of profound economic consequence are subjected to analysis. Implications of legislative and/or regulatory decisions to subsidize coal usage, or alternatively, to tax coal usage by power plants or to expand nuclear power production, or to eliminate nuclear plants are typical of the scenario assumptions. Implications using a least squares predictive equation are compared to implications using a neural net that was computed and published earlier. The data used in each case is the same. Input data consist of primary consumption of coal, natural gas, petroleum, nuclear, and hydro energy inputs. Twelve outputs track the consumption of coal, gas, petroleum, and electricity among three using sectors—residential and commercial, industrial, and transportation. The scenarios also include assumptions such as the expansion of energy usage over time, and the presump- tion that U.S. population will be 500 million by year 2050. The importance of understanding policy implications is underlined by two realizations. The standard of living of every single American is based on the consumption of 1,000,000 Btu per day, more or less, measured as primary energy inputs (largely fuel inputs). Also, the two most populous nations in the world are rapidly industrializing. The results of both methodologies are consistent and therefore the implications are the same. The advantage of using both methodologies is to confirm results, especially in turbulent waters of macro economics with very significant policy implications.
Earth Science II
01:30PM Saturday, April 1, 2000
Meyer Hall Room 124
C. Scott Brockman - Presiding
1:30 Division Business Meeting

2:00 LATE PRECAMBRIAN EVENTS ON EARTH: POSSIBLE LUNAR INVOlVEMENT. Robert J. Malcuit, Dept of Geology-Geography, and Ronald R. Winters, Denison University, Dept of Physics-Astronomy, Granville OH 43023. malcuit@denison.edu
The Late Precambrian appears to be a critical time in the history of the planet. There are two major horizons of glacial deposits in the more complete sequences and each of the glacial sequences is capped by a significant thickness ofstromatolitic carbonates. These features have been interpreted by many researchers as recording alternating "snowhouse" and "greenhouse" episodes in a low paleolatitude setting. Many of the glacial-carbonate sequences are several hundred meters thick and are thought to be rift basin fills. Another noteworthy feature of Late Precambrian sequences is the association of tidally influenced sediments including significant thicknesses of tidal rhythmites. The Late Precambrian also appears to be a critical time in the history of the lunar orbit. Peele and Cassen (1978 Icarus, 24: p 245) identified an orbital resonance state between Jupiter's orbit and the lunar orbit when the lunar orbit is at 53.4 earth radii. They state that if the resonance is stable, then there could be "profound" effects on both the earth and moon. We have done some 4-body (sun, earth, moon, planet) numerical simulations (fourth-order Runge-Kutta integration procedure) on the effects of this resonance. In the short (100-year) runs that we have done on both circular and elliptical lunar orbits with semimajor axes between 50.0 and 53.4 earth radii, we have found a notable increase in orbital eccentricity. In general, a geologically short-lived excursion in lunar orbit eccentricity could explain the abundance of tidally influenced sediments of that time and the enhanced rock tides could have an ancillary influence on the development of continental rift zones.

2:15 OF ROCKS AND ECONOMICS: THE GEOLOGY OF THE MARION, OHIO, 30 X 60 MINUTE QUADRANGLE. Douglas L. Shrake, ODN Division of Geologic Survey, 4363 Fountain Square Dr, Columbus OH 43224-1362. doug.shrake@dnr.state.oh.us
A cooperative effort between the Ohio Division of Geologic Survey and the U.S. Geological Survey producing the 1997 regional geologic map of the Marion County, Ohio 30 x 60 minute quadrangle (scale 1:100,000). Comparing the 1997 map to the same area on the 1920 bedrock-geology map of Ohio shows significant differences. These differences result from analyses of field observations, measured stratigraphic sections, water-well drillers logs, and geophysical logs and descriptions from water and oil and gas wells. The Ohio Geological Survey cored and geophysically logged two sites, one near Ada and the other near Bucyrus, to determine the stratigraphy of the area. These data facilitated the correlation between geophysically logged water or oil and gas wells. Drafting the geologic contacts at a scale of 1:24,000 enhanced the resolution of structural features. Structural features present include faults, the Fiddyach, and a portion of the Appalachian Basin. A high degree of correlation exists between these structural features and known oil and gas fields. The dominant trend of these fields is SVI-NE; however, there appears to be a secondary SE-NW trend; perhaps future exploration will determine if there are additional SE-NW fields. Fossiliferous production and mining operations in the map area produce dolostone, limestone, clay, and sand and gravel. Although not present in economic quantities, sulfide-based minerals occur in the map area.

2:30 SURFACE MINE SPOILS: WEATHERING RATES AND LANDUSE CAPABILITIES. James R. Bauder, 1061 Armistice Avenue NW, Canton OH 44718. james.bauder@worldnet.att.net
For nearly forty years as a soil scientist and geologist, numerous observations and experiences with surface mine spoils have revealed a wide range of weathering profiles and potential land uses for differing surface mine spoils. The evolution of perceptions concerning surface mine spoils range from early expressions that surface mine spoils were basically wastelands to the present reappraisal of prime agricultural soils by replacing each horizon in sequence. Soil development within the various spoils is the result of the highly variable rates of weathering. The rates of weathering are the result of differing soil forming processes. Effective hydraulic conductivity of the spoil is apparently the most important factor in Northeast Ohio. The wide range of soil formation rates within the spoils have resulted in numerous weathering profiles that have varying capabilities for differing land uses. The spoils with the widest range of suitable land use capabilities are the older "unclaimed" spoils; while spoils with more recent reclamation procedures, result in a narrower range of capabilities for efficient land uses.

2:45 INTERPRETATIONS OF THE GEOCHEMISTRY OF AN ACID-CONTAMINATED STREAM IN CENTRAL OHIO. Linda M. Centeno and Gunter Faure, Ohio State University, 170 Mendenhall Laboratory, 125 South Oval Mall, Columbus OH 43210. centeno.6@osu.edu
Abandoned and reclaimed coal mining areas over 30 years old still present problems of high acidity and metal contaminants in stream water. This is a potential health hazard for humans and animals who drink this water. The site of the present study is Lexington Creek in Perry County, Ohio. Lexington Creek is a tributary of Rush Creek, which flows into the Scioto River. Chemical analysis of the water and the suspended sediment were interpreted to determine how the sediment load and metal concentrations vary downstream. The results indicate the presence of three components: acid mine drainage (AMD), groundwater, and meteoric water. The abundances of AMD along the course of Lexington Creek, determined from the triangle of mixing, range from less than 10% at the head of the creek to more than 25% at its mouth. The abundance of the groundwater component increased downstream and reached about 65% at the confluence with Rush Creek. The pH of the water in this drainage basin ranges from 2.6 to 5.2. In addition, the suspended sediment consisting primarily of ferric hydroxide reaches a concentration of 162 mg/L. This component's cation at low pH and cations at high pH, thereby altering the chemical composition of the water. Nevertheless, our data show that Lexington Creek is impacted by AMD several decades after strip mining has ceased.

3:00 A RE-ANALYSIS OF USGS REPORT 95-4194 CONCERNING THE GROUND WATER AVAILABILITY IN GEauga COUNTY. George W. Collins ll, Case Western Reserve University, Dept of Astronomy, 10000 Euclid Ave, Cleveland OH 44106-7215. Collins@ccas.owu.edu
Jaggi and Lesney (1995) conducted in the USGS REPORT 95-4194 that while 70% of water level in the wells of the county had declined during the interval between 1987 and 1994, that the decline cannot be traced to changes in the population and the primary cause seemed to be a decline in the recharge rate of the aquifer during the study period. Their result was based on the failure to find a statistically significant correlation between the decline in the wells and the population growth in the county during that period. We use recently compiled data to re-examine the data and the county into two separate aquifer re-supply zones. We find that there is a significant difference in the water level declines in wells between the eastern part of the county drained by the Cuyahoga River and the western part which, when correlated with population growth accounts for the small value of the correlation coefficient found by Jagucki and Lesney (1995). Further regression analysis of the water level declines for well s sampling the four primary aquifers in the county show statistically significant correlations of water level decline with population growth in the aquifers; but no correlation with the Potrillo formation in the eastern and western parts of the county. However, only the aquifers show statistically significant decline which Jagucki and Lesney (1995) attribute to a decline in the recharge rate probably due to a decline in precipitation between 1987 and 1994. We suggest that the magnitude of the decline in those aquifers recharged by the Cuyahoga River warrant further hydrogeological study to determine an explanation for their decline.

3:30 ROOT CHANNELS AND MICROBIAL PRECIPITATES IN SUBSURFACE FRACtURES WITHIN GLACIAL TILLS OF OHio. Ann D. Christy and Margaret J. McMahon, Ohio State University, Dept. of Food, Agricultural, and Biological Engineering and Dept. of Horticulture and Crop Science, Columbus OH 43210. christy.14@osu.edu
Fractures and joints are common in Ohio's glacial till deposits. The more permeable fractures allow preferential root penetration beyond what would be expected in unfractured parent tills. Roots have been observed growing within till fractures at test pits and streamcuts in Franklin, Madison, Clark, and Clermont Counties in Ohio. Greyish-white, powdery calcium carbonate (calcite) coatings on the walls of the fractures and partially decomposed roots within some of the calcite-filled fractures were observed at the Madison county site. Microbial action upon living roots and dead root material can lead to calcite precipitation and infilling of the fractures. Initially roots grow into and fill the fracture. Eventually the root dies, and aerobic fungi and bacteria decompose the dead roots. These fungal fibers become calcified and/or calcium oxalate crystals grow as a metabolic byproduct on fungal hyphae. Certain aerobic soil bacteria decompose calcium oxalate and cause direct precipitation of calcite. As bacteria exhaust the available oxygen and the fracture becomes anaerobic or the nutrients are completely consumed, the fungi die and anaerobic bacteria than decompose the remains including the calcified fungal fibers, leaving the original fracture filled or lined with semi-soluble calcite.

3:45 AN EXPANDABLE DESIGN OF SOILS/GEOLoGIC TEST PITS FOR ENVIRONMENTAL INVESTIGATIONS OF FRACTURED GLACIAL TILLS. Ann D. Christy and Louis A. McFarland, Ohio State University, Dept of Food, Agricultural, and Biological Engineering, Columbus OH 43210. christy.14@osu.edu
Environmental investigations in glacial settings can be enhanced by the construction of subsurface geologic test pits which allow investigators to evaluate the presence, extent, and density of subsurface fractures. An expandable design allows a pit of any depth to be constructed by benching or stair-stepping the sidewalls until the desired depth is achieved. The dimensions of these benches, 1-meter deep and 1- to 2-meters wide, allow site investigators to trace fractures in a 3-dimensional view while meeting OSHA excavation safety requirements. The proposed 4-meter deep test pit design can be used for 1-meter, 2-meter, or 3-meter deep test pits by sequentially eliminating the shallower benches from the design. Ramps on one or more sides may be included to facilitate entry by wheeled vehicles or other equipment. Once the pit is constructed and the exposed faces are painstakingly prepared, further analyses can be performed including in situ tests of hydraulic conductivity in fracture-affect ed and non-fractured zones, grain size analyses and mapping on the USDA textural triangle, geochemical lab tests of small sample cores, clay mineralogy identification of fracture-affect ed and non-fractured samples, in situ dye tracer studies, and density measurements of fractures, earthworm burrows, and root channels at various depths.
PHYSICAL SCIENCE
04:15PM Saturday, April 1, 2000
MEYER HALL ROOM 124
JOSEFINA DE LOS REYES - PRESIDING

4:15 MORPHOLOGIC STUDY OF SICKLED ERYTHROCYTES. Florencia Pauli (Dr. H. Westcott Vayo). University of Toledo, 2801 W. Bancroft, Toledo OH 43666. fpauli@fut.edu.toledo.edu

In sickle cell anemia, the red blood cells contain an abnormal type of hemoglobin caused by abnormal beta chains of the hemoglobin molecule. When this hemoglobin is exposed to low concentrations of oxygen, it precipitates into long crystals that give the erythrocytes a sickled or otherwise abnormal appearance. The precipitated hemoglobin also damages the cell membrane making the cells very fragile and leading to severe anemia. The purpose of this research is to identify some sickled erythrocyte shapes and describe mathematically their surface area and volume using the techniques of calculus. Important functions of normal cells are oxygenation, diffusion, and membrane deformation; these depend, in part, on the surface area to volume ratio of the cell. The surface areas and volumes of these sickled cells could be compared to normal cells to assess their functionality. Sickled cells are thought to have a different surface area to volume ratio than normal cells and thus it is extremely important to investigate the surface area to volume ratios of these cell types. The cells chosen for this study are all of the “flat” type, not rotationally symmetric, and will be presumed to have a common thickness $t$. The types of cells studied thus far are named deformed, astrocyte, and hypochromic, as these are the plane curves that best represent their profiles. These derived results for surface areas and volumes give rise to certain parameters which can later be recorded for surface simulation using ratios for these cell types. Measurements of actual cells can be performed by using a light microscope monitor system. This study could help classify cells and explain the “why” of sickling relative to geometric considerations.

4:30 MOLECULAR DYNAMICS SIMULATION OF RNA FRAME-SHIFTING PSEUDOKNOT. Kristina E. Czastrz (Dr. Neocles B. Leontis), Bowling Green State University, Chemistry Dept. Bowling Green OH 43403. czastrz@bgsu.edu

The structural dynamics and solvation of an RNA frame-shifting pseudoknot from Beet Western Yellows Virus (BWYV) were investigated using molecular dynamics (MD) simulation methods. The simulations were carried out using the programs in the AMBER 5.0 package, with explicit solvent and counterions (Na+) and accurate treatment of long-range electrostatic interactions (Particle-Mesh Ewald method). The pseudoknot structure is of particular interest because it contains four of the six possible stable spray-groove interactions that have been identified on theoretical grounds (Leontis and Westhof, 1998, Quart. Rev. Biophys. 31:369-455), as well as a protonated C-G-Gr base Watson-Crick-Hoogsteen pair. Starting with the crystal coordinates for this molecule, multiple MD simulations were carried out to explore the stabilities of these pairings and the solvent and counterion dynamics (Su, L., L. Chen, M. Egli, J. M. Berger, and A. Rich, 1999, Nat Struct Biol. 6:285-92). Each simulation consisted of four stages of minimization and MD equilibration followed by the restrained production run. The following observations were made: All of the noncovalent/basic baseribbons referred to above are stable between two and two hundred picoseconds of 6N-protonated C$^\circ$ (they are not retained if C$^\circ$ is not protonated). Also, retention sites for both water and sodium ions have been located in repeated simulations, with water participating directly in some of the base pairs. Further work is currently being done with longer simulations (one nanosecond or more) to see if these interactions are still stable over a longer time scale.

4:45 COMPUTER GENERATION OF MAGIC SQUARES USING MINITAB®. Josefina P. De Los Reyes, University of Akron, Dept. of Statistics, Akron OH 44325-1913. jdeldores@uakron.edu

The purpose of this paper is to present a computer method of generating a magic square using MINITAB®, a statistical software. A magic square of order $n$ is an array of $n$ rows, $n$ columns, and $n$ main diagonals is a constant. A fascinating recreational aspect of magic squares and theoretical questions asked about a matrix when a magic square is regarded as such, two ideas in particular caught this author’s interest while writing this paper. One idea is from a problem regarding the magic square: (1) $n$ is odd as in 3,5,7,... (2) $n$ is an even number that is twice an odd number as in 4,8,12,16,... (3) $n$ is an even number that is twice an odd number as in 6,10,14,...

Experimental Physiology:

9:00AM Saturday, April 1, 2000
MEYER HALL ROOM 114
MARY D. GAHBAUER - PRESIDING

9:00 EFFECTS OF DIETARY EXPOSURE TO 3,3',4,4'-TETRACHLOROBIPHENYL (PCB77) ON CHOLINE ACETYLTRANSFERASE ACTIVITY, AND SPATIAL LEARNING AND MEMORY IN 30-DAY-OLD RATS. Christa L. Bowen, Terri L. Provost, and Lee A. Mouser, Bowling Green State University, Dept. of Biological Sciences, Bowling Green OH 43403. cbowen@bgsu.edu

Polychlorinated biphenyls (PCBs) are toxic environmental contaminants that were first observed as a problem after about 40 years of industrial use. Placental and lactational PCB exposure to offspring cause metabolic and endocrine disruptions including depressed body weight, hypothyroxiainema, spatial learning and memory deficits, and neurochemical and neurobehavioral alterations. Previous work has shown that a mixture of PCB congeners resulted in smaller offspring, problems with spatial learning, and alterations in choline acetyltransferase (ChAT) activity. The present study concentrated on one specific coplanar congener of PCB. Pregnant female Sprague-Dawley rats were exposed to either a control diet (consisting of rat chow) or a treatment diet (consisting of standard chow with PCB 77 added at 1.25 ppm (LPCB) or 25 ppm (HPCB). Offspring were tested for learning and memory via a Morris water maze, and ChAT activity was measured radiometrically. This study has shown that dietary exposure of 30-day-old-rats to LPCB and HPCB during gestation, lactation, and post-weaning diet elevated ChAT activity in the hippocampus and basal forebrain. These groups per litter of rats were tested for 10 trials in a Morris water maze on days 20-24 for learning ability. The latency times to the platform were longer for controls than either PCB groups. After training, rats were assigned to either a memory group or one of two relearning groups. On day 29, the memory group rats were placed in the maze, and the control animals demonstrated longer latency than the PCB groups. Relearning was done on days 25-29, and involved either finding the platform after it was placed in a new position, or finding the platform from a new release point. The control groups took longer to relearn the water maze task than did the PCB exposed groups. These results show that ChAT activity and behavior are altered by PCB.

9:15 TESTOSTERONE EFFECTS ON CARDIAC FUNCTION IN THE MALE SPONTANEOUSLY HYPERTENSIVE RAT (SHR). Christina Spahn, Michael Herman, Gail Dunphy, Daniel Ely, University of Akron, Dept. of Biology, Akron OH 44325-3908. chrispaah@hotmail.com

Males have a greater incidence of hypertension than females and one reason may be how testes testosterone(T) affects cardiac function. The objective of this study was to determine the effect of T on the contractility of rat hearts to see if it improves left ventricular (LV) function. Male SHR rats were castrated and implanted with either sham implants (n=9) or less testosterone (n=9). The isolated hearts were perfused using the Langendorff technique. LV pressure was assessed at three balloon volumes ($v_0$, 0.05, 0.10, 0.15 mL) and subsequent $v_0$ with a correlation of ($F_0.67, p=0.002$) volumes. Conversely, NE release was associated with increased DP at the 0.05 mL $v_0$ ($p=0.0417$) volume. Coronary flow in the T group was significantly higher than sham before ($p<0.02$) and after ($p<0.01$) pressure recordings. LVFD showed no significant differences in tissue damage in either group. In conclusion, T appears to beneficially increase SP and decrease DP; however, NE release produced the opposite results and was harmful, possibly by increasing vascular permeability.

9:30 THE EFFECTS OF MATERNAL EXPOSURE TO POLYCHLORINATED BI-PHENYLS ON THYROID HORMONES AND INSULIN-LIKE GROWTH FACTOR-I IN 15 AND 30- DAY-OLD SPRAGUE-DAWLEY RAT PUPS. Terri Provost, Laura Jutredez de K,
should be genetically identical, they exhibit different phenotypes, as we described previously in our studies with WKY female rats. While methylation is not a mutation, the pattern of methylation is passed from one generation to the next, potentially affecting gene expression and phenotype. In our experimental setup, we observed a trend toward increased systolic blood pressure (BP) in the SHR/Y group, consistent with previous reports. Our data, however, did not show a significant difference in BP between the SHR/Y and WKY groups. Future studies could further investigate the role of methylation in hypertension.

In conclusion, our findings suggest that epigenetic mechanisms, such as DNA methylation, play a significant role in the development of hypertension. Understanding these mechanisms could provide new avenues for the treatment and prevention of hypertension.

**Experimental Physiology: Clinical**

**2:00 THE PHARMACODYNAMIC CHARACTERIZATION OF AN ANTISENSE Oligonucleotide Against MAO-B In The Rat Brain**

Kevin Haynes, Travis J. Worst, Michael D. Kane, and Jon E. Sprague, Ohio Northern University, The Rabbe College of Pharmacy, Dept. of Pharmaceutical & Biomedical Sciences, Ada OH 45810.

Previous work has identified an effective antisense oligonucleotide, which effectively blocks mouse uptake-0xidase (MAO-B) translation and transcription. They have studied the effect of maternal low concentration (1.25 or 12.5 ppm) PCB exposure (Aroclor 1254) on growth related parameters. Thyroxine (T4), triiodothyronine (T3), and insulin-like growth factor-1 (IGF-1) were measured radioimmunologically in serum of controls. However, 30-day-old pups from both treatment groups had significantly higher T3 concentrations. Serum IGF-1 was significantly decreased at 15 days of age and elevated significantly (in 12.5 ppm) at 30 days of age in both treatment groups compared to same aged control animal concentrations. These results suggest there are no direct correlations between alterations in thyroid hormone status and IGF-1 status due to PCB exposure.

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**2:15 CHROMOSOME 17Q GAIN ASSOCIATED WITH THE PEDIATRIC TUMOR NEUROBLASTOMA**

John J. Brown, Stephen J. Quilman, Althea Thomas, Jadwiga Lebowski, and Gail D. Wengler, Childrens Hospital, Cytogenetics Laboratory, 700 Childrens Dr, Columbus OH 43205.

As the most commonly diagnosed extracranial solid malignancy in children, neuroblastoma continues to have a mortality rate of approximately two-thirds despite decades of research. Quantification of the oncogene NMYC, tumor cell ploidy analysis, and chromosome 1q loss of heterozygosity in conjunction with consideration of patient age and clinical stage allow categorization of value to the physician for the purposes of prognosis. It is of importance to identify additional genetic abnormalities that can assist in neuroblastoma therapy development and selection. We have performed fluorescence in situ hybridization (FISH) and comparative genomic hybridization (CGH) of neuroblastoma tumors to monitor the unbalanced gain of chromosome segment 17q13.3-q23. FISH of interphase cells was performed using differentially labeled probes to17s122 (17p11.2-12) and myeloperoxidase (17p11.3-q23). This method allows the distinction of an unbalanced 17q gain from a balanced change. Eight tumors were studied by FISH; 5 showed unbalanced gain of 17q. This change was confirmed by CGH analysis in all 3 tumors. However, in 2 tumors studied using both FISH and CGH, concordance between results was not found. Consistently, the unbalanced gain of the chromosome 17q segment has been associated with NMYC amplification. The gain of chromosome segment 17q21.3-q23 is commonly found in patients with advanced poor prognosis neuroblastoma and could become a routine cytogenetic test. Although more labor- and time-intensive, preliminary data suggests CGH may allow more reliable assessment of Chromosome 17 status, as well as providing additional whole genome copy number change information. Additional development and validation of the FISH assay is required for routine clinical use.

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**2:30 MICROSOMAL EPoxide HYDrolase (EPHX) AND GLUTATHIONE S-TRANSFerases (GST) GENE POLymorphisms In PaTIENTS With ORAL-PHARYnGEAL CANCer (OPCa)**

Armando G. Amador, Paul D. Righi, Shokri Radpour, Eric T. Everett, Edward Weisberger, Mark Langer, Arden G. Christen, Samuel Campbell, Don J. Summerton, James K. Harrfield, L. Indiana University, Dept of Medical & Molecular Genetics, 975 W. Walnut, IB-130, Indianapolis IN 46222-5251. amador@iumail.indiana.edu

Microsomal epoxide hydrolase and glutathione S-transferases play a role in carcinogenesis by detoxifying reactive electrophiles. Genetic polymorphisms in the genes encoding these enzymes may be linked to susceptibility to oral cancers. The objective was to determine the effect of low dose of PCBs on growth related parameters. Thyroxine (T4), triiodothyronine (T3), and insulin-like growth factor-1 (IGF-1) were measured radioimmunologically in the sera of controls. However, 30-day-old pups from both treatment groups had significantly higher T3 concentrations. Serum IGF-1 was significantly decreased at 15 days of age and elevated significantly (in 12.5 ppm) at 30 days of age in both treatment groups compared to same aged control animal concentrations. These results suggest there are no direct correlations between alterations in thyroid hormone status and IGF-1 status due to PCB exposure.

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**2:45 Pesticides and the Thyroid**:

Jon Summerlin, James K. Hartsfield Jr., Indiana University, Dept of Medical & Molecular Genetics, Indiana University, Dept of Medical & Molecular Genetics, 975 W. Walnut, IB-130, Indianapolis IN 46205. jsummerlin@iu.edu

Pesticides are ubiquitous environmental toxins that bioaccumulate in the thyroid gland and may interfere with thyroid hormone production. Studies have related testosterone (T) levels to hypertension and suggest T may influence renal sodium excretion. The hypothesis tested in this study was that T increases sodium reabsorption in the kidney and blood pressure (BP). Two strains of rats: normotensive Wistar Kyoto (WKY) and a borderline hypertensive strain genetically similar to WKY but having a Y chromosome from a genetically hypertensive father (SHR/y) were used. To increase SNS activity, nerve growth factor (NGF) was administered to both treatment groups at 30 days of age, although significantly lower than control groups at 12.5 ppm exposure. Fifteen-day-old animals had serum T concentrations near those of controls. However, 30-day-old pups from both treatment groups had significantly higher T concentrations. Serum IGF-1 was significantly decreased at 15 days of age and elevated significantly (in 12.5 ppm) at 30 days of age in both treatment groups compared to same aged control animal concentrations. These results suggest there are no direct correlations between alterations in thyroid hormone status and IGF-1 status due to PCB exposure.

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**3:00 EPigenetic mechanisms in hypertension: is estrogen involved?**

Brady T. Kleman (Dr. Amy Milsted), University of Akron, 18870 Rd 20-P, Fort Jennings, OH 43525. bkleman@uakron.edu

The objective of this study was to determine the effects of neonatal nerve growth factor treatment on blood pressure in SHR and WKY rats. Bradey T. Kleman (Dr. Amy Milsted), University of Akron, 18870 Rd 20-P, Fort Jennings OH 43525-3908, bkleman@uakron.edu

Studies have related testosterone (T) levels to hypertension and suggest T may influence renal sodium excretion. The hypothesis tested in this study was that T increases sodium reabsorption in the kidney and blood pressure (BP). Two strains of rats: normotensive Wistar Kyoto (WKY) and a borderline hypertensive strain genetically similar to WKY but having a Y chromosome from a genetically hypertensive father (SHR/y) were used. To increase SNS activity, nerve growth factor (NGF) was administered to both treatment groups at 30 days of age, although significantly lower than control groups at 12.5 ppm exposure. Fifteen-day-old animals had serum T concentrations near those of controls. However, 30-day-old pups from both treatment groups had significantly higher T concentrations. Serum IGF-1 was significantly decreased at 15 days of age and elevated significantly (in 12.5 ppm) at 30 days of age in both treatment groups compared to same aged control animal concentrations. These results suggest there are no direct correlations between alterations in thyroid hormone status and IGF-1 status due to PCB exposure.
some of these, GSTM1, GSTT1, GSTP1 and EPHX1 in particular, a search for over- or under-representation of any of these genes in patients with OPCA was undertaken. This was done using PCR followed by RFLP for GSTP1 and EPHX1, and by allele specific multiplex PCR for GSTM1 and GSTT1. The study groups included 120 ever-smokers (ES) and 25 non-smokers (NS), which were compared to a random control population sample of 99 individuals (C). At EPHX1 codon 113, a significant over-representation of the high activity genotype (Tyr/Tyr) was observed when compared to C. This was observed for male ES and the overall samples of ES as well as that of NS. A less dramatic but significant over-representation of the Tyr/Tyr genotype was observed in female NS (P = 0.042). The incidence of homozgyosity for a null allele at either or both of the GSTM1 or GSTT1 loci in OPMA patients indicates that, in ES in general there was an over- representation of the combination of the most aggressive behavior in the aged, aggressive, male, and large breed dogs. This is, as is true for a number of遛 native studies, an indication of a male, aggressive, large, breed inclination.

2:45 LUPUS: 1) ESTROGEN’S ROLE IN AUTOIMMUNE INDUCTION, AND 2) AN IN VITRO GLOMERULAR BANDING ASSAY FOR AUTOANTIBODY PATHOGENICITY. Kari Oliver A. Yui, Chunsheng Wang1, and Betty Diamond2, Hiram College, Depts. of Biology and Chemistry, Hiram OH 44234 and The Albert Einstein College of Medicine, yuka@hiram.edu

Autoimmunity occurs in the condition in which the immune system reacts against self-antigens, underlying diseases such as rheumatoid arthritis, multiple sclerosis and systemic lupus erythematosus. 1) Neutrophils damage liver and kidney of female rats is caused by anti-DNA antibodies in renal tissue. R4A, an anti-DNA antibody from BALB/c mice that induces nephritis, and a DWEYSVWLSN decapeptide, that binds to R4A, have been identified previously. DWEYSVWLSN immunization triggers autoimmunity in BALB/c mice, but not in DBA/2 mice. Previous data suggest that estrogens may play a role in inducing an autoimmune response. To determine if estrogen can break tolerance against autoimmunity, DBA/2 mice with estrogen implants were immunized with peptide. The hyperestrogenic mice did not develop anti-DNA antibodies, disproving the hypothesis. 2) An in vitro glomerular binding assay (GBA) was used to measure anti-DNA antibody deposition in glomeruli or tubules removed from renal tissue. This assay represented a possible alternative to a mouse in vivo assay, for it had been shown to distinguish between anti-DNA antibodies in those lupus patients with nephritides and in those without. Assay conditions were optimized. The assay was tested on five antibody clones derived from autoimmune mouse. Some, though insufficient, correlation was observed between these results and in vivo data from the literature; however, the implication was that the GBA cannot substitute for the in vivo assay for autoantibody pathogenicity.

3:00 THE Y CHROMOSOME EFFECT OF AGGRESSION ON THE MALE SHR AND WKY. Jonathan D. Toot, Gail E. Dumpy, Daniel L. Ely, University of Akron, Dept. of Biology, Akron OH 44325-3908, jtoot@uakron.edu

The hypothesis that is tested is that a locus on the Y chromosome is responsible for increased aggressive behavior in the SHR. Aggressive behavior for male SHR and WKY rats was scored according to physiological and behavioral responses to intermale and resident-intruder tests. The SHR strain was derived from the inbreeding of hypertensive WKY rats. SHR and WKY rats differ generally only at a locus on the Y chromosome. Housing conditions consisted of 6-8 males with 6-8 females for each strain, which were 10-12 weeks old. This exposed the male rats to social stresses and allowed for the formation of dominance hierarchies. Males were tested for behavior at least once a week until the age of 12 weeks. Each maximum length of 15 minutes. Female rats had no direct role the behaviors tested. Average systolic blood pressure of WKY was 131mmHg and 166mmHg for SHR, significant at p<0.05. Baseline plasma measurements indicated a norephinephrine average of 551 pg/ml for WKY and 868pg/ml for SHR at significant at p<0.05. The average epinephrine reading was 204pg/ml for WKY and 342pg/ml for SHR which was not significant at p=0.05. Intermale aggression tests showed fighting behavior in 20% of WKY tests and 55% of SHR tests. In conclusion, there is a relationship between norepinephrine, blood pressure, and behavioral characteristics of aggression with a locus on the Y chromosome.

3:30 A STATISTICAL ANALYSIS OF HEARTWORM DISEASE IN NORTHWESTERN OHIO, 1996-98. Aaron M. Sargeant and Eric V. Nelson, 14231 Pasco Montra Rd, Northwood, OH 43619

This study was designed to determine whether preconception administration of L-arginine in drinking water could help prevent damage which occurs during ischemia in spontaneously hypertensive male rat hearts. Previous studies of this experimental method have shown that there is a significant decrease in coronary flow following ischemia, and L-arginine is a precursor of the well-known vasodilator nitric oxide. One group was given L-arginine (1.2 g/l) in drinking water (for 6) for three to four weeks, while the control group (n = 5) was kept on its normal water. The hearts were then perfused using the Langendorff technique both before and after a twenty-minute ischemia. During this ischemia, the flow of the perfusate was turned off so that it does not receive any oxygen or nutrients. The hearts of the rats given L-arginine had significantly higher (P<0.05) ventricular systolic pressures than the control group, as well as significantly higher (P<0.01) coronary flows after the ischemia. The administration of L-arginine appears to improve the recovery of the heart after ischemia, most likely due to the vasodilatory actions of nitric oxide.

3:45 LARGININE PRECONDITIONING IMPROVES RECOVERY OF THE HEART AFTER ISCHEMIA IN SPONTANEOUSLY HYPERTENSIVE (SHR) RATS. Seth Bradford, Michael Herman, Gail Dumpy and Daniel Ely, University of Akron, Dept of Biology, Akron OH 44325-3908.

This study was designed to determine whether preconception administration of L-arginine in drinking water could help prevent damage which occurs during ischemia in spontaneously hypertensive male rat hearts. Previous studies of this experimental method have shown that there is a significant decrease in coronary flow following ischemia, and L-arginine is a precursor of the well-known vasodilator nitric oxide. One group was given L-arginine (1.2 g/l) in drinking water (for 6) for three to four weeks, while the control group (n = 5) was kept on its normal water. The hearts were then perfused using the Langendorff technique both before and after a twenty-minute ischemia. During this ischemia, the flow of the perfusate was turned off so that it does not receive any oxygen or nutrients. The hearts of the rats given L-arginine had significantly higher (P<0.05) ventricular systolic pressures than the control group, as well as significantly higher (P<0.01) coronary flows after the ischemia. The administration of L-arginine appears to improve the recovery of the heart after ischemia, most likely due to the vasodilatory actions of nitric oxide.
players and non-athlete graduates (p = 0.854). Cigarette smoking and smokeless tobacco rates were 7.5% and 17.8% for the former football players, and 16.3% and 8.7% respectively for the non-athlete graduates (p = 0.007, p = 0.181). Cigar smoking, at least occasional rates, were similar for former football players at 13.3%, and 14.5% for non-athlete graduates (p = 0.796). For the examined five years after graduation, no significant change in tobacco consumption was observed in either group. Graduation is a time of transition for college males. Their lifestyles are forced to adapt to a change in environment. This is especially true for former athletes whose time was divided between academics and athletics. This study reports similar athlete/non-athlete overall tobacco consumption rates slightly higher than national averages. For the populations in question, this study provides baseline data on cigar smoking rates. The former football players smoked less but chewed more than non-athlete graduates. In both groups, the number of tobacco users did not change for any of the studied five years after graduation.

4:30 THE EFFECTS OF ERYTHROPOIETIN (EPO) ON RETICULOCYTE COUNTS IN DIALYSIS PATIENTS' RELATIVE TO PATIENT AGE, GENDER, RACE, EPO DOSAGE, AND DURATION OF RENAL DISEASE. Jennifer L. Johnson (Linda M. Young), Ohio Northern University, Dept. of Biological Sciences, Room 163 Meyer Hall, Ada OH 45810. Johnson1@onu.edu

Patients with chronic renal dysfunction generally have reduced red blood cell (RBC) counts caused by the combined effects of erythropoietin deficiency and mechanical damage during dialysis. Consequently, the focus of this study is to determine the possible effects of recombinant human erythropoietin (rHuEPO) on anemia caused by renal dysfunction. This analysis is limited to a correlative study between patient reticulocyte counts and the following parameters: patient age, gender, race, rHuEPO dosage, and duration of renal disease. Monthly blood samples were collected from 45 dialysis patients and 5 healthy controls at Lima Memorial Hospital Renal Clinic. Manual reticulocyte counts were performed on all the samples and the data correlated with the indicated parameters. Additionally, these samples were run on the Abbott Cell Dyn 3500 to verify agreement of automated versus manual reticulocyte counting as part of the laboratory's quality control program. Preliminary results indicate recombinant human erythropoietin is effective in the treatment of anemia caused by renal dysfunction.

Plant Ecology

09:00AM SATURDAY, APRIL 1, 2000
MEYER HALL ROOM 125
BRIAN C. MCCARTHY - PRESDING

9:00 IMAGE ANALYSIS AS A TOOL FOR PLANT POPULATION STUDIES. Sarah M. Emery, Juliana C. Mulroy, and Jennifer A. Rudgers, Denison University, Slatyer Box of 672, Granville OH 43023. emery@denison.edu

Image analysis is a tool for gathering information from visual images such as photographs. It has widespread application, but there has been relatively little published use of image analysis as a tool in plant ecology. We used NIH Image, a public domain image analysis program available from the National Institutes of Health, to study intraspecific competition in the small, rosette-forming winter annual, Draba verna (Cruciferae). Studies were demonstrated.

9:15 VEGETATION ECOCOLOGY AND NATURAL HISTORY OF DEEP WOODS, HOCKING COUNTY, OHIO. Cynthia L. Riccardi and Brian C. McCarthy, Ohio University, Dept. of Environmental and Plant Biology, Athens OH 45701-2979. Crircardi@rocketmail.com

Deep Woods, a 114-ha private preserve in Hocking County, Ohio, offers a diversity of habitats and species. Second-growth beech and upland hardwood forest, riparian forest, hemlock ravines, sandstone outcrops, rockhouse formations and pastures provide areas of substantial diversity for plant and animal species. We examined the vascular flora across two full growing seasons (1998-1999) to determine the following aspects: (1) are there any identifiable patterns or trends in the plant communities; (2) what are the species that are occupying these areas; and (3) are there any species that are particularly useful or rare. Survival of Carex and Pratnus seedlings was greater with tubes. However, survival of Carex was greater without a browsing tube (82% and 92% respectively). While no treatment effects were obvious after one year, species and size class responses were demonstrative.

9:45 VASCULAR FLORA OF AN ECOCOLOGICALLY DISTURBED INDUSTRIAL SITE IN BUTLER COUNTY, OHIO. Brian C. McCarthy and Darrin L. Rubino, Ohio University, Dept. of Environmental and Plant Biology, Athens OH 45701. mccarthy@ohio.edu

Governmental and environmental agencies are increasingly interested in biodiversity data for the purposes of preservation and restoration. This interest has created important new constituencies for the products of floristic research. As an initial step in identifying focal taxa for subsequent preservation and restoration efforts, we conducted a floristic inventory of the vascular plant species of the Fenwick Environmental Management Project, a 425 ha facility located 30 km northwest of Cincinnati, Ohio. Between 1953 and 1988, the U.S. Department of Energy facility, then called the "Feed Materials Production Center," produced uranium metal products. In 1989, uranium metal production was suspended and resources shifted to environmental restoration. We studied a defined 50 ha site composed of five apparent habitats: old-fields, moist meadows, young forest, old forest, and a "wet swamp". While the specific site study was not directly impacted by industrial activities, the area had been regularly grazed by cattle, annually mowed, and otherwise perturbed by motor vehicles. We examined the vascular flora across two full growing seasons (1998-1999) with ten-weekly visits (12 collection trips). We discovered a total of 332 taxa in 20 genera and 75 families. Asteraceae (42 taxa) and Poaceae (41) were the most important families; Cercideae (42 taxa) and Poaceae (41) were the most important families; Carex (15) and Quercus (8) were the most important genera. No taxa were state Listed as threatened or endangered. As is typical of many disturbed sites, a relatively large proportion (31%) of the taxa were non-native to the region, Loricariu masu and Ailacna pelastica are invasive and appear to be negatively impacting native species.

10:00 THE EFFECTS OF MECHANICAL, BIOLOGICAL AND CHEMICAL TREATMENT METHODS ON AN INVASIVE PLANT, THE GIANT REED (PHRAGMITES AUSTRA-LIS). Curt S. Schaeffer and Dr. David A. Francko, Miami University, Dept of Environmental and Plant Biology, Miami University, Dept of Botany, Middletown OH 45042. CurtS@muohio.edu

In 1998, we conducted a pilot study to determine the effects of mechanical, biological and chemical treatment methods on an invasive plant, the Giant Reed (Phragmites australis). A 3 x 3 factorial experiment included: (1) mechanical cutting, (2) mechanical cutting followed by a 20% glyphosate (3) no treatments. The results of the pilot study demonstrated that (1) mechanical cutting alone was not sufficient to control the Giant Reed, (2) mechanical cutting followed by a 20% glyphosate was efficacious in reducing the Giant Reed, but did not destroy it, (3) and 66% of the Giant Reed was destroyed by mechanical cutting followed by a 20% glyphosate. Since the Giant Reed is an invasive species, it is important to determine the most effective treatment method for controlling its growth. The Ohio Journal of Science
while the multiple cut plot stem densities began to decrease earlier in the growing season. Continuous cut and removal of reed shoots is the most effective method of treatment examined in this study.

10:15 FOREST RESTORATION FOLLOWING THE REMOVAL OF AN INVASIVE SHRUB, AMUR HONEYSUCKLE (LONCERA MAACKII). Kurt M. Hartman and Brian C. McCarthy, Ohio University, Dept of Environmental and Plant Biology, Athens OH 45701. kkh34992@ohio.edu

Amur honeysuckle (Lonicera maackii) is a non-native, invasive shrub that is now common throughout Southwestern Ohio. Various studies have shown Lonicera to have a negative impact on native plant diversity and abundance. The purpose of this study was to evaluate two methods for the eradication of Lonicera and to assess the performance of planted seedlings following removal. We employed a randomized complete block design (N = 8) with three treatment plots per block: control (unmanipulated), cut (Lonicera cut, stumps herbicided), and injection (Lonicera stems injected with herbicide). In each treatment plot, 18 seedlings of 6 species were planted. Juglans nigra, Fraxinus pennsylvanica, Quercus muehlenbergii, Prunus serotina, Cornus florida, and Cirsium canadense. Browse tubes were added to half of the seedlings to evaluate browsing pressure. Lonicera kill rates were similar for both treatment methods, thus injection may be preferred due to its ease of application. Experiment-wide, seedling survival was low (43%) due to severe drought (PSDI < -3). There was differential seedling survival among blocks, treatments, species, and tubes. Seedling survival and growth varied among blocks due to environmental heterogeneity. Seedling survival was greatest in the removal treatments compared to the controls. Overall survival actually decreased with browse tubes (44% vs. 50%), but mean height growth was greater with a tube vs. without. The presence of a species ? tube interaction indicates that survival was species dependent. Browse frequency was related to species but not to block or treatment. The data suggest that there were multiple factors leading to the survival and growth of seedlings.

ANIMAL ECOLOGY AND BEHAVIOR

02:00PM SATURDAY, APRIL 1, 2010

MEYER HALL ROOM 125

DANNY J. INGOLD - PRESIDING

2:00 RELATIONSHIPS BETWEEN SEED FALL OF THREE TREE SPECIES AND PEROMYSCUS LEUCOPUS AND CLETHRIONOMYS GAPPERI DURING 10 YEARS IN AN OAK-PINE FOREST. Karen E. McCracken*, Jack W. Wilham, and Malcolm L. Hunter Jr., University of Maine, Defiance College, Dept. of Natural Sciences, Defiance OH 43512. kmccracken@defc.edu

We analyzed live-trapping data from 10 years (1983-1992) of a long-term study of forest ecosystems in southern Maine to investigate relationships between seed fall of red oak (Quercus rubra), white pine (Pinus strobus), and red maple (Acer rubrum), and populations of Peromyscus leucopus and Clethrionomys gapperi. Population trends of Peromyscus were correlated positively with both red oak and white pine in the previous autumn; populations of Peromyscus were not correlated with either red oak or white pine in the previous spring. Population trends of Clethrionomys were correlated positively with crops of both red oak and white pine in the previous autumn; populations of Clethrionomys were not correlated with either red oak or white pine in the previous spring. Association with increased summer captures of Peromyscus per quadrat for 2 of 4 years, and associations with increased summer captures of Clethrionomys per quadrat for 2 of 4 years, were associated positively with the number of live red oaks per quadrat. Association with increased summer captures of Peromyscus was associated positively with the number of live red oaks per quadrat.

2:15 THE HIBERNATING BATS OF ZANE-SHAWNEE CAVERN, LOGAN COUNTY, OHIO. Jennifer L. Cudney and Carl W. Hoagstrom, Ohio Northern University, Dept. of Biological Sciences, Ada OH 45810. j-cudney@onu.edu

Zane-Shawnee Cavern is a commercial cavern in Logan County, Ohio. Despite the commercial use of the cavern throughout the winter, a number of bats use it as a hibernaculum. The bats are being censused periodically to determine the importance of the cavern as a hibernaculum. At each census, bats are counted by a group of at least three persons searching the main cavern. Each bat’s location in the cavern, position (on the wall or ceiling), placement (in crevices or exposed) and height from the floor of the cavern are recorded. Observation from one year (the winter of 1996-1997) and quantitative data, collected as described above, from two years (1997-1998 and 1998-1999) resulted in some preliminary conclusions: (1) Bat counts have been quite reproducible among censuses (2) Hibernating bat populations of eastern pipistrelles (Funiculus vittatus) and big brown bats (Eptesicus fuscus) have been constant from year to year (about 50 and 20 respectively), (3) Little brown bats (Myotis lucifugus) use the cavern more sporadically, either hibernating there some years, and not others, or using the cavern as a transect route in travel between their hibernaculum and summer range. At least one northern long-eared bat (Myotis septentrionalis) roosted in the cave for at least two weeks in the spring of 1999, probably in transit from its hibernaculum to its summer range. Zane-Shawnee Cavern is used by at least four species of bats and should be considered a valuable asset to the bat community of Logan County.

2:30 ARE ENVIRONMENTAL FACTORS RESPONSIBLE FOR THE DECLINE IN CHELONIA MYDAS AGASSIZI (BLACK TURTLE) POPULATIONS OF BAHIA MAGDALENA, MEXICO? Jennifer L. Cudney and Regina Woodrom Luna (Luis E. Calderon), Ohio Northern University, Dept. of Biological Sciences, Ada OH 45810. j-cudney@onu.edu

Bahia Magdalena is a vital habitat in the life cycle of black turtles, which migrate to the area after hatching to grow and develop through intensive feeding on red algae, sea grass and eventually invertebrates and fish. After an unknown period of time (8 to 20 years), turtles migrate back to their nesting beaches to reproduce. The feeding grounds support an estimated but declining population of 3000 to 5000 turtles. These turtles are an important component of the Bahia Magdalena ecosystem, and were an economic asset to the people of coastal towns as they were hunted to fulfill an international demand for turtle products. Loopholes in current laws permit fishermen to keep turtles that are incidental bycatch. To assess the effect of environmental factors on the black turtle population, we evaluated the water quality (pH, salinity, dissolved oxygen, turbidity) and the primary production (light and dark bottles method) in different locations in Bahia Magdalena. We estimated the sea grass and algae abundance (using quadrats), we collected benthic invertebrates (core sampling), and conducted observation and gut content analysis of turtles and other predominate species. The estimated biomass of black turtles, seagrass, and invertebrates in Magdalena Bay were 0.5 t/km², 1.2 t/km², and 102.5 t/km² respectively. The data collected with past studies on physiological and nutritional needs of turtles indicate that Bahia Magdalena is a suitable habitat for the black turtle. It is presumed that illegal catching and other anthropogenic factors are responsible for the decline of the black sea turtle population.

2:45 ACID RAIN, EGGSHELL-THINNING, AND THE EXTINCTION OF THE PASS- ENGER PIGEON. Jack Kovach, Muskingum University, Department of Biology, New Concord OH 43762. jkovach@muskingum.edu

The suggestion that acid rain from industrial pollution is the most likely cause of the progressive thinning of the shells of eggs of British thrushes (Turdus spp.) over the past 150 years causes one to wonder if this phenomenon may have played a role in the extinction of the passenger pigeon (Ectopistes migratorius) in North America. With a population estimated at 2-5 billion (Schorger, 1935, The Passenger Pigeon: Univ. Wisconsin Press, Madison), concentrated in huge flocks, the calcium requirements for eggshell development in passenger pigeons, although apparently only one egg was laid by the nestling female (ibid., p. 109), would have been sizable. Hence any reduction of the calcium content of mast (the preferred diet of passenger pigeons (ibid., p. 55) and of leaf litter consumed by earthworms (“...sought and eaten with avidity...” by passenger pigeons (ibid., p. 47) or reduction in abundance of land snails (“...sought eagerly by the pigeons,” (ibid., p. 45), all of which are documented effects of acid rain, may have resulted in eggshell thinning and a reduced reproductive success that may have contributed to the bird’s decline and eventual disappearance. Evidence from paleoecological studies and other sources indicates that industrial pollution in eastern North America was rapidly increasing during the time frame in which the passenger pigeon declined to extinction.

3:00 HABITAT USE AND REPRODUCTIVE SUCCESS OF GRASSLAND NESTING BIRDS ON A RECLAIMED STRIP-MINE. Danny J. Ingold, Muskingum University, Biology Dept, New Concord OH 43762. j-ingold@muskingum.edu

Although reclaimed strip-mines are artificial ecosystems, they provide a refuge for a variety of grassland birds, whose populations are declining and that might not otherwise survive in the area (e.g., Henslow’s sparrows, Ammodramus henslowii; grasshopper sparrows, A. savannarum; short-eared owls, Asio flammeus). During the 1997 and 1998 breeding seasons habitat selection and the nesting success of grassland birds were studied on a 3,700 ha reclaimed stripmine (the Wilds) in Guernsey, Muskingum, and Noble counties in eastern Ohio. Grasshopper sparrows, eastern meadowlarks (Sturnella magna), red-winged blackbirds (Agelaius phoeniceus) and Henslow’s sparrows were the most abundant and most successful nesting species on the reclaimed mine. Short-eared owls and Henslow’s sparrows avoided nesting on plots that were mowed just prior to the onset of nesting. There were significantly more nests (P < 0.05) of all species located on unmowed versus mowed plots during both years, and pairs using mowed plots tended to initiate nesting later in the season. Red-winged blackbirds were more abundant and most successful nesting species on the surrounding control plots. A Mayfield analysis indicated that, while henslow’s sparrows had the greatest nesting success on the experimental plots, followed by red-winged blackbirds and eastern meadowlarks. Nests on mowed plots suffered higher predation rates (41%) than did nests on unmowed (39%) and control (38%) plots. These data suggest that Henslow’s sparrows, short-eared owls, grasshopper sparrows and other uncommon grassland breeders in Ohio, are benefiting from this expansive, reclaimed surface mine.
field. Each grid was trapped six times at approximately eight hour intervals over a two day period each April and October. Captured animals were identified to species, marked with a unique toe clip number, sexed, aged, checked for parasites and injury, weighed and released. From April 21 to May 19, 1996, 100 circular (0.7 meter diameter) quadrats will be sampled in each field, thirty adjacent to woods or to small stands of trees, and thirty as far away from the woods or tree stands as field size and goldenrod distribution permit. The number of goldenrod plants, the number with galls and the number of galls with downy woodpecker holes will be counted in each quadrat.

The impacts of these factors are being tested in two fields in Hardin County, Ohio—one surrounded by a closed canopy, subclimax woods; the other entirely of females. 43 of 46 total specimens collected on June 18 some 67 m above ground floor of the Conesville Plant were female. These highly-skewed sex ratios are remarkable and may indicate that female periodical cicadas, despite their larger size (or perhaps because of it), are stronger fliers than males, in keeping with their tendency to disperse from chorusing centers after mating.

4.15 SOME ESTIMATES OF NYMPHAL POPULATIONS OF 17-YEAR CICADAS (BROOD V) IN EASTERN OHIO, 1999. Jack Kovich, Muskingum College, Geology Dept., NewConcord OH 43782. jkovach@muskingum.edu

Counts of nymphal emergence holes of Brood V periodical cicadas (Mogopicidae spp.) were made in June at sites in Muskingum County. Two to fifteen 1 ft.2 (0.093 m2) plots were selected at each site by tossing a cardboard frame onto the ground surface beneath the foliar canopy of one or more trees at the site. Litter was removed from the plots, and emergence holes (which, due to compaction of their walls, remain intact long after the nymph has left its burrow, and which are so distinctive that they are unlikely to be confused with holes made by other organisms) were counted. Any such hole partly or entirely inside the perimeter of the quadrat was counted. Quadrats with more than 10-12 holes were censused by inserting a plastic drinking straw in each hole, then retrieving and counting the straws. Mean numbers of emergence holes/ft2 varied from 4.6 (range 2 - 8, N = 3) beneath a slippery elm (Ulmus rubra) at the Education Center at the Hiwassee (Mega Twp.) to 27.2 (range 10 - 36, N = 15) beneath a sugar maple (Acer saccharum) on the campus of Muskingum College in New Concord (Union Twp.). Mean numbers of emergence holes/ft2 beneath a white pine (Pinus strobus) at Muskingum Technical College Natural Resources Center (Falls Twp.) and a bee tree (Pagus grandiflora) 0.75 ml. N of Rix Mills (Union Twp.) were, respectively, 21.3 (range 15 - 32, N = 3) and 13.1 (range 3 - 21, N = 10). These figures fall within the ranges reported by earlier workers using more elaborate census techniques to investigate previous emergences of periodical cicadas in Ohio and elsewhere in the midwestern U.S.

4.30 ASPECTS OF DOWNY WOODPECKER PREDATION ON GOLDENROD GALLS. Kathryn L. Wilson (Carl W. Hoagstrom), Ohio Northern University, Dept. of Biological Sciences, Ada OH 45810. k-wilson@onu.edu

Eurasia solildaginis lays its eggs in the stems of goldenrods (Solidago spp.). Downy woodpeckers (Picoides pubescens) feed upon these galls, extracting the larva from a characteristic hole in the gall. Three factors which might influence woodpecker predation on the galls are under investigation: (1) proximity to tree stands, (2) size of the tree stand, and (3) density of the galls. The impacts of these factor are being tested in two fields in Hardin County, Ohio—one surrounded by a closed canopy, subalbump woods; the other including scattered, small stands of trees. A general linear analysis of variance will be employed to sort out the impacts of the factors and their interactions. A second experiment will be conducted with goldenrods planted in a regular grid pattern 0.7 meter distance between galls. Circular (2 meter diameter) quadrats will be sampled in each field, thirty adjacent to woods or small stands of trees, and thirty as far away from the woods or tree stands as field size and goldenrod distribution permit. The quadrats in each group of thirty will be subdivided into those with a high density and those with a low density of galls. The number of goldenrod plants, the number with Eurosta galls and the number of galls with downy woodpecker holes will be counted in each quadrat. A general linear model will be used to test the hypothesis that downy woodpecker predation on goldenrod galls (1) does not differ between the two fields, (2) is more intense near woods or tree lines and (3) is more intense in patches with high densities of goldenrod galls.
Identification of a 0.7kb Insert Found in Lymantria dispar MultiNucLeoCaPIdD NucLear ProLyHoidisIs Virus following Serial PasaGe. Rachel M. Johnson, Holly J.R. Popham, James M. Slavicek; Ohio Wesleyan University, USDA Forest Service, 359 Main Rd., Delaware OH 43015. mrmustard73@hotmail.com

Lymantria dispar MultiNucleoCaPIdD Nuclear PolyhoidisIs Virus (LdMNIV) is a nauturally occurring virus, pathogenic to Lymantria dispar, commonly known as the gypsy moth. This virus belongs to the family Baculoviridae, and exhibits the family trait of producing cuboidal or polyhedral-shaped intracellular protein structures that encase infectious virus. Because LdMNIV infects this notorious pest, its genetic characteristics have been studied for future application and to unravel its structure. This virus, which has the tendency to pick up mutations, exhibits the addition of a 700 base pair insert in several isolates after serial passage in cell culture. Because these isolates appear to naturally select for this insert, studies to characterize this 0.7kb area were conducted to determine the advantage it imparts. The possible correlation of this insert to the rate of replication and the amount of apparent budded virus production was examined by comparison of the viral growth curves of isolates with and without the insert (122-fp and 122-2 respectively). This assay showed no differences between the two strains, and no correlation of the insert to either rate of replication or apparent budded virus production. Further study was conducted by restriction enzyme characterization of the area surrounding the insert. In continuing work, this area will be cloned. Furthermore, sequencing of the insert will be performed after it has been subcloned to a suitable size. An analysis of the open reading frames (ORFs) will be conducted to determine how the insert alters existing ORFs or if a new ORF is present. Results will contribute to generating a more stable isolate of LdMNIV, which would be more suitable for biocontrol applications.

Effects of Mechanical, Biological, and Chemical Treatment Methods on an Invasive Plant, the Giant Reed (Phragmites australis). Curt S. Schaeffer, Dr. David A. Franco, Miami University, Dept. of Botany, Oxford OH 45056. mrmustard73@hotmail.com

The native flora of Mentor Marsh, a Lake Erie coastal wetland near Cleveland, OH, is being replaced by an exotic invasive species, Phragmites australis. In 1996, we conducted a pilot study that showed that controlling and limiting the spread of this species was possible and seedbank species could re-establish. A 1999 large-scale study was designed to observe the response of P. australis to several treatments. Treatment methods were applied as follows: cutting and removal of emerging shoots of P. australis; treatment one coupled with application of herbicide and either covering with shade cloth or planting Typha latifolia, and covering with shade cloth and removing shoots. Control plots were left unaltered. Stem counts were taken every three or four weeks along with species occurrence, conductivity and water temperature and depth on sixty 5m2 cells. After 15 weeks, control plots and single-cut plots exhibited a mean stem count of 81 +/- 10 /m^2 and 90 +/- 17 /m^2 respectively. The multiple cut plots had a mean stem count of 4.4 +/- 2 /m^2 and a p-value of > 0.0001. Both single cut and control plots exhibited increasing stem densities up to the end of the growing season, while the multiple cut plot stem densities began to decrease earlier in the growing season. Continuous cut and removal of seed shoots is the most effective method of treatment examined in this study.

Characterization of the Smcy Gene in the Spontaneously Hypertensive Rat. Kristina L. Brady, Amy Milsted, University of Akron, Dept. of Biology, Akron OH 44325-3908. kbrady@gmail.com

The Y chromosome is localized only in mammals. It encodes a portion of the H-Y antigen that has been found to be responsible for male to female rejections in organ and bone marrow transplants. It has been hypothesized that the Smcy gene may also be involved in spermatogenesis. The object of the present study is to characterize the rat Smcy gene. Six genomic clones were isolated from the male rat SHR/Akr genomic library, indicating that there is probably only a single copy on the Y chromosome. The Smcy gene is not found in female rats of this same species. It is known that Smcy is widely conserved across species. Homology of the gene can range from 70 to 85 percent. Based on this knowledge, primers for PCR were designed by analyzing gene sequences from other species. The primers we used are found in mice at nucleotides 572-691 and 753-774, suggesting that they should amplify a specific band of around 120 bp. However, we found that these primers amplified a sequence of approximately 300 bp in length. A possible explanation for these results is that there is a difference in splice sites or intervening sequences in the Smhr rat as compared to the mouse. This work will help us to better understand gene organization in the spontaneously hypertensive rat, and the relationships among Smcy genes from different species.

Differentiation of Dirigent Protein Gene Homologues in Lobolly Pine. Jodi E. Creasap*, Aldwin Anterola, Mi Kwon, Laurence Davin, and Norman G. Lewis; *Hiram College, P.O. Box 1211, Hiram OH 44234, and Washington State University. creasaj@hiram.edu

Four dirigent protein gene homologues in loblolly pine were investigated for possible involvement in lignin and lignin formation. Of the four homologues, two were found to be involved in lignin or lignin formation, while the other two were connected with neither process. Measurement of mRNA levels using Real Time Quantitative PCR (RTQPCR) showed that two homologues (8730M and 8811M) are not involved in lignin or lignin formation, since they are found most abundantly in non-lignified areas of the plant and are not involved in lignifying or lignin-forming cell cultures of Pinus trees. In differentiated tissues of the plant, one homologue (9212M) is found 2 to 20 times more than the other predominant homologue (8699M). HPLC analysis of cell suspension cultures from 8% sucrose and 6% sucrose/20 mM potassium iodide media, together with measurement of mRNA levels by RTQPCR, demonstrate that 9212M is associated with the formation of lignin, and 8699M is involved solely in lignin biosynthesis.

A Molecular Analysis of Intraspecific Genetic Variation in Draba Vera L. Using ISSR (INTER-SIMPLE SEQUENCE REPEAT) MARKERS. Michael S. Barker, Denison University, Slayter Box 327, Granville OH 43023. barker.m@denison.edu

Many localized populations of the winter annual Draba (Erithrea) verana L consist of morphologically and cytologically similar individuals. Presumably these similarities are a consequence of obligate self-fertilization. Using ISSR (Inter-Simple Sequence Repeat) markers, I examined intraspecific genetic variation of D. verana populations from Indiana, Ohio, and New York. A total of 85 polymorphisms were generated from six ISSR primers. Within each of four populations of D. verana, one or two genotypes were detected. UPGMA cluster analyses were used to assess genetic variation among individuals representing 20 populations of D. verana individuals from Athens County, Licking County, and Erie County, Ohio consist of the same D. verana genotype, whereas different genotypes were detected in populations from Athens County, Delaware County, and other sites in Licking County, Ohio. Individual genotypes did not correlate well with geographic distribution, and thus formed a mosaic pattern. This type of distribution is best explained by the lack of a seed dispersal mechanism, which may localize D. verana genotypes. Any seed dispersal that occurs may be attributed to human activities, and thus may result in the observed mosaic distribution pattern. Currently, I am examining 100 D. verana individuals from the above 20 populations to further assess within-population variation.

Characterization of a Rat SHR Y Chromosome Clone. Michelle Bowman (Dr. Amy Milsted, Bin Zeng), University of Akron, Dept. of Biology, Akron OH 44325-3908. bmschied4@yahoo.com

Previous research has shown that a focus on the Y chromosome increases blood pressure in the spontaneously hypertensive rat (SHR). A suggested candidate for this is Sry, since it encodes a transcription factor and is present in several copies. We are currently searching for these extra copies of Sry. To start, we screened the rat SHR library using a hybridization probe made by amplifying the Sry HMG box from the male DNA with P1/M1 primer set. 19 positive clones were obtained. One of these clones, designated S167, contains approximately 750 base pairs. Our strategy is to generate a restriction map and to sequence S167 using silver sequencing. The sequence obtained will be used in homology searches of other copies of Sry. A Southern blot will confirm that this particular clone is male-specific (found only on the Y chromosome). The acquired information from S167 will help further our knowledge of the Y chromosome structure and organization.

The Effects of Glycosaminoglycan Supplementation on Proteoglycan Synthesis and Chondrogenesis by Human Chondrocytes in Culture. Katherina J. Montgomery, Amy L. Aulthouse, Ohio Northern University, Biology Dept, Ada OH 45810. k.montgomery1@onu.edu

Homeopathic agents reduce inflammation and pain in injured joints and also purportedly stimulate cartilage regeneration, as opposed to prescribed non-steroidal anti-inflammatory drugs (NSAIDs) that prevent cartilage repair by inhibiting chondrocyte metabolism. This study analyzed the effects of glucosamine sulfate, a homeopathic compound, on chondrocyte metabolism and matrix production. Human chondrocytes first grown in monolayer culture were then transferred into an agarose gel culture in order to regain the chondrocyte phenotype. The cells were treated twice weekly with Dulbecco's Modified Eagle Medium (DMEM) containing glucosamine sulfate (50mg/ml). Treatment was divided into four schedules: A) parallel untreated control B) treated four weeks consecutively C) treated two weeks then untreated two weeks D) untreated two weeks then treated two weeks. N=10 cultures for all groups except C (N=5). Proteoglycan synthesis was measured qualitatively by staining with alcian blue and comparing the number of cells and cell clusters with and without stained matrix. Motric activity was measured by counting the number of single cells versus cell clusters (indicates mitosis). The blue trypan exclusion assay determined cell viability. Comparisons among means were analyzed by ANOVA with LSD multiple comparisons post hoc test (p<0.05). An overall trend of decreasing mitosis approached significance between groups A and B (p=0.054). There was a significant decrease in matrix production between group A and every other group (p=0.005, p=0.037, p=0.003). The nearly identical matrix data from groups A and C (p=0.977) suggest no recovery from previous treatment. The results of this preliminary study suggest a decrease in mitosis and matrix production by cells treated with glucosamine sulfate with no recovery, regardless of when the substance is introduced during the culture period.

Characterization of a Rat SHR Y Chromosome Clone. Michelle Bowman (Dr. Amy Milsted, Bin Zeng), University of Akron, Dept. of Biology, Akron OH 44325-3908. bmschied4@yahoo.com

Previous research has shown that a focus on the Y chromosome increases blood pressure in the spontaneously hypertensive rat (SHR). A suggested candidate for this is Sry, since it encodes a transcription factor and is present in several copies. We are currently searching for these extra copies of Sry. To start, we screened the rat SHR library using a hybridization probe made by amplifying the Sry HMG box from the male DNA with P1/M1 primer set. 19 positive clones were obtained. One of these clones, designated S167, contains approximately 750 base pairs. Our strategy is to generate a restriction map and to sequence S167 using silver sequencing. The sequence obtained will be used in homology searches of other copies of Sry. A Southern blot will confirm that this particular clone is male-specific (found only on the Y chromosome). The acquired information from S167 will help further our knowledge of the Y chromosome structure and organization.
Molecular Biology II
02:00PM Saturday, April 1, 2000
Meyer Hall Room 126
Carol A. Heckman - Presiding

2:00 RANDOMLY AMPLIFIED POLYMORPHIC DNA MARKERS: CONSERVATION AND MANAGEMENT IMPLICATIONS. Wilson W. Mwanja, Les Kaufman; Paul A. Fuerst;  Ohio State University, Dept. Evolution, Ecology and Organismal Biology, Columbus OH 43210; ¹Boston University Marine Program, Dept. Biology. Mwanja.875@osu.edu

The fishery of the Lake Victoria basin, dominated by the Cichlid family of fishes, has suffered significant species loss due to overfishing, lake basin environmental changes, and introduction of non-indigenous species in most of the lakes in the basin. Among species severely affected were two endemic Tilapiine species, Oreochromis niloticus and Oreochromis esculentus locally known as ngege. Ngege has nearly been extirpated from Lake Victoria and currently survives as small isolated remnant populations in several small satellite lakes in which it was introduced from small brood stocks and coexisting with other introduced more ecologically versatile non indigenous congeners. Of immediate danger is genetic interaction with ngege's sister species, the introduced Oreochromis niloticus. In this study, Random Amplified Polymorphic DNA (RAPD) molecular markers were used to examine and characterize the remnant populations of ngege of Lake Victoria basin. Eight primers were used to generate 140 RAPD markers for seven ngege populations. Populations exhibited much higher between-population (Hs = 0.613) than within-population (Hz = 0.152) genetic diversity. Populations exhibited genetic differentiation with characteristic private alleles (29.2%) amongst all the populations. Populations that coexisted with O. niloticus showed relatively higher levels of polymorphism as well as gene diversity than those that did not coexist with O. niloticus. We suggest protection against interaction with O. niloticus in lakes in which O. esculentus is dominant or does not coexist with O. niloticus yet. With geographically close lakes enhancement of the genetic status of O. esculentus through limited gene flow between isolated populations is recommended. (Research was partially supported by grants from the National Science Foundation, The Rockefeller Foundation, and the Pew Charitable Trusts and the Columbus Zoo).

2:15 POTENTIAL TO ENHANCE NODULE OCCUPANCY OF SELECTED IMPROVED RHIZOBIUM STRAINS IN PHASEOLUS VULGARIS GROWN IN TROPICAL SOILS. Mari-Vaugh V. Johnson, Ohio University, Dept. of Environmental and Plant Biology, Porter Hall, Athens OH 45701. mj35592@ohio.edu

Rhizobia and legumous plants form a symbiotic relationship, in which the bacteria fix atmospheric nitrogen, making nitrogen accessible to the plants, and the bacteria are afforded protection and energy. A mutant Phascolus vulgarus has been identified, which does not allow nodulation with most strains of rhizobia. However, three permitted strains of rhizobia have been found that will nodulate the restrictive host: USDA4032, USDA4041, and USDA4017. A plasmid containing the Green Fluorescent Protein (GFP) has been inserted into the USDA4032 strain via tri-parental mating; this permits distinction between nodules formed by USDA4032 and those formed by native rhizobia. Soil samples containing native nodules were taken from various leguminous crop fields in Belize and Guatemala. Restrictive host plants were grown in the soil samples. Plants were inoculated with GFP containing USDA4032 Rhizobia two days after germination. Competition between native rhizobia and USDA4032 is being determined by the ratio of nodules occupied by GFP containing Rhizobia compared to those occupied by native rhizobia. The outcome of this experiment will determine the feasibility of improving nitrogen fixation in beans by increasing the occupancy of nodules on field grown beans with select rhizobial strains, to the exclusion of resident native rhizobia.

2:30 EXAMINING THE MOLECULAR SIGNALS EXCHANGED BETWEEN A MUTANT PHASEOLUS VULGARIS AND SPECIFIC RHIZOBIUM STRAINS. Sarah L. Bashore, Kent State University, Dept. of Biological Sciences, Kent OH 44242; ¹Ohio State University, Dept. of Evolution, Ecology and Organismal Biology. sbsashore@kent.edu

Corallorhiza species form a symbiosis with leguminous plants. The bacteria fix atmospheric nitrogen for the plant and the plant in turn supplies the bacteria with energy and protection. A mutant Phascolus vulgarus was found that restricts nodulation by native rhizobia strains. Laboratory screening showed that three rhizobium strains were able to overcome this mutation and nodulate the plant. The plant exudates of the wild type host were not able to induce nodulation of the restricted rhizobia strains. Nannizzi, a flavonoid that can activate the nod genes, also did not allow for the overcoming of the mutant and the result of nodulation. The steps involved in the nodulation process were examined using Green Fluorescent Protein (GFP). A plasmid with the GFP gene on it was inserted into a permitted strain via tri-parental mating. This allowed visibility of each individual bacterium. When the restrictive mutant host was inoculated with restricted strain, no infection threads were seen. This demonstrates that the mutation disrupts the nodulation process some time before infection threads form. This conclusion is supported by the fact that when the permitted strains nodulated the mutant plant they use infection threads. This shows that when the mutant plant is nodulated it utilizes the same processes as the wild type host. Currently, research is being done to determine which, if any, gene in the permitted strain controls the nodulation of the mutant plant.

2:45 THE EFFECTS OF TISSUE PROPAGATION OF COLD HARDY SABAL MINOR WITH PAL INHIBITOR. Katie E. Kettles; Alison L. Boutin; Sarah L. Whillette, (Dr. David Stiles, Dr. Frank L. Arancio; Dr. Kenneth G. Miami University, Botany Dept, Oxford OH 45066. Ketteke@muohio.edu

Growth of palms in different regions has shown that certain species and varieties of palms are more cold tolerant. Breeding experiments have lead to a cultivar of Sabal minor variety Louisiana (Bluestem palmetto), which is more cold tolerant than the wild type variety of S. minor. Tissue experiments have been generally restricted to coconut (Cocos nucifera), and oil (Olea europaea) palms. Our ongoing tissue culture experiments are focused on palm growth with the goal of producing more cold tolerant lines. This study focuses on the culture and propagation of the cold tolerant varieties of S. minor variety Louisiana. These plants are cultivated for horticulture use. With our research, we predict that making small changes to already used methods for palm regeneration will help to produce S. minor variety Louisiana palms. Seeds from S. minor and (Bluestem) palms were taken from plants with known origins. The seeds were soaked in a 10% bleach solution containing a trace of detergent. Fruit and vegetative tissue was cut into sections and placed in Murashige and Skoog media with varying amounts of hormones. Embryos were also placed in similar cultures. The tissues were kept at a constant temperature of 28°C. The fruits and vegetative parts of the plant turned a dark brown (almost black) color after a period of only a few days. Tissues were then transplanted as needed if contamination occurred. The PAL inhibitor (AIP-2-amino-indan-2-phosphonic acid) was ten introduced to prevent the browning from continuing. Efficiency of the AIP and the cold-tolerance of the two varieties of palms is currently being investigated.

3:00 CHLOROPLAST DNA SEQUENCES CONFORM A NORTH AMERICAN-HISPANIOPLAINT PHOTODYNOMIC CONNECTION IN THE VIOLA MACLOSKEYI COMPLEX. Bryan J. Rayo and Harvey E. Ballard Jr., Ohio University, Dept. of Environmental and Plant Biology, Porter Hall, Athens OH 45701. b357697@ohiou.edu

New World ‘sterile white’ violets (Viola subsection Strobosae Kupfer) comprise nine perennial species of mesic to wet habitats. The Viola macloskeyi complex is representative of a dispersed lineage that chose to clade on its own. The complex ranges from southwestern Oregon, transcontinental V. macloskeyi ssp. patterns (Sing.) Hutch., and V. domingensis of marshy openings in Dominican Republic cloud forests. Recent phenetic studies have failed to separate V. macloskeyi ssp. patterns from the Hispanic ‘endemics’ but sharply distinguish V. macloskeyi ssp. macloskeyi from this aggregate. Geographic variation has been recovered from microsatellite chloroplast spacer sequences for both populations and taxa in the macloskeyi complex. Midwestern V. macloskeyi and contemporary V. domingensis are virtually identical but diverse from northeastern and western North America populations, and from V. macloskeyi ssp. patterns. The Hispanic ‘endemic’ but sharply distinguish V. macloskeyi ssp. macloskeyi from this aggregate.

Geographic variation has been recovered from microsatellite chloroplast spacer sequences for both populations and taxa in the macloskeyi complex. Midwestern V. macloskeyi and contemporary V. domingensis are virtually identical but diverse from northeastern and western North America populations, and from V. macloskeyi ssp. patterns. The Hispanic ‘endemic’ but sharply distinguish V. macloskeyi ssp. macloskeyi from this aggregate.

3:30 A MOLECULAR PHYLOGENY OF CORALLORHIZA (ORCHIDACEAE) AND RELATED GENERA BASED UPON THE INTERNAL TRANSCRIBED SPACER (ITS) REGION OF NUCLEAR RIBOSOMAL DNA. Diana M. Senyo, John V. Freudenstein*, Kent State University, Dept. of Biological Sciences, Kent OH 44242; ¹Ohio State University, Dept. of Evolution, Ecology and Organismal Biology. dsenyo@kent.edu

Corallorhiza Gingsh (Orchidaceae) is comprised of eleven species of rosetteless, rosetteless, mycorrhizal orchids. Close related genera (Aplectrum, Cremastra, and Oreorchis) all possess leaves and roots. Because Corallorhiza is characterized by loss of structure, morphological evidence provides only weak support for the monophy of the genus. Reduced numbers of morphological characters have also made phylegetic reconstruction within the genus difficult. ITS sequences were generated for multiple accessions of Corallorhiza (representing 8 of 11 spp.), Aplectrum (1 of 1 sp.), Cremastra (2 of 2 spp.), and Oreorchis (1 of 16 spp.), for use in cladistic analysis. Coevia was used as outgroup. Data were obtained using PCR methods and automated sequencing, and analyzing using parsimony. Molecular characters provide support for the monophy of Corallorhiza. Relationships suggested among the genera are: Aplectrum (Cremastrea, Oreorchis, Corallorhiza). Within Corallorhiza, relationships among species are largely congruent with previous phylogenetic hypotheses, with the exception that C. mertensiana and C. bulbosa appear to have been derived from within C. maculata. Previous hypotheses have been C. bulbosa (C. bulbosa) and C. mertensiana (C. bulbosa). The monophy of species C. pallens, C. siphonifera, and C. zonata is not supported. Relationships among species are not supported, but relationships among species are largely suggested by the monophy of species C. pallens, C. siphonifera, and C. zonata is not supported. Relationships among species are largely congruent with previous phylogenetic hypotheses, with the exception that C. mertensiana and C. bulbosa appear to have been derived from within C. maculata.
3:45  PMA INDUCED DOWN REGULATION OF SPECIFIC PROTEIN KINASE C ISOZYMES AT VARIOUS TIME INTERVALS. Carol A. Heckman and Jason M. Urban, Bowling Green State University, Dept. of Biological Sciences, Bowling Green OH 43403-4400. heckman@bgsu.edu

We investigated the possible role of protein kinase C (PKC) in mediating morphological changes in the rat tracheal cell line, 100W. When treated with phorbol 12-myristate 13-acetate (PMA) these cells undergo similar actin-based changes as those mediated by rho-family G-proteins. Previous results revealed that PMA treatment stimulates ruffling at the 2-5 hour interval possible due to the down-regulation of certain PKC isoforms by phorbol esters. The purpose of this work was to determine whether any isoforms were depleted at the interval when ruffling peaks. Six isoforms known to be present, PKCα, β, δ, ε, γ, and ζ were quantified. Cell cultures were treated with PMA and collected at 0, 0.5, 2, 5, 10, and 15 hours. Isozyme presence was determined by immunoprecipitation of PKC with specific antibody and running the precipitated protein on SDS-PAGE, followed by exposing to a chemiluminescent film. There was a marked decrease in intensity of PKC-α, -ε, -ζ after 5 hours. Recovery of PKC-α was not observed after 10 hours. PKC-ζ showed a marked variation in the samples in down-regulation; decreasing, increasing, and decreasing at 5.10 and 15 hours respectively. The remaining isoforms (band t) displayed a constant intensity. It may be possible that the down-regulation of PKC-α, -ζ and γ are individually or collectively responsible for an increase in ruffling activity.

4:00  ARE MUTATIONS RESPONSIBLE FOR THE DIFFERENCES IN mRNA LEVELS OF THE RENIN AND ANGIOTENSINOGEN GENES IN RATS WITH THE SAME GENETIC BACKGROUND? Ashwini Viswanathan, Amy Milsted, University of Akron, Dept. of Biology, Akron OH 44325-3908. ashwini@uakron.edu

In a study conducted earlier to evaluate whether renin and angiotensinogen gene expression in females from two strains of rats (WKY and SHRy) that share the same autosomal and X chromosomes differ, it was found that the renin and angiotensinogen mRNA levels differ between the strains and appear to be regulated coordinately within each strain. A possible explanation is that a mutation in renin and angiotensinogen genes has occurred in one strain, but not in the other, or that some factor that co-regulates expression of both renin and angiotensinogen mRNA has undergone a mutation in only one strain. Our hypothesis is that mutations have not occurred in the 15 generations since the SHRy strain was developed (from the parental WKY strain). We are investigating whether mutations have occurred in the coding sequences or in the regulatory regions of these genes. We designed 13 primer sets for renin and 8 primer sets for angiotensinogen to cover the entire protein-coding region of each gene. Results of this study are expected to rule out mutations in renin and angiotensinogen as the cause of the phenotypic differences in gene expression between the WKY and SHRy females. When I compared the first 101 base pairs obtained by sequencing to already existing sequences of the rat angiotensinogen gene I found 100% homology. Therefore it proves that mutations may not be the reason for the differences in mRNA levels in genetically similar rats. Depending on these results we may also sequence into the regulatory regions.

4:15  EXTRACTION OF ACANTHAMOEBAE SP. DNA FROM PARAFFIN-EMBEDDED CONEAL TISSUE SECTIONS. Joe Wernet, Katherine Olsborn, Barbara Finik, Greg Borton, David Wilke, Paul Fuerst, and Thomas Byers. Ohio State University, Dept. of Molecular Genetics, 484 W. 12th Avenue Columbus OH 43210. Wernet@osu.edu

Acanthamoeba species are the most common cause of keratitis. This occurs primarily in soft contact lens users. The amoeba can colonize tissue, causing a painful, and potentially sight threatening infection which is difficult to treat. Effective treatment depends upon accurate diagnosis. As part of a study to examine the effect of excimer phototherapeutic keratectomy on Acanthamoeba keratitis (AK) in infected Chinese hamster, fixed and paraffin-embedded corneal tissue sections were examined for the presence of Acanthamoeba DNA. These hamster corneas were previously inoculated with Acanthamoeba and appeared to be severely infected when later examined using a slit lamp procedure. However, no Acanthamoeba were specifically observed. Therefore, to determine if the Chinese hamster AK cases were in fact the result of Acanthamoeba infection, and that they were present in corneal tissue, extraction of total DNA from multiple sections of the AK was developed (from the parental WKY strain). We are investigating whether mutations have occurred in the coding sequences or in the regulatory regions of these genes. We designed 13 primer sets for renin and 8 primer sets for angiotensinogen to cover the entire protein-coding region of each gene. Results of this study are expected to rule out mutations in renin and angiotensinogen as the cause of the phenotypic differences in gene expression between the WKY and SHRy females. When I compared the first 101 base pairs obtained by sequencing to already existing sequences of the rat angiotensinogen gene I found 100% homology. Therefore it proves that mutations may not be the reason for the differences in mRNA levels in genetically similar rats. Depending on these results we may also sequence into the regulatory regions.

4:30  THE EFFECT OF PAF INHIBITOR ON THE TISSUE CULTURE OF TRACHYCARPUS FORTUNII AND TRACHYCARPUS TAKIL PALMS. Alison L. Boutin; Katie E. Ketterl; Sarah L. Wilhoite; (Dr. Kenneth Wilson; Dr. David Francko), Miami University, Botany Dept, Pearsall Hall, Oxford OH 45056. boutinl@miamiohio.edu

Palms have potential of producing cold tolerant lines beneficial for horticultural use. Several current tissue culture projects are focused on developing means for propagation. With most palm tissue grown in culture, browning occurs very quickly. Browning is due to a phenolic pathway that produces degradation of cell wall material. A novel phenylalanine ammonia-lyase (PAL) inhibitor has been shown to be effective in preventing browning in tissue culture of red cabbage and duckweed. This project's objective is to test the same for palms. To yield the best regeneration tissue cultures of Trachycarpus fortunei and Trachycarpus takil, samples were grown in media containing varied hormone ratios. During the browning stage of the tissue cultures' growth, the PAL inhibitor was used. The PAL inhibitor tested in this study consists of 2-amino-indan-2-phosphonic acid (AIP). The effectiveness of the PAL inhibitor on browning in palm tissue culture as well as overall effectiveness of the regeneration of the samples will be evaluated.

4:45  TISSUE CULTURE PROPAGATION OF COLD-HARDY SABAL PALMETTO PALMS. Sarah Wilhoite, Alison L. Boutin, Katie E. Ketterl, David A. Francko, Kenneth G. Wilson), Miami University, Dept. of Botany, Pearson Hall, Oxford OH 45056. wilhois@muohio.edu

Field trial investigation into the cold-hardness of palms have shown that some species are viable in temperate regions. Tissue culture propagation of palms that exhibit enhanced cold tolerance may permit rapid production of cold tolerant lines for horticultural use. Previous research in palm tissue culture has been limited to Cocos nucifera, Phoenix dactylifera and Euclea sinuosa. We predict that slight adjustments in in vitro methods for palm embryo tissue culture will be applicable to mass propagation of Sabal palmetto. Seeds of a cold tolerant and a wild type Sabal palmetto were surface sterilized in a 10% bleach solution containing a trace of detergent. Embryos were then removed and placed in petri dishes on Murashige and Skoog media with varying amounts of hormones and kept at 28°C. Observations are being made regarding the success of embryogenesis among the various cultures. Cold tolerance screening of propagated palm tissue is under investigation.

Plant Systematics

09:00AM Saturday, April 1, 2000
MEYER HALL ROOM 128
SHAH CHITALE - PRENdING

9:00  SYSTEMATICS, BIogeOGRAPHY, AND EVOLUTIONARY TRENDS IN THE NORTH AMERICAN SPECIES OF FROELICHLIA (AMARANTHACEAE). Ross A. McCauley and Harvey E. Ballard Jr., Ohio University, Dept of Environmental and Plant Biology, Athens OH 45701. rmccaul@ohio.edu

As it is currently circumscribed, Froelichia Moench. is a genus of 15-20 species of annual and perennial herbs and shrubs which inhabit dry plains and coastal areas of the tropical and subtropical western hemisphere and temperate North America. This group is closely related to Comprehena (Globe Amaranth) and Alternanthera, both planted ornamental in North America. This work is part of a larger project to study the genus with the goal of determining species boundaries and determining phylogenetic relationships within the group. As a portion of this work, the North American species are here reviewed using a series of morphological and Internal Transcribed Spacer DNA datasets to distinguish species and reconfigure phylogenies. Preliminary analysis suggests there are four distinct species with one showing wide-ranging varietal distinctions. This is a reduction from the eight species once recognized for the region. The greatest species diversity and abundance occurs in the southwestern United States and northern Mexico where the species ranges all overlap. An apparent radiation occurred in a northward and eastward direction from this region distributing the genus in sand prairies over much of the Great Plains, the Midwest, and the southeastern coastal plain. Recent human introductions primarily along railroads in the early to mid-1900's have caused the range of a widespread weedy species, F. gracilis (Hooker) Moq. north and east to southern Ontario and the New England states. Two of the species, F. gracilis and F. floridana (Nutt.) Moq. occur in isolated localities here in Ohio.

9:15  A SYSTEMATIC STUDY OF THE NORTH AMERICAN YELLOW LADY'S SLIPPER ORCHIDS. Julie A. Morris and John V. Freudenstein, Kent State University, Dept. of Biological Sciences, Kent OH 44224. jmorris@kent.edu

The North American Yellow Lady's Slipper Orchids (Cypripedium) and their relatives present a large amount of variation that has caused significant taxonomic confusion when relying on morphological characters alone. In this study, the group was investigated using inter-simple sequence repeat (ISSR) markers. Samples were taken from multiple populations of C. parviforum var. parviforum and C. parviforum var. pubescens sampled from across their ranges, as well as from populations of C. kentuckiense, C. candidum and C. montanum. One population of C. californicum was included for outgroup comparison. Individuals were scored for the presence or absence of bands for 8 ISSR primers, and the data were analyzed cladistically using parsimony, and phenetically using UPGMA and neighbor-joining. The relationship of the ISSR patterns to variations in floral morphology was also investigated. Populations of C. pubescens and C. parviforum are intermixed in all of the analyses with very few patterns relating to morphological differences or geographic locations. This could mean that they should not be treated as distinct and that morphological groupings are based on consequences, or that both are experiencing secondary hybridization. Populations of C. kentuckiense fall in two clades associated with two different populations of C. pubescens. This could also be due to convergent evolution or occurrences of secondary hybridization. The distinctness of C. candidum and C. montanum from the rest of this clade is well supported.


ACCLIMATION OF WOODY PLANTS TO LOW LIGHT ENVIRONMENTS MAY INTERFERE WITH THEIR ABILITY TO ACQUIRE NUTRIENTS 
AND RESPROUT ABILITY OF LUPINUS PERENNIS. A. CHRISTINA WILLIAMS AND BRIAN C. MCCARTHY, OHIO UNIVERSITY, DEPT OF ENVIRONMENTAL AND PLANT BIOLOGY, ATHENS OH 45701. sw71857@ohio.edu

Studies suggest that seed banks play a vital role in forest recovery following meso-scale disturbances. However, few studies have focused on seed banks of eastern deciduous forests, particularly relative to site conditions and anthropogenic disturbance. Our objective was to examine the influence of harvesting and topography on seed bank (SB) and understory (US) composition in oak-hickory forests of southeastern Ohio. We established 192 2.5-m quadrats in regenerating clearcut (CC < 10 yr) and mature second-growth (SG > 125 yr) stands of similar aspects. In each quadrat, US vegetation was sampled in spring and summer 1999. SB samples (1,000 cm²) were collected in winter 1999 for greenhouse germination. US richness was greater in CC than SG quadrats (total S = 117 vs. 103; mean S = 14.99 vs. 12.80 (P < 0.05), respectively). SB richness was also greater in CC than SG samples (total S = 48 vs. 45; mean S = 2.59 ± 1.67 (P < 0.01), respectively). Stand age showed no significant difference with either CC or SG similar results between US and SB composition was low in both CC and SG ( < 30%). Aspect also influenced composition in CC and SG, with strong divergence of N- and S-slope samples ( < 40% similarity). Our results support others indicating low US-SB similarity and decreasing SB richness with forest successional change. The strong influence of disturbance and aspect on these strata emphasizes the importance of site conditions to forest recovery following disturbances such as clearcutting.

2:45 BIOMASS ALLOCATION AND RESPROUT ABILITY OF PRINCESS TREE (PAULOWNIA TOMENTOSA) ACROSS A LIGHT GRADIENT. A. CHRISTINA WILLIAMS AND BRIAN C. MCCARTHY, OHIO UNIVERSITY, DEPT OF ENVIRONMENTAL AND PLANT BIOLOGY, ATHENS OH 45701. aw71857@ohio.edu

Accumulation of woody plants to low light environments may interfere with their ability to resprout. We examined the patterns of biomass allocation and resprout ability of Paulownia tomentosa (Sorophylloidaeae) and selected species, in three light environments. Plants were grown in shade houses in a common garden with two replicates of three light treatments: ambient light, artificial edge, and shade. The shade treatment mimicked light patterns and levels typical of a deciduous forest understory. The artificial edge provided an intermediate light regime. Seedlings were clipped to ground level and representative plants were harvested periodically over the growing season. Plants allocated more to belowground biomass in the first weeks of the experiment and then shifted allocation to aboveground biomass. Plants grown in shade had lower relative growth rates (RGR) and higher specific leaf area (SLA), leaf area ratio, and leaf weight ratios than plants in the other light treatments. The ability to resprout was shown to be influenced by the amount of accumulated below ground biomass and this was lowest in the shade treatment, resprouting was reduced in low light. P. tomentosa responded holistically to the stresses of light and artificial grazing treatment. A pattern of increased root to shoot ratio with increased light follow that found in other studies. However, increased SLA was not correlated to an
increase in RGR. Also, correlation networks showed decreased integration in the stressful environment (shade). These results are contrary to previous studies of short-lived annuals, perhaps because P. tomentosa is a long-lived heliophile.

3:00 ANATOMY AND ELEMENT LOCATION IN ROOTS OF SUGAR MAPLE SEEDLINGS FROM LUMED AND UNLIMED FOREST SITES. Carolyn J. McQuattie*, Robert P. Long**, Thomas Hall*, USDA Forest Service, 359 Main Rd, Delaware OH 43015 and Pennsylvania Bureau of Forestry, cmcquattie.dept@fse.us

Poor survival of sugar maple (Acer saccharum Marsh.) seedlings on acid forest soils in north-central Pennsylvania may be due in part to the acidity or chemical composition of the soil. Lime application to these soils results in significantly greater survival of sugar maple seedlings. Anatomy, mycorrhizal colonization, and element microdistribution in roots of sugar maple seedlings from a limed site (pH 5.4) and a nearby unlimed site (pH 3.8) were compared. In 1996 and 1998, ten seedlings were collected from both sites in June and August. Representative fine roots from each root system were chemically fixed and resin-embedded for light and electron microscopy or quench-frozen and freeze-substituted for X-ray analysis. The remaining portion of each root system was stored for morphometric analysis. At all collection times, mycorrhizal colonization was significantly greater in roots from limed than from unlimed soil. In mycorrhizal root segments, fungal hyphae generally filled cortical cells of roots from the limed soil but were sparse in root cells from the unlimed soil. In June, roots from unlimed soil were more irregular in cross section and contained more dense compounds in endodermal cells than roots from the limed soil. In roots from the unlimed soil only (June 1998 collection), precipitates in xylem and cortical cells were detected as stained Mn, while Al was detected in xylem and root cells of mycorrhizal hyphae. Seedling survival at the unlimed site exhibited indicators of stress; low mycorrhizal colonization, increased root cell deterioration, and the presence of potentially toxic elements (Mn, Al) in root or fungal cells.

3:15 DENDROCLIMATOLOGICAL ANALYSIS OF WHITE OAK (QUERCUS ALBA L.) RADIAL GROWTH PATTERNS ACROSS A TOPOGRAPHIC MOISTURE GRADIENT IN SOUTHERN OHIO. Darrin L. Rubino and Brian C. McCarthy, Ohio University, Dept of Environmental and Plant Biology, Athens OH 45701, drubin09@ohio.edu

Annual tree growth represents an aggregate response to numerous biotic and abiotic factors. Understanding how these factors influence growth rates is a major objective of dendroclimatological or tree-ring studies. The goal of this investigation was to determine the influence of moisture availability and climate on radial growth patterns of white oak growing in mixed-oak forests of southern Ohio. Using accurately dated and measured tree rings, we analyzed 120 white oak growing across an integrated moisture index (IMI) range. The IMI is a computer-generated GIS model which combines topographic and edaphic features into a moisture index scale. To observe radial growth patterns across IMI classes (xeric, intermediate, and mesic), we modeled tree growth using orthogonal polynomials. Radial growth trends were significantly greater (ANOVA; P = 0.0365) in mesic sites than in xeric sites. Decadal radial-growth trend analysis revealed significant (P < 0.05) differences in growth rate among the various IMI classes, but consistent patterns were not observed among all decades. Climatic analysis found annual growth increments to be significantly correlated (P < 0.05) with monthly drought severity, precipitation, and temperature. The number of significant correlations between climatic parameters and annual growth varies among the IMI classes and thus suggests that climate-growth relationships vary across IMI. Growth rates during years of drought and high precipitation also differed significantly across IMI, but no consistent pattern was noted among the different IMI classes. We hypothesize that radial growth and IMI may be loosely associated, but other factors may have a greater influence on radial growth rates.

3:30 LANDSCAPE CULTIVATION OF COLD-HARDY PALMS IN SW OHIO: MI- MICROCLIMATE INFLUENCES. David A. Francko and Sarah Wiholme, Miami University, Dept. of Botany, Oxon OH 45056, franskod@muohio.edu

Survivorship/growth of several cold-hardy palm species was evaluated at the Hardy Palm Demonstration Plot (HPDP; of Miami University, Oxford OH 45017) and in home garden plots a few km southwest. Oxford lies within USDA Plant Hardiness Zone 6a, but data on 1998-99 daily temperatures and winter minima for 1989-99 demonstrated that microclimates vary from site to site. Kriging analysis revealed annual growth increments to be significantly correlated (P < 0.05) with monthly drought severity, precipitation, and temperature. The number of significant correlations between climatic parameters and annual growth varies among the IMI classes and thus suggests that climate-growth relationships vary across IMI. Growth rates during years of drought and high precipitation also differed significantly across IMI, but no consistent pattern was noted among the different IMI classes. We hypothesize that radial growth and IMI may be loosely associated, but other factors may have a greater influence on radial growth rates.

345 POTENTIAL REDISTRIBUTION OF TREE SPECIES UNDER CLIMATE CHANGE IN THE EASTERN UNITED STATES. Louis R. Iverson, Anantha M. Prasad, USDA Forest Service, Northeastern Research Station, Delaware OH 43015. liversonl@al.ars.usda.gov

Global climate change would have profound effects on the earth’s biota, including large redistributions of tree species and forest types. We used DISTRIB, a deterministic regression tree analysis model, to examine environmental drivers related to current forest species distributions and then model possible future distributions under five climate change scenarios associated with a doubling of atmospheric CO2. Potential shifts of 80 common tree species in the eastern United States were evaluated based on more than 100,000 plots and 33 environmental variables related to climate, soils, land use, and elevation. Regression tree analysis was used to derive prediction rules from current species-environment relationships. These rules were used to replicate the current distribution and predict the future potential distributions for more than 2,100 counties east of the 100th meridian. About 35 tree species were projected to expand in range and/or importance by at least 10%; 31 species could decrease in range/importance by at least 10%. Several species (Populus tremuloides, P. grandidentata, Acer saccharum, Betula papyrifera, Thuja occidentalis) could be extirpated from the United States. The five scenarios were generally in agreement with respect to trends in potential future distributions. Actual species and forest-type redistributions will be controlled by migration rates attainable through fragmented landscapes, another area of active research.

AQUATIC BIOLOGY 09:00AM SATURDAY, APRIL 1, 2000 MEYER HALL ROOM 113 SUSAN CARTY - PRESIDING

9:00 BACTERIAL AVAILABLE PHOSPHATE (BAP) - A NOVEL APPROACH TO ESTIMATE AMBIENT PHOSPHATE CONCENTRATION IN FRESHWATER COMMUNITIES. Xuejiao Gao and R. T. Heath, Kent State University, Kent OH 44242, gao@kent.edu

The concentration of phosphate is known to control phytoplankton growth in freshwater communities, but estimation of the concentration of this critical nutrient is uncertain, and estimates often range over two orders of magnitude. Here we propose a novel approach to determine ambient phosphate concentration through examination of bacterial phosphate uptake, known to be responsible for most of the community phosphate uptake. Velocity of net uptake of phosphate was estimated from the bacterial growth rate (3H-thymidine and 3H-leucine methods) minus losses due to release and grazing. Using radiometric procedures we found only insignificant losses of phosphate by release and by grazing. BAP was estimated from velocity, where k is the proportional uptake rate constant. We assumed there was no discrimination between 31P- and 32P-phosphate. We found that in most cases, BAP was lower than estimates from both soluble reactive P (SRP) test and Rigler’s bioassay. This suggests that the majority of SRP may not be available to bacteria and that Rigler’s bioassay estimate was only an upper limit. This study was supported by Ohio Sea Grant R/ER-43.

9:15 MICROBENTHIC CARBON DYNAMICS IN THE OLD WOMAN CREEK COASTAL WETLAND. John A. McCreary and Robert T. Heath, Kent State University, Dept. of Biological Sciences, Kent OH 44240-0001, jmcgree@kent.edu

Previous observations of field samples indicated the relationship between benthic bacteria and their potential grazers was unclear. The purpose of this study was to determine whether benthic bacterial productivity was controlled through resource availability (i.e. “bottom-up” control) or protistan bacterivorous grazing (i.e. “top-down”). We conducted field observations and laboratory experiments to examine the interrelation of organic carbon (NOM detection by hot catalytic method), bacterial bacterial numbers (acridine orange staining), bacterial productivity (3H-lucine method), protistan numbers (five counts) and protistan grazing rate (fluorescein-tagged sediment). Sites at Old Woman Creek (LOC) were project to the shores of the microalga Nymphastrum lutea (American water loto). Laboratory sediment microcosms differed in the amount of dissolved organic carbon (buffered acetate) added by different numbers of Mytilus leaf disks placed on their surface. In both field and laboratory observations bacterial numbers and productivity increased as organic content increased. Benthic protistan bacterivory accounted for only minor losses of bacterial production (typically << 1%). We conclude that benthic bacterial productivity and numbers were controlled through “bottom-up” rather than “top-down” processes. This study was supported by Ohio Sea Grant R/ER-43.

9:30 VARIATIONS IN EPiphytic DIATOM POPULATIONS OF NELUMBOMELLOTA AT OLD WOMAN CREEK. Sharon E. Reed and Brian C. McCarthy, Ohio University, Dept. of Botany, Oxford OH 45056, reedsh2@heidelberg.edu

The studies of host specificity and population dynamics have produced contradictory results. Epiphytic diatoms were sampled from Nelumbo lutea in Old Woman Creek Estuary during June, July, and August of 1999. These samples were cleaned and then viewed at 1000x Magnification to determine the genus and species. This study investigates three different aspects of these issues. First, it reveals which epiphytic diatoms occur on the plant.
Nelumbo lutea in Old Woman Creek National Estuarine Research Reserve. Second, it makes a spatial comparison of populations at the inlet of the estuary compared to the outlet. Third, it describes the timing of blooming on Nelumbo lutea from two sites collected in 1983 and 1999. The dynamics of the population are explored to seek out future areas of research to explain variations in populations.

6:45 EFFECTS OF DIFFERENT VEGETATIVE SUBSTRATES ON ALGAL COMPOSITION IN VERNAL POOLS. Robert G. Verb, Dale A. Casamatta, and Morgan L. Vis. Ohio University, Dept. of Environmental and Plant Biology, Athens OH 45701. n-1359668@ohio.edu

Vernal pools represent one of several types of temporary aquatic habitats found in Ohio. These may occur as ephemeral mesohabitats in a wide variety of community types. Field observations identified four types of vernal pools from community types throughout southeastern Ohio. For this study, pools were categorized by the type of dominant plant material composing their substrate. The categories were as follows: 1. Emergent macrophytes (M): 2. Mix deciduous forest leaves and debris (F); 3. Pinus spp. needles (P); 4. Old field herbs (OP). A study was designed to examine if these varying substrate types lead to the production of different leachates, and if there was a resulting variation in the algal community composition. Vernal mesocosms were constructed and lined with one of the four substrate categories listed above. These mesocosms were inoculated with an algal cocktail consisting of field-collected samples from a wide spectrum of community types. Controls consisted of mesocosms with and without algae, but no substrate added. The algal community composition and environmental parameters were tracked over eight weeks to examine if the type of algal substrate could cause differences in leachate community composition. After 56 days, all conditions except P had significantly greater (p<0.05) algal biomass than the control. Further, M, F, and OP mesocosms all had significantly (p<0.05) greater biomass than P. A total of 81 algal taxa were identified. Chlorophytes were most abundant and diverse (41 taxa), followed by Bacillariophyta (20), Bacillariophyceae (10), Euglenophyta (11), Chlorophyta (3), Cryptophyta (2) and Dinophyta (5).

10:00 GENETIC VARIATION AMONG INDIVIDUALS OF BATRACHOSPERMUM HELMETSUMOS (RHODOPHYTA) WITHIN AND AMONG STREAM REACHES THROUGHOUT NORTH AMERICA. Melissa M. Hall & Morgan L. Vis. Ohio University, Dept of Environmental & Plant Biology, Athens OH 45701. mnh6723@ohio.edu

A relatively new molecular marker technique, inter-simple-sequence repeats (ISSR), was used to assess the genetic variation of the freshwater red alga Batrachospermum helmetsumos within a stream reach in southeastern Ohio and among streams throughout North America. For the intraspecific sub-study, 58 individuals were collected from an approximately 200m stream length. Individuals appeared to be aggregated into three distinct areas, with no plants between areas. Using three primers, 100 polymorphic bands were scored. Although it was hypothesized that genetic variation would reflect geographic distance, the results showed six distinct genetic groupings, some of which consisted of geographically separated individuals. Overall, genetic diversity was greater among individuals than between geographic and genetic groups. To assess genetic variation among stream reaches, ten streams (3 from OH and each one from MA, MI, RI and CT) were sampled throughout the alga's known distribution in North America. Approximately 20 individuals were collected per stream for ISSR analysis. Five primers were used to examine variation among all individuals. Sequence data from these populations show TN as basal among all individuals. Sequence data from these populations show TN as basal, and show more differentiation among geographic and genetic groups. To assess genetic variation among two seasons before collecting additional specimens in 1996. Our collecting utilized standard aerial nets and a newly-modified version of the Towne's malaise trap for larval capture, mark, recapture studies. This dragonfly has narrow habitat requirements. It requires first order streams that are spring fed and that maintain continuous flow. These streams may be less than 30 cm wide and only a few cm deep. The dragonfly also prefers shaded sites, with no plants between areas. Using three primers, 100 polymorphic bands were scored. Although it was hypothesized that genetic variation would reflect geographic distance, the results showed six distinct genetic groupings, some of which consisted of geographically separated individuals. Overall, genetic diversity was greater among individuals than between geographic and genetic groups. To assess genetic variation among stream reaches, ten streams (3 from OH and each one from MA, MI, RI and CT) were sampled throughout the alga's known distribution in North America. Approximately 20 individuals were collected per stream for ISSR analysis. Five primers were used to examine variation among all individuals. Sequence data from these populations show TN as basal among all individuals. Sequence data from these populations show TN as basal, and show more differentiation among geographic and genetic groups.
3:20  THE EVOLUTION OF SIMULTANEOUS HERMAPHRODITISM IN THE FRESH-WATER MUSSLE GENUS TOXOCLASMA (BIVALVA: UNIONIDAE). Angela M. Fetty (Walter R. Hoeh), Kent State University, Dept. of Biological Sciences, Kent OH 44242. Afetty7013@aol.com

Taxa that are reproductively variable have provided biologists with the ability to test mechanisms of evolutionary change. North American freshwater mussels, a primarily di-ecious group, are an exceptionally useful group for investigating mating system transitions (e.g. from dioecy to simultaneous hermaphroditism [SH]). Studies of unionid genera consisting of both dioecious and hermaphroditic species offer significant opportunities for increased comprehension of the ecological, genetic, historical, and morphological factors involved in the origin and maintenance of SH. The freshwater mussel genus Toxoclasma currently contains eight recognized species. T. coruscans, T. cylindritis, T. invalidus, T. meansi, T. parvus, T. paulus, T. pulchra, and T. toxoclasmoides (T. parvus is the only hermaphroditic species). Species delineation and interspecific relationships within Toxoclasma, currently based on morphological data sets, are questionable and have hindered the examination of mating system transitions in this genus. The goal of this project is to use phylogenetic analysis of DNA sequence data (from the cytochrome c oxidase subunit I [COI] gene) to (1) estimate the evolutionary relationships among multiple populations representing the species within Toxoclasma and (2) use this estimate to infer the minimum number of mating system transitions that occurred within Toxoclasma. The estimation of the phylogenetic relationships among the species within Toxoclasma is a necessary first step toward gaining an understanding of the events that led to the origin of SH in this genus. To date we have extracted total DNA. PCR amplified a portion of the COI gene, gel purified the PCR products, and ran sequencing reactions for both strands of the PCR products. We have sequence from 42 individuals, representing 42 populations.

3:25  INFLUENCE OF ZEBRA MUSSELS, DREISSENA POLYMORPHA, ON PHY-TOLANKTON PHOTOSYNTHESIS IN LAKE ERIE. Robert T. Heath, X. Gao, H. Wang, and V. Mattson, Kent State University, Dept. of Biological Sciences, Kent OH 44242. rheath@kent.edu

Although much attention has been given to investigation of population- and community-level effects of zebra mussels (D. polymorpha), relatively little attention has been given to ecosystem-level effects of this non-indigenous mollusc. Here we report the possible effects of these molluscs on photosynthetic capabilities dependent on the physiological responses of phytoplankton in the western basin of Lake Erie. Phytoplankton were collected in 8 carboys from the 1 m stratum 9 km west of Rattlesnake Is. and 2 km north of Niagara Reef, a region with a silty sediment and relatively unmixed LS. Fifteen ZM (1.3 cm 1.7 cm in length) collected from rocks near Green LS were washed, and placed in some carboys (exp.) and not in others (contr.). Carboys were incubated under laboratory conditions approximating ambient light and temperature. After 24 hours, photosynthetic parameters were determined. The photosynthetic efficiency of the phytoplankton in the carboys was determined in a "photosynthetic" that controls temperature at ambient T and varies light intensity of photosynthetically active radiation from 0 to 700 μE sec m⁻². We found that in the presence of ZM, Pₐ and is significantly decreased, while b increased. This indicates that the presence of ZM may decrease the photosynthetic response of phytoplankton communities they encounter not only by decreasing the number of phytoplankton but also by altering their physiology. This study was supported by Lake Erie Protection Fund Grant Nos. 97-18 and 98-06.

3:30  SELECTIVITY OF FISH SIZE AND SPECIES COMPOSITION FOR THREE TRAP NET DESIGNS. Daniel E. Shoup, Robert E. Carlson and Robert T. Heath, Kent State University, Dept. of Biological Sciences, Kent OH 44242. dshoup@kent.edu

TRAP NET DESIGNS. Daniel E. Shoup, Robert E. Carlson and Robert T. Heath, Kent State University, Dept. of Biological Sciences, Kent OH 44242. dshoup@kent.edu

Large mesh/throat nets had significantly larger total fish catches, while small mesh/throat nets caught significantly smaller fish. Large mesh/throat nets had significantly larger total catch per unit effort (CPUE) than small mesh/throat nets. Some species-specific CPUE's also appeared to differ significantly between some net sizes. Larger mesh and throat sizes should not be directly compared with each other, and that multiple mesh/throat sizes should be utilized when a more complete picture of fish size and abundance is desired. This research was supported in part by Sigma Xi, The International Research Society.

3:40  GENETIC STUDIES OF POPULATION STRUCTURE IN THE LAKE STURGEON OF THE GREAT LAKES. Tara Rose, Ted M. Cavender, Brian Mark and Paul A. Fuerst, Ohio State University, Dept. of Evolution, Ecology and Organismal Biology, Columbus OH 43210. Rose.256@osu.edu

Information about the genetic population structure of the lake sturgeon, Acipenser fulvescens, in the Great Lakes is critical for effective management of this locally endangered species. Questions concerning the degree of population differentiation and the similarity of populations are relevant in making decisions concerning possible restocking or supplemental stocking of populations. Genetic differences between localities within the lake sturgeon population have been examined using RAPD (Randomly Amplified Polymorphic DNA) analysis and microsatellite locus comparison. A set of fish representing several localities throughout the Great Lakes has been analyzed. These localities include the Wolf River in Wisconsin, the Ship Creek in Alaska, and the Chippewa and Lake Erie. Population distances based on allelic sharing and allele frequency were determined and population relationships analyzed using UPGMA cladograms. The RAPD studies show substantial differences between localities, and an East-West component of overall differentiation. The analysis of these data by coistic methods shows that genotypes are shared between some populations. An analysis of the same localities using microsatellite DNA shows a similar clustering of populations. The data should be expanded with additional populations and more loci to confirm the preliminary findings. The results suggest that transplantation of stock must be undertaken with care. (We thank the Wisconsin, Michigan and Ohio DNRFs for assistance in collecting and maintaining the USFWs, Ohio Sea Grant and the National Science Foundation for partial support of the work reported here).

3:45  MICROSATellite ANALYSIS OF FORMALIN TREATED LAKE ERIE STURGEON TO DETERmINE THE GENETIC VARIABILITY FOLLOWING A POPULATION CRASH. Julie L. Maybruck, and Paul Fuerst, Ohio State University, Dept of Molecular Genetics, Columbus OH 43210. Maybruck.2@osu.edu

Populations of the lake sturgeon, A. fulvescens, suffered a severe reduction in numbers when the value of sturgeon flesh and caviar was realized in 1898. By the end of the 19th century, the population in Lake Erie alone was reduced by 80%. A decline of this magnitude suggests that a population bottleneck may have occurred. To assess this possibility, a temporal genetic study examining the genetic variation of Lake Erie sturgeon is being conducted. Formalin treated specimens collected throughout the 20th century were obtained from The Ohio State University Museum of Biodiversity. These samples represent part of a larger study to determine if a population bottleneck has occurred. Difficulties in obtaining DNA from formalin have been reported. For example, Giorgi et al. (1994) found that formalin fixation caused DNA sequence changes. These results were confirmed by a study conducted in our lab, indicating that sequence comparisons are unreliable. However, no insertions or deletions events were observed in the mitochondrial analyses conducted in our lab nor were they reported by Giorgi et al. in their study of formalin treated nuclear DNA. Since microsatellite allele occurrence changes by size in nuclease sequence, microsatellite DNA analysis of formalin fixed material was investigated. It was first necessary to determine the reliability of the microsatellite data from formalin treated specimens. A comparative study of microsatellite data between matched ethanol fixed and formalin treated specimens from the same individual was conducted. The banding patterns of ethanol and formalin treated samples from the same individual were found to be the same. Allele sizes were not changed, Microsatellite analysis appears to be a reliable and more appropriate technique for the analysis of the formalin treated specimens. Results using this method will be presented. (Supported by funds from the Ohio Sea Grant College Program).

4:00  EFFECTS OF PREY AVAILABILITY ON LARVAL GIZZARD SHAD (DOROSOMA CEPIDAZUM) PREY SELECTIVITY. David W. Paul, Maria J. Gonzalez and Amina I. Pollard, Wright State University, Dept. of Biological Sciences, 3640 Colonel Glenn Hwy, Dayton OH 45435-0601. dpaul@heitech.com

The objective of this study was to compare prey selectivity by larval gizzard shad in a hypereutrophic reservoir (Acton Lake, Ohio) between years with different zooplankton composition (1996 and 1997). Zooplankton abundance was higher in 1996 than 1997. Rohlfers dominated the zooplankton community (48.23% in 1996 and 92.31% in 1997) when larval gizzard shad were present in the lake. The proportion of cladocerans and small copepods was higher in 1996 (31.6%) than in 1997 (6.7%). Mean density of larval gizzard shad was lower in 1996 (2.2 ind/m³, max 10.4 ind/m³) than in 1997 (7.4 ind/m³), max 35.6 ind/m³). We calculated Chesson's Prey Selectivity Index on three larval fish sizes (<10.5 mm TL, 10-15.0 mm TL and >15.1 mm TL). In 1996, larval gizzard shad <10.5 mm TL positively selected for nauplii, Asplanchna sp., Polyarthra sp. and Synchaeta sp. The medium size-class 10-15.0 mm TL selected cyclopoids, nauplii and Asplanchna sp. Larvae greater than 15.1 mm TL positively selected for Daphnia parvula, cyclopoids, nauplii and Asplanchna sp. In 1997 larvae <10.5 mm TL positively selected for nauplii, Asplanchna sp., Polyarthra sp. and Synchaeta sp. The medium size class selected for Asplanchna sp., Polyarthra sp. and Synchaeta sp. Larvae >15.1 mm TL positively selected for Daphnia parvula, cyclopoids, nauplii and Asplanchna sp. Our results suggest that rotifers, which are commonly excluded from studies of feeding preference, may be important food sources of gizzard shad throughout larval life stages, in particular, when the availability of cladocerans and copepods is low.
PRELIMINARY FINDINGS OF NONTARGET FISH DISPERAL VIA LIVE BAIT SHIPMENTS IN OHIO. Fred L. Snyder, Ohio Sea Grant Extension, Camp Perry, Bldg. 3, Rm. 12, Port Clinton OH 43452. snyder.8@osu.edu

Shipments of live fishing bait, particularly minnows, are widely suspected of transporting nontarget fish species into Ohio, raising the possibility of introducing these species into local waters. A study begun in 1998 purchased minnow samples from retail outlets along Lake Erie and in the Miami, Scioto, Muskingum and Ohio River valleys. Outlets were selected from a license list to maximize geographic coverage and to sample products from major wholesale distributors. Seventeen percent of samples collected in 1998 contained nontarget fishes, excluding mixtures of advertised minnow species that were considered to have originated from cross-tank mixing within the stores. No designated aquatic nuisance species were found in the samples, although alewife (Alosa pseudoharengus) were observed in one tank. All nontarget fishes were species considered native to Ohio. Thirty-nine percent of samples collected in 1999 contained nontarget fish species. Particular concern arose when four of ten outlets along Lake Erie visited in 1999 had tanks containing sometimes substantial numbers of western banded killifish (Fundulus diaphanus menomae), an Ohio endangered species. With this finding, the Ohio Department of Natural Resources ordered 183 bait dealers to remove all killifish from their tanks. ODNR is reviewing potential new live bait regulations to minimize the movement of nontarget fish species into Ohio.

LAKE VICTORIA REGION: LARGE LAKES AND THEIR SURROUNDING MINOR WATER BODIES AS A NATURAL LABORATORY FOR ADAPTIVE ECOLOGY, SPECIATION AND EVOLUTION OF FISH SPECIES. Paul A. Fuerst, Les Kaufman and Wilson W Mwanja, Ohio State University, Dept. of Molecular Genetics, Columbus OH 43210, fuerst.1@osu.edu

The Lake Victoria Region (LVR) is a unique zoogeographical area. The LVR now comprises five large lakes, Victoria, Kyoga, Edward, George and Kivu, each containing a repeated set of fish faunal groups that share common origins. Evolution has repeated itself numerous times - affected by evolutionary parallelism and dispersal. Historically the LVR was more expansive, with adjoining east-west rivers, breaking up following tectonic and volcanic activity. The lakes, though zoogeographically similar, are geologically, hydrologically and limnologically different. A variety of small Acasatellite® lakes exist around larger LVR lakes. Exploratory surveys reveal significant portions of the cichlid fauna considered extinct in large lakes may survive in satellite lakes. Some satellite lakes, such as the Nabusagabo lakes, retain a small number of species found nowhere else. Other satellite lakes, such as the Kyoga lakes in central Uganda, have a wide variety of species including undescribed species that seem to be sister species to extinct taxa from larger lakes. Microsatellite DNA markers which are shown to differentiate populations and species, are being used to investigate phylogenetic and macroevolutionary questions in the LVR haplochrome species. Understanding the evolutionary and hydrological processes shaping the LVR system depends on determining whether the species in small water bodies have recent origins or reflect longer historical changes. Conservation of aquatic biodiversity requires knowledge about the species and relationships among extant evolutionary and ecological groups. Molecular information will directly impact decisions about fisheries management and conservation practices in the LVR especially for the closely related species found in this geologically vast area.

THE INFLUENCE OF DIET ON THE GROWTH OF ANURAN LARVAE (RANA PIPIENS). Alex Collier, Dale A. Casamatta, and Lowell P. Orr, Kent State University, Dept. of Biological Sciences, Kent OH 44240. acollier@kent.edu

Anuran larvae play an important role in freshwater systems. They filter phytoplankton and other suspended particles from the water column and use their keratinized beaks and denticles to scrape, bite and ingest epiphytic algae and other vegetation. We compared the ability of Rana pipiens larvae to ingest four species of green algae collected from area wetlands. Sixty tadpoles were placed in each of the following monocolonies: Hydrodictyon reticulatum, Ulothrix aequalis, Zygnema pectinatum, and Spirogyra crassa. Treatment tanks containing larvae, algae and 8 L of filtered (1.0mm pore) rainwater were equipped with aerators and housed in a greenhouse during the 30 day investigation. We collected ten larvae at five-day intervals and recorded their size, weight and developmental stage. The feeding rate for each culture was measured directly as the rate at which particulate matter entered the gut. Ash-free dry weight was used to estimate the total biomass ingested within a 4h interval. Data were analyzed using a one-way ANOVA (p = 0.00) and Student-Newman-Keuls post hoc test when appropriate. Tadpoles fed Zygnema pectinatum grew more slowly than larvae from other treatment groups. Conversely, larvae collected from Spirogyra crassa tanks were on average significantly longer and heavier than tadpoles from other treatment groups. Our data suggest that there are nutritional differences between the four species of filamentous green algae selected for this experiment.

ANNUAL BUSINESS MEETING FOR MEMBERS ONLY:

There shall be an Annual Business Meeting for the membership of the Academy during the Annual Meeting. The business session shall be conducted in accordance with the most recently published edition of “Robert’s Rules of Order”. The order of procedure shall be as follows:
A. A Call to Order by the President.
B. A summary of the Minutes of the previous meeting shall be read by the Secretary.
C. Presentation of the report of the tellers of the election of officers and other positions.
D. Voting on any proposed amendments to the Constitution or By-Laws.
E. Business from the floor.
F. Adjournment.