The Fifth Annual

Science Research Symposium

University of Illinois at Springfield

Health and Sciences Building
22 April 2005

Acknowledgments

Organizers: Nada Chang and Mike Lemke

Sponsors and Facilitators: Biology Department, Chemistry Department, Clinical Laboratory Science Department, The Biology Club, Chemistry Club, Margot Duley (Dean, CLAS), UIS Research Board, UIS Speaker’s Award Committee, College of Liberal Arts and Sciences

Awards for Best Student Papers and Posters: Education Awards for Outstanding Achievement, compliments of Scientific American

Judges: Amy McEuen (BIO), Lucia Vazquez (BIO), Keenan Dungey (CHE), Wayne Gade (CLS)
Doyn Kellerhals (M.Sc. Student, BIO), Michael Rossetto (M.Sc. Student, BIO).

**Note:** In this program, the name of the presenter is underlined and “*“ indicates student.
8:30-9:30  Information Table & Refreshments
Health and Sciences Building Art Gallery Lobby

MORNING ORAL PAPER SESSION (9:00-10:30 a.m.)
Chemistry, Computer, and Mathematical Sciences
Brookens Auditorium, Lower Level Brookens Library

Moderators:  Handel Metcalf
            (UIS CAP Biology B.Sc. Student)
            Laura Petrea
            (UIS CAP Biology B.Sc. Student)

9:00-9:10  OPENING REMARKS  -  Dr. Margot Duley, Dean of College of Liberal Arts & Sciences, UIS

9:10-9:30  ORDERS IN CHAOS.
            Chan, Hei-Chi.  Mathematical Sciences Program, University of Illinois at Springfield.

9:30-9:50  PARALLEL FAST FOURIER TRANSFORM ON A CLUSTER.
            Zhang, Jingyu, and Michael Stults.  Department of Computer Science, University of Illinois at Springfield.

9:50-10:10  COBALT VANADATES FOR ENERGY STORAGE.

10:10-10:30  SPEED BUMPS, NEURAL NETS, ANGELS AND MORAL AGENCY: CAN SILICON BE HELD RESPONSIBLE?
            Larson, David¹, and Keith Miller².  ¹Management Information Systems and ²Computer Science Department, University of Illinois at Springfield.

10:30  Refreshment Break
Health and Sciences Building Art Gallery Lobby

10:30 - 12:00  POSTER SESSION
2nd Floor Hallway, Health and Sciences Building
(Though posters will be on display throughout the day, this is the time to meet poster investigators and discuss their work).

Now THAT’S some serious computing!
POSTER PRESENTATIONS

BI OLOGICAL SCIENCES

[1] DEVELOPMENT OF A PCR PRIMER FOR LOCATING ANAEROBIC AMMONIUM OXIDIZING PLANCTOMYCETE BACTERIA FROM THE ILLINOIS RIVER
Boltuc, Nicholas¹, James Bonacum², and Michael J. Lemke². ¹Springfield High School, Springfield, IL; ²Biology Department, University of Illinois at Springfield.

[2] DISTRIBUTION OF BIGHEAD AND SILVER CARP THROUGHOUT THE UPPER MISSISSIPPI RIVER SYSTEM
Cochran, Matthew D.*¹ and Michael J. Lemke². ¹FishPro / Cochran & Wilken, Inc., Springfield, Illinois, 62703; ²Biology Department, University of Illinois at Springfield, Springfield, IL 62703.

[3] A MASS SPECTROMETRIC DETERMINATION OF ORGANOHALIDES IN FISH TISSUE
Johnson, Stephen R.*¹, and Harshavardhan D. Bapat. Chemistry Program, University of Illinois at Springfield.

[4] PROGRESS TOWARD THE DETERMINATION OF SULFAMETHOXAZOLE IN TREATED AND NATURAL WATERS
Kravanya, Lyn*¹, and Ed Acheson. Department of Chemistry, Millikin University, Decatur, Illinois 62522.

[5] MANAGEMENT AND RESTORATION STRATEGIES FOR THE EMQUION FLOODPLAIN OF THE ILLINOIS RIVER, ILLINOIS
Lemke, A. Maria¹, Michael J. Lemke², Keith Miller², and Douglas Blodgett³. ¹The Nature Conservancy, Illinois Chapter, Lewiston, IL; ²Emiquon Field Station, University of Illinois at Springfield.

[6] ARCHAEA DIVERSITY ON DECOMPOSING SILVER MAPLE (Acer saccharinum) LEAVES ON THE ILLINOIS RIVER FLOODPLAIN
Paver, Sara F.*¹, Doyn M. Kellerhals*, and Michael J. Lemke. Biology Department, University of Illinois at Springfield.

[7] PHYLOGENETIC STUDY OF WHITE OAKS BASED ON NUCLEAR GENE ANALYSIS
Petrea, Laura*¹, and Lucia Vázquez. Biology Department, University of Illinois as Springfield.

[8] A MODEL OF NUTRIENT MITIGATION IN SMALL-SCALE RESTORED WETLANDS
Tanton, Rusty*¹, Keith Miller², and Michael J. Lemke³. ¹Biology and ²Computer Science Departments, University of Illinois at Springfield.

[9] Nautilus: PHYLOGENETIC STUDY
White, A. Jeannette*¹, and James Bonacum. Biology Department, University of Illinois at Springfield.

CHEMISTRY

[10] SYNTHESIS AND SEPARATION OF AL⁺⁺⁺(8-HYDROXYQUINOLINOLATO)₃ INTO TWO ISOMERS AND PREPARATION OF A [RU(BPY)₃](BF₄)₂ POLYVINYL ORGANIC LIGHT EMITTING DIODE
Edwards, Julia*¹, and Gary Trammel. Chemistry Program, University of Illinois at Springfield.

Masuda, Shinji. Chemistry Department, Ashikaga Institute of Technology, Ashikaga, Japan.
POSTER PRESENTATIONS

CLINICAL SCIENCES & PSYCHOLOGY

[12] CAPSULE INDUCTION TECHNIQUE FOR GENITOURINARY TISSUE ENGINEERING
Cunningham, Daniel J., Michael W. Neumeister, Hans Suchy, and R. Jeffery Karnes. Department of Surgery, Southern Illinois University School of Medicine, Springfield, IL.

[13] STIGMASTEROL AND SITOSTEROL INHIBIT PROSTATE CANCER CELL GROWTH IN VITRO
Cunningham, Daniel J., and R. Jeffery Karnes. Department of Surgery, Southern Illinois University School of Medicine, Springfield, IL.

[14] THE IMPACT PRISON PROGRAMS HAVE ON PREVENTING INMATES FROM RETURNING TO PRISON
Grey, Matthew T.* (Faculty Sponsor: Lynn Pardie). Psychology Program, University of Illinois at Springfield.

[15] PSYCHOPHYSICAL EVIDENCE OF TINNITUS IN AN ANIMAL MODEL: YOUNG VS. AGED RATS
Perring, Alison*¹, and Hongning Wang². ¹Psychology Program, University of Illinois at Springfield; ²Pharmacology Department, Southern Illinois University School of Medicine, Springfield, IL.

12:00 - 1:00 LUNCH
On your own; for our guests, we suggest dining at the UIS Food Court, Lower Level, Public Affairs Center (PAC)
AFTERNOON ORAL PAPER SESSION (1:00-3:00 PM)
Biological Sciences, Clinical Sciences, and Environmental Studies
Brookens Auditorium, Lower Level, Brookens Library

Moderators:  Adam DeWilde  
(UIS Biology B.Sc. Student) 
Sara Paver  
(UIS CAP Biology B.Sc. Student)

1:00 - 1:20  
INHIBITION OF AMPA RECEPTORS BY GUANINE NUCLEOTIDES  
Montgomery, Kyle E.*, M. Kessler, and A.C. Arai.  Department of Pharmacology, Southern Illinois University School of Medicine, Springfield, IL.

1:20 - 1:40  
AUTOPSY OBSERVATIONS OF TOXICOLOGY CASES  
Jett, Patricia*¹, and Wayne Gade².  Departments of ¹Biology and ²Clinical Laboratory Science, University of Illinois at Springfield.

1:40 - 2:00  
Y-STR ANALYSIS IN CAUCASIANS, AFRI CAN-AMERICANS, AND HISPANICS  
Krishack, Paulette*¹, James Bonacum¹, and William Frank².  ¹Biology Department, University of Illinois at Springfield, and ²Research and Development Laboratory, Illinois State Police, Springfield, IL.

2:00 - 2:20  
BACTERIAL SUCCESSION ON ACER SACCHARINUM LEAVES IN THE ILLINOIS RIVER FLOODPLAIN  
Kellerhals, Doyn M.*, and Michael J. Lemke.  Biology Department, University of Illinois at Springfield.

2:20 - 2:40  
AN EVALUATION OF SHORT- AND LONG-TERM RADON LEVELS IN CENTRAL ILLINOIS HOMES  
Powell, Darlene K.* (Faculty Advisor: Sharron LaFollette).  Department of Environmental Studies, University of Illinois at Springfield.

2:40 - 3:00  
LONG DISTANCE SEED DISPERSAL IN A FRAGMENTED LANDSCAPE: IMPLICATIONS FOR PLANT RESPONSES TO CLIMATE CHANGE  
McEuen, Amy B.  Biology Department, University of Illinois at Springfield.

3:00 - 4:00  
KEYNOTE ADDRESS: Millicent A. Firestone  
“Nanostructured Protein-based Materials for Energy Storage and Conversion”  
Brookens Auditorium; 3:00 - 4:00 p.m.

4:10 - 5:00  
Social & Awards: Best Student Poster & Paper  
Health and Science Building 2nd Floor Art Gallery; Refreshments available

Species diversity or science fiction?

-page 6 -
Millicent Firestone received her B.S. in chemistry from the Indiana University of Pennsylvania. From there she earned a master’s in inorganic chemistry at the University of Arizona and completed her Ph. D. in inorganic/physical chemistry with Tobin Marks at Northwestern University in 1993. After conducting research with Paul Bohn at UIUC, Dr. Firestone joined the staff at Argonne National Laboratory.

Her research is at the bio-inorganic interface. She is interested in the properties of membranes and uses of small-angle X-ray and neutron scattering to study soft-condensed matter. Thus her work involves the determination of the physical principles governing hierarchical biological organization and the synthesis of biomimetic materials that are multi-component, integrated, spatially-organized structures exhibiting functional behavior on multiple length scales (i.e., molecular, mesoscopic, and macroscopic).

Recently her work has turned to the nanoscale. A nanometer is one billionth of a meter (1 nm = 1 x10^{-9} m) and is about the size of a large molecule. She is developing strategies for the fabrication of nanocomposite materials comprising inorganic nanoparticles spatially organized into processable polymer-based matrices.

She has published 48 papers and is the co-director of the nanoscience summer school at Argonne's new Center for Nanoscale Materials.
DEVELOPMENT OF A PCR PRIMER FOR LOCATING ANAEROBIC AMMONIUM OXIDIZING PLANCTOMYCETE BACTERIA FROM THE ILLINOIS RIVER SYSTEM

Boltuc, Nicholas1*, James Bonacum2, and Michael J. Lemke2. 1Springfield High School, Springfield IL; 2Biology Department, University of Illinois at Springfield, Springfield, IL 62703.

Most nitrifying bacteria that oxidize ammonia to nitrate are strict aerobes. Relatively recently, an alternative and somewhat counter-intuitive pathway of ammonia oxidation has been described. This highly exergonic process has been called “anammox,” for anoxic ammonia oxidation, and has been described in at least one uncultured prokaryote, from the Planctomycetes phylum, called Brocadia (Candidatus) anammoxidans. Brocadia has “organelles” analogous to a nucleus and an anammoxosome where nitrogen oxidation takes place. Current research suggests that the conversion of ammonium to dinitrogen by anammox bacteria might be taking place on a much larger scale than previously assumed. The Illinois River basin, with its high concentration of ammonium from farmland fertilizer runoff, could provide a likely habitat for anammox bacteria. Our objective was to apply taxa-specific primers in the polymerase chain reactions (PCR) to screen samples and to locate anammox bacteria in the region. To detect anammox bacteria, we created a primer for Brocadia anammoxidans and tested it on a control sample of Brocadia DNA obtained from Dr. Schmidt at the University of the Netherlands. Thanks to numerous trial PCRs, we were able to find optimal PCR conditions for the primer set we were using. We are in the process of applying the “designer primers” to locate the species in the region.

ORDERS IN CHAOS

Chan, Hei-Chi. Mathematical Sciences Program, University of Illinois at Springfield, Springfield, IL 62703.

In this presentation, I will talk about some curious “orderly” patterns that manifest themselves in random numbers. These results are based on my recent work on continued fractions and ergodic theory.

DISTRIBUTION OF BIGHEAD AND SILVER CARP THROUGHOUT THE UPPER MISSISSIPPI RIVER SYSTEM

Cochran, Matthew D.*,1 and Michael J. Lemke2. 1FishPro / Cochran & Wilken, Inc., Springfield, Illinois, 62703; 2 Biology Department, University of Illinois at Springfield, Springfield, IL 62703.

In 1963, fish farmers introduced the first of four Asian carp species into the United States in an attempt to control aquatic vegetation in aquaculture ponds. Since that introduction, three additional Asian carp species have been imported for use in aquaculture ponds and have escaped into major rivers of the United States. Asian carp pose a threat to the biodiversity in the Upper Mississippi River System (URMS). In some areas within the Lower Mississippi River System (LMRS), Asian carp are estimated to account for 90% of the biomass. Efforts to track distribution of grass carp, silver carp, bighead carp and black carp in the URMS are underway and alternatives to control or limit the northward advance of these species are being explored. Early estimates indicate that the current population of Asian carp has passed Lock and Dam 15 and will reach the Minnesota border within two years. The goal of this study is to determine and map the current distribution of silver and bighead carp utilizing data from the Upper Mississippi River Conservation Committee (URMCC), The Long Term Resource Monitoring Program (LTRMP) and the National Nonindigenous Species Database maintained by the Unites States Geological Survey (USGS). In addition, GIS habitat layers maintained by the United States Army Corps of Engineers (USACE) will be utilized to predict habitats vulnerable for future dispersal in the Upper Mississippi River System. With the aid of GIS, a spatial analysis will be conducted that relates the current distribution of Asian carp in the Mississippi River to known critical habitats. By spatially analyzing the current distribution, it may be possible to predict critical habitat areas that are at risk for Asian carp populations and thus should be targeted for future management or control. Currently, the ecological aspects of the Asian carp species are being assembled by this study. Efforts to contact key researchers have yielded up to date biological information that, in some cases, represent unpublished data or data in review. The current documented locations of Asian carp species have been obtained from the data sources and are being used to determine the actual extent of northward advance in the UMRS. Base mapping of the UMRS in GIS layers is also currently under development for this study.
ABSTRACTS

CAPSULE INDUCTION TECHNIQUE FOR GENITOURINARY TISSUE ENGINEERING
Cunningham, Daniel J., Michael W. Neumeister, Hans Suchy, and R. Jeffery Karnes. Department of Surgery, Southern Illinois University School of Medicine, Springfield, IL 62701.

Tissue engineering techniques used to repair urothelial defects have yet to produce sustainable full thickness structures. In order to generate an autologous source of urothelial tissue, vascularized capsules were created in vivo by anchoring a silicon catheter adjacent to the urethra in male Wistar rats. After one month a vascularized capsule formed around the catheter. Urothelial cells used to seed created capsules were cultured by harvesting from excised rat bladder tissue and expanded from $1.4 \times 10^4$ to $3.2 \times 10^6$ cells in vitro. The cultured urothelial cells were suspended in fibrin glue and used to seed the newly formed capsule after the silicon catheter was removed. Histology revealed that capsule induction and subsequent seeding has resulted in the formation of a multilayered urothelium.

STIGMASTEROL AND SITOSTEROL INHIBIT PROSTATE CANCER CELL GROWTH IN VITRO
Cunningham, Daniel J., and R. Jeffery Karnes. Department of Surgery, Southern Illinois University School of Medicine, Springfield, IL 62701.

Men often employ herbal remedies such as saw palmetto when self-treating prostate disease including cancer. Extracts of the saw palmetto plant are known to contain the phytosterols, sitosterol and stigmasterol. The mechanism by which saw palmetto affects prostate cancer cell growth is not completely understood; however, it is known to inhibit the enzyme 5-alpha reductase. Normally, 5-alpha-reductase converts testosterone to dihydrotestosterone and inactivation results in repression of cell proliferation genes. Finasteride, a known 5-alpha reductase inhibitor, is structurally similar to sitosterol and stigmasterol, and may have an impact on prostate cancer development and progression. Thus we investigated the effect of sitosterol and stigmasterol on prostate cancer cell proliferation. Treatment of PC-3 (androgen independent) and LnCAP (androgen sensitive) cells with both sitosterol and stigmasterol inhibited cell growth in a concentration dependent manner. Flow cytometry revealed S phase cell cycle arrested in LnCAP but not PC-3 cells. Our results suggest that sitosterol and stigmasterol have an anti-proliferative effect on prostate cell growth and development by downregulating expression of genes involved with cell proliferation.

SYNTHESIS AND SEPARATION OF ALIII(8-HYDROXYQUINOLINOLATO)3 INTO TWO ISOMERS AND PREPARATION OF A [RU(BPY)3](BF4)2 POLYVINYL ORGANIC LIGHT EMITTING DIODE
Edwards, Julia*, and Gary Trammel. Chemistry Program, University of Illinois at Springfield, Springfield, IL 62703.

The organometallic complex AlIII(8-hydroxyquinolinolato)3 (Alq3) is used in a variety of organic light emitting diodes (OLEDs) as a green light emitter. It was synthesized using the same method as Liu and Wang in 88% yield. The synthesis produces Alq3 as a mixture of meridional (mer) and facial (fac) isomers which have different electrical and luminescent properties. The literature separation used a high temperature sublimation method. We developed a chromatographic separation suitable for undergraduate chemistry laboratories. The separation method developed used thin layer chromatographic (TLC) plates visualized under UV light. The best results used ethyl acetate and cyclohexane as the solvent. The separation method was scaled up using column chromatography. A silica gel column (1cm x 25cm) was prepared and two different solvent mixtures were used: first an ethyl acetate and cyclohexane (1:1) mixture and then a methanol and methylene chloride (1:20) mixture, which separated better. The fractions were examined under a UV lamp and separation was apparent. Three distinct colors were observed: blue, yellow, and green. Alq3 was examined using IR, HNMR, UV-Vis, and X-ray powder diffraction. The IR and NMR spectrums were similar to those in literature. A functional OLED was prepared by two different methods using [Ru(bpy)3](BF4)2 polyvinyl solution, one was spin-coating the slide and the second was using a cotton swab applicator. The cotton swab method created more working OLEDs than the spin-coat method and used less solution. The best method investigated used one cotton swab application and drying in an oven (80-100°C) for an hour.
ABSTRACTS

THE IMPACT PRISON PROGRAMS HAVE ON PREVENTING INMATES FROM RETURNING TO PRISON
Grey, Matthew T.* (Faculty Sponsor: Lynn Pardie). Psychology Program, University of Illinois at Springfield, Springfield, IL 62703.
The prison programs available to inmates are very diverse. There are programs that help to solve interpersonal issues and there are some that provide knowledge and/or skills that an inmate can use to be a more productive member of society upon release. Even though there are so many different types of programs, there are few independent evaluations to determine the impact upon an inmate’s likelihood to recidivate after release from prison. The independent studies that have been conducted focused mostly on drug related programs, and provided little information about the impact of academic, interpersonal, or vocational programs. The current study utilized archival records of 66 inmates released from a mid-west prison in the United States. The records were used to determine if inmates who were involved in one or more of a wide range of programs while incarcerated had a lower rate of recidivism than the inmates who did not participate in a program. Results show that inmates who completed at least one program were significantly less likely to return to prison compared to inmates who were not in a program while incarcerated. Discussion regarding the need for more independent evaluations of all prison programs, more programs that use a Therapeutic Community (TC) model, more aftercare programs, and suggestions for future research are included.

AUTOPSY OBSERVATIONS OF TOXICOLOGY CASES
Jett, Patricia*1, and Wayne Gade2. Departments of 1 Biology and 2Clinical Laboratory Science, University of Illinois in Springfield, Springfield, IL 62703.
This independent study project resulted from the unique opportunity to observe several autopsies and learn directly from experts in the field of forensic pathology. Autopsies were viewed at Springfield’s Memorial Medical Center under the direction of either Dr. Travis Hindman or Dr. Jessica Bowman and the observations were supplemented with follow-up readings related the cases. Forensic pathologists examine the organs, tissues, and body fluids of the deceased while attempting to establish the cause of death. Autopsies can determine if foul play occurred as well as answer many other questions concerning the death. The conclusions are often important to family members and also to legal authorities, basing important decisions about possible arrests and prosecutions on autopsy findings. Pathologist testimony, based their interpretation of direct observations and laboratory results, provides the cornerstone of many criminal cases. Observations made during autopsies have contributed greatly to our understanding human physiology and pathophysiology and can even suggest medical interventions or treatments for future patients with similar conditions. Unfortunately, common causes of death in today’s society are drug or alcohol overdose, or other preventable toxic insults on the body. This presentation will describe student observations of several toxicology cases and compare the damage done to organs and tissues as a result of the toxic effects of narcotics and stimulants such as cocaine and methamphetamine. Alcoholism, carbon monoxide poisoning, and other toxicology cases will be discussed.

A MASS SPECTROMETRIC DETERMINATION OF ORGANOHALIDES IN FISH TISSUE
Due to the continued awareness of the toxicity of halogenated organic compounds and the significant improvements in analytical technology, this study was performed to improve the chemical analysis for the determination of bioaccumulative organohalide pollutants in fish tissue. Past studies conducted by the USEPA were performed with gas chromatographic methods coupled with halide specific detectors (HSD) as a solution for compound screening of fish tissue samples. Due to the complex nature of tissue samples, results of the original studies indicated a need for an improved method of qualitative and quantitative analyses of samples. A standard EPA protocol has been modified to replace the analog Halogen Specific Detection (HSD) with a triple stage quadrupole (TSQ) mass spectrometer (MS) in negative chemical ionization (NCI) mode. The result was changing a single dimensional assay of the compounds to a multi-dimensional solution reflecting an identification of compounds originally not possible in the one dimensional analog signal. The multi-dimensional results provided a more accurate identification of specific compounds and provided a significant reduction and modification of compound interferences with no loss of sensitivity.
ABSTRACTS

BACTERIAL SUCCESSION ON *Acer saccharinum* LEAVES IN THE ILLINOIS RIVER FLOODPLAIN
Kellerhals, Dony M.*, and Michael J. Lemke. Biology Department, University of Illinois at Springfield, Springfield, IL 62703.

Ecological succession of species is a well-established concept for macrobiota. The objective of this study was to monitor change in prokaryotes in the Domain *Bacteria* on and in maple leaves beginning with the microbial community colonizing leaf buds and following changes through decomposition on the flood plain of the Illinois River. In addition to tracking changes through this temporal variable, a spatial comparison was made among leaves falling on the floodplain, those on the floodplain wetted by flood waters, leaves in a drier, upland habitat, and those permanently soaked in river water. It was expected that bacterial diversity would increase as leaves mature and that a replacement community would emerge when the leaf drops to the river floodplain. Leaves were sampled over a 21-month period and change in organic mass was determined (AFDM). The microbial assemblage was monitored through 16S rDNA extraction followed by community fingerprinting on denaturing gradient gel electrophoresis (DGGE). Domain *Bacteria* DNA was examined at the bud stage, at the mature leaf stage, and on samples collected at 6 to 10 week intervals after leaf fall. DNA extracts, purified using Sephadex G-200 columns and amplified by PCR with 338F - GC clamp and 518R primers were run on DGGE (8% acrylamide, 30-70% denaturing gradient). Results show nearly twice as much decomposition in leaves exposed to flood water (70.1%) than for those not wetted by floodwaters (36.0%). Molecular results showed limited diversity before leaf fall. More bands were found after leaf fall and on leaves exposed to flood water, some unique bands not found on unexposed leaves were present. As expected, diversity in bacterial communities increases initially after leaf fall, decreases as leaves become more decomposed and introduction of new communities occurs after leaf fall and flooding.

PROGRESS TOWARD THE DETERMINATION OF SULFAMETHOXAZOLE IN TREATED AND NATURAL WATERS
Kravanya, Lyn*, and Ed Acheson. Department of Chemistry, Millikin University, Decatur, Illinois 62522.

A recent nation-wide study published in Environmental Science & Technology found nearly 100 pharmaceuticals and hormones present in ground and surface waters. Intrigued by this paper, we decided to begin a similar study on a much smaller scale in Decatur, Illinois. Of the antibiotics studied in the original paper, sulfamethoxazole was one of the most commonly found substances. We therefore decided to begin our study with an analysis of sulfamethoxazole in local waters. Water samples were collected, concentrated using solid phase extraction (SPE), and the sulfamethoxazole determined using HPLC with UV-visible detection, and LC/MS. We were able to recover sulfamethoxazole from spiked water samples and thus far have not found any sulfamethoxazole present in the local waters. This project serves as the beginning of a longitudinal study of sulfamethoxazole and other antibiotics found in local water sources.

Y-STR ANALYSIS IN CAUCASIANS, AFRICAN-AMERICANS, AND HISPANICS
Krishack, Paulette1, James Bonacum1, and William Frank2. 1Biology Department, University of Illinois at Springfield, and 2Research and Development Laboratory, Illinois State Police, Springfield, IL 62703.

Short tandem repeat regions (STRs) are polymorphic DNA loci found throughout the human genome. Within a given STR, the repeat unit can range from 2-7 nucleotides in length. The number of repeat units fluctuates, resulting in alleles of variable lengths among individuals, making STRs useful in human identification. The objective of this study was to contribute to the Y Chromosome Haplotype Reference Database by studying combinations of STR alleles located on the Y chromosome (Y-STRs). Because of its high level of discrimination, profiling of minimal Y-STR haplotype is being used in forensic casework. For instance, given a sample of DNA extracted from an individual male, multiple Polymerase Chain Reactions can be performed, and the alleles present at targeted Y-STR loci can be identified. Profiling the minimal Y-STR haplotype for multiple populations can be used to make predictions about the race of the individual providing the sample. This technique can also be used to identify human males in cases where the DNA sample is mixed, contains a high field of female DNA, and/or a low concentration of male DNA. Y-STR amplification was performed and capillary electrophoresis was used to separate alleles by size for 11 Y chromosome STR loci. The Y-STR haplotype and loci selected for study were DYS392, DYS390, DYS385a/b, DYS393, DYS389I, DYS391, DYS389II, DYS19, DYS439, and DYS438. Attempts were also made to see if any definitive markers within the minimal Y-STR haplotypes could be used to identify specific populations. Although allele frequencies varied among the different populations, no race specific markers were fixed in any of the populations surveyed, including on the Y-chromosome.
ABSTRACTS

SPEED BUMPS, NEURAL NETS, ANGELS AND MORAL AGENCY: CAN SILICON BE HELD RESPONSIBLE?
Larson, David1, and Keith Miller2. 1Management Information Systems and 2Computer Science Department, University of Illinois at Springfield, Springfield, IL 62703.
Traditionally, philosophers have ascribed moral agency to humans. Early writing about moral agency can be traced to Aristotle [1] and Aquinas [2]. In addition to human moral agents, Aristotle discussed the possibility that Greek gods were moral agents, and Aquinas discussed the moral agency of angels. Recently, new candidates have been suggested for non-human moral agency. Floridi [3] suggests that artificially intelligence programs that meet certain criteria may attain the status of moral agents; he suggests a redefinition of moral agency to clarify the relationship between artificial and human agents. Other philosophers, as well as scholars in Science and Technology Studies, are studying the possibility that artifacts that are not designed to mimic human intelligence still embody a kind of moral agency. For example, there have been discussions about the moral intent and the consequential effects of speed bumps. [4] Distributed networks and neural nets are candidates for moral agency. In this paper, we will examine ideas about artificial moral agency from the perspective of computer science.


MANAGEMENT AND RESTORATION STRATEGIES FOR THE EMQUION FLOODPLAIN OF THE ILLINOIS RIVER, ILLINOIS, USA
Lemke, A. Maria1, Mike Lemke2, Keith Miller2, and Doug Blodgett1. 1The Nature Conservancy, Illinois Chapter, Lewiston, IL; 2Emiquon Field Station, University of Illinois at Springfield, Springfield, IL 62703.
Intact large floodplain-river ecosystems are rare. In 2004, The Nature Conservancy began to convert the Emiquon area adjacent to the Illinois River, from row crop agriculture into a complex aquatic ecosystem. The Conservancy identifies historic floodplain areas, like Emiquon, that are currently isolated from the river and its vital flood pulse and develops strategies to restore the floodplain to a functioning mosaic of natural communities (e.g., bluff, floodplain and diverse aquatic communities) and to restore habitat that sustains native plants and animals (e.g., mussels, ancient fishes, and Boltonia decurrens). In a gradual process, these areas are allowed to revert to wetlands, sometimes in conjunction with a controlled reconnection to the river. The Emiquon restoration is unusually large (3005 ha), and will require innovative approaches to planning, implementation, and documentation. One innovation is the early establishment of aquatic vegetation critical to maintaining water quality in the new wetlands. In addition, scientists from the Illinois State Water Survey and Illinois Water Resource Center have developed innovative hydrological computer models that will help the Conservancy evaluate the effects of management decisions long before the decisions have to be finalized. At the University of Illinois at Springfield, scientists are studying a 9-year survey of nutrients on the Illinois River and its backwaters to better understand how to manage the Emiquon Restoration. Based on these approaches and on previous experiences (such as the Spunky Bottoms restoration), the Conservancy is devising novel restoration strategies and research plans that are sensitive to different spatial resolutions, long and short term concerns, and species diversity. By carefully documenting Emiquon before, during, and after its restoration, the Conservancy hopes to encourage practical innovations in future restorations.

THE SYNTHESIS OF METAPARACYCLOPHANES CONTAINING A FLUORINE ATOM AND THEIR DYNAMIC NMR
Masuda, Shinji. Chemistry Department, Ashikaga Institute of Technology, Ashikaga, Japan.
The fluorine atom in fluorocarbons has the second smallest size following hydrogen. Here I describe the synthesis of metaparacyclophanes having a fluorine atom in a crowded position by the Barbier reaction to elucidate the steric hindrance of the fluorine atom. The activation energies (ΔH° and ΔS°) of the flip-flop vibration of these compounds were evaluated by temperature dependent NMR spectroscopy.
LONG DISTANCE SEED DISPERSAL IN A FRAGMENTED LANDSCAPE: IMPLICATIONS FOR PLANT RESPONSES TO CLIMATE CHANGE
McEuen, Amy B.  Biology Department, University of Illinois at Springfield, Springfield, IL 62703.
Many species may be unable to shift their distributions in response to the expected rates of climate change. Movement of species may be particularly impeded in fragmented landscapes where large distances exist between natural areas. Information on long distance dispersal (LDD) may help in determining the types of species that will be capable of distributional responses but such data are extremely rare. I sampled woody plant seed rain throughout five forest fragments in Michigan over two years (forest fragment size 4 - 8 ha, $n = 114$ traps total, trap surface area = 28.5 m$^2$). To quantify between-fragment dispersal, I took advantage of species absences from individual fragments. Species absences for fragments were determined by initial surveys and were then verified through resurveys for all successful immigrants. Of seventeen species, seed dispersal into fragments was detected for only four disturbance-adapted woody plants ($Acer$ negundo, $Betula$ papyrifera, $Celastrus$ scandens, $Elaeagnus$ umbellata). In contrast, species such as $Acer$ rubrum and $Tsuga$ canadensis showed no between-fragment seed exchange despite the ability to saturate individual fragments with seed. Multiple LDD events were recorded for $Betula$ papyrifera allowing some exploration of the spatial and temporal patterns of long distance dispersal. Long distance seed exchange was greatest in November, directly after leaf litter fall, with immigrant seed randomly distributed throughout the receiving fragment. The temporal pattern of exchange suggests wind patterns rather than peak seed availability may increase the number of long distance dispersal events. It is perhaps not surprising that early-successional, disturbance-adapted plants appear to be better than others at moving through fragmented landscapes. Conservation of species with other life history characteristics may require more direct intervention as on-going global change occurs.

INHIBITION OF AMPA RECEPTORS BY GUANINE NUCLEOTIDES
Montgomery, Kyle E.*, M. Kessler, and A.C. Arai.  Department of Pharmacology, Southern Illinois University School of Medicine, Springfield, IL 62794.
AMPA receptors that are naturally gated by glutamate mediate fast excitatory transmission in the mammalian central nervous system. Overexcitation of glutamate receptors is implicated in neuronal excitotoxicity, a process that involves the disruption of cellular Ca$^{2+}$ homeostasis and subsequent cell death. Guanine nucleotides have been shown to inhibit receptor activation by associating with a particular motif that appears to overlap with the binding pocket for glutamate. It has been proposed that this property evolved as a protective mechanism against excitotoxicity. We propose an additional function of the guanine nucleotide binding motif. The receptors may be activated by glutamate while in the endoplasmic reticulum (ER), thus allowing Ca$^{2+}$ to leak into the cytoplasm which could be detrimental to cell viability. Guanine nucleotides within the ER might then protect against deleterious effects of disrupted Ca$^{2+}$ homeostasis. To test this hypothesis, we made a mutation in rat AMPA receptor GluR1 that corresponds to a mutation in chick kainate binding protein which confers selective loss of guanine nucleotide binding. We confirmed that this mutation reduces guanine nucleotide binding without affecting agonist affinity. Ca$^{2+}$ imaging was performed in COS cells transfected with wild type or mutant receptors. In preliminary experiments a difference was seen in peak fluorescence when the cells were treated with thapsigargin in Ca$^{2+}$ free solution and also when Ca$^{2+}$ was reintroduced to the medium. These results are compatible with our hypothesis that the mutated receptor makes the ER more permeable to Ca$^{2+}$.
ABSTRACTS

COBALT VANADATES FOR ENERGY STORAGE

Lithium ion batteries are used for portable electronic devices. The literature indicates that there is a synergistic effect between cobalt and vanadium, resulting in improved properties relative to the commercial cobalt oxide. Our goal is to chemically modify compounds to produce an improved cathode for lithium ion batteries. We have theorized that the insertion of the vanadate ions into the cobalt hydroxide lattice will make it possible for lithium ions to flow more freely through the structure which could decrease the amount of time needed to recharge lithium ion batteries. Therefore we have prepared a series of cobalt vandadates by two soft chemistry routes: coprecipitation under basic conditions and ultrasound under acidic conditions. The former procedure has produced the cobalt analogue of Zn$_3$(OH)$_2$V$_2$O$_7$, as confirmed by powder X-ray diffraction. The structure consists of cobalt hydroxide layers intercalated with pyrovanadate ions (Fig. 1). The full characterization of this material (elemental analysis, thermogravimetric decomposition, powder X-ray diffraction, and scanning electron microscopy) as well as the one produced under acidic conditions will be presented.

Fig 1. Proposed structure of the cobalt analog of Zn$_3$(OH)$_2$V$_2$O$_7$

ARCHAEA DIVERSITY ON DECOMPOSING SILVER MAPLE (Acer saccharinum) LEAVES ON THE ILLINOIS RIVER FLOODPLAIN
Paver, Sara F.*, Doyn M. Kellerhals*, and Michael J. Lemke. Biology Department, University of Illinois at Springfield, Springfield, IL, 62703.

Historically, prokaryotes in the Domain Archaea were associated with extreme conditions, earning them the name “extremophiles.” However, within the last decade, they have been found in other habitats suggesting that they may be more common than previously thought. The primary objectives of this study were to determine presence of Archaea on leaves sampled at different times during decomposition, and if detection was successful, obtain a DNA fingerprint of Archaeal diversity. Leaf sampling occurred over a 21-month period at 6-10 week intervals from April 2002, when the microbial communities on leaf buds were sampled, to September 2004, when leaves were nearly fully decomposed. Four sites were sampled throughout this time: leaves placed on the floodplain, leaves wetted during spring flood and located on the floodplain, leaves submersed in the Illinois River, and leaves placed in an upland site. DNA was extracted and purified from the leaf samples, the 16s rDNA region (primers 344F+GC to 915R) amplified using PCR, and the resulting amplicons from July 2004 run on denaturing gradient gel electrophoresis (DGGE) (8% acrylamide, 30-70% denaturing gradient). The resulting community fingerprints confirm the presence of Archaea in all four habitats. In addition, 8 DGGE bands, suggesting no less than 8 species, confirmed Archaeal diversity from the river floodplain samples. Future research will include running DGGE on samples from each area to establish temporal succession and cloning and sequencing bands to identify specific species. Confirming and identifying Archaea as part of the decompositional process represents the first step in determining the now unknown function of these prokaryotes in nutrient cycling.
PSYCHOPHYSICAL EVIDENCE OF TINNITUS IN AN ANIMAL MODEL: YOUNG VS. AGED RATS
Perring, Alison*¹, and Hongning Wang². ¹Psychology Program, University of Illinois at Springfield, Springfield IL 62703; ²Pharmacology Department, Southern Illinois University School of Medicine, Springfield, IL 62701.

Tinnitus, or ringing in the ears, can be evaluated in the laboratory using an animal model. Tinnitus can be defined as an internal auditory sound in the absence of an external stimulus. In the human population, tinnitus is more prevalent in older persons than in younger. Our research examined the susceptibility and severity of tinnitus in young adult (5 mo old) versus old (28 mo old) Fisher Brown Norway rats. Each group was divided into two subgroups: control (no tinnitus) and experimental (acoustic-trauma-induced tinnitus). The rats were placed inside individual behavioral test chambers within a larger, sound attenuating chamber. The rats were behaviorally trained to press a lever for food in the presence of low-level background sound (60 dB broad-band noise). Lever pressing in the presence of different auditory stimuli was used to psychophysically characterize each subject’s hearing. For tinnitus induction, the tinnitus subgroups were anesthetized and exposed in one ear for 1 hr to a loud sound (octave-band noise at 120 dB). This type of exposure would produce long-term tinnitus in humans. The hearing of both the young and old groups, with and without exposure, was tested both before and after exposure, for evidence of tinnitus. The results indicate that the old rats showed more psychophysical evidence of tinnitus than the young adult rats. This evidence indicates that hearing impairment and susceptibility to hearing dysfunction increases with age. To date, there is no generally effective cure for tinnitus, and few medications provide adequate relief. Basic research using animals to model the condition of tinnitus should lead to effective treatments in the future.

PHYLOGENETIC STUDY OF WHITE OAKS BASED ON NUCLEAR GENE ANALYSIS
Laura Petrea*, and Lucia Vázquez. Department of Biology, University of Illinois, Springfield, IL 62703.

Species within the genus Quercus, which includes white oak trees, are very important from the economic and ecologic standpoints, thus, it is essential to understand their evolutionary history. There are some discrepancies in the phylogenetic relationships within the genus Quercus due to differing phylogenetic trees based on morphological analyses and DNA sequences from one gene. While some studies indicate that the American white oaks (subgenus Quercus, section Quercus) and the Eurasian white oaks (subgenus Quercus, section Cerris) are monophyletic, that is they share a common ancestor, other studies suggest that they are different lineages. Currently, no other research has addressed this problem and no additional genes have been tested in oaks. The objective of this study is to analyze sequences from the nuclear gene leafy to infer the evolutionary history of these taxa. The results of this study will be presented and the implications on the classification of these white oak groups will discussed.

AN EVALUATION OF SHORT- AND LONG-TERM RADON LEVELS IN CENTRAL ILLINOIS HOMES
Powell, Darlene K.* (Faculty Advisor: Sharron LaFollette). Department of Environmental Studies, University of Illinois at Springfield, Springfield, IL 62703.

Radon-222 is a naturally occurring gas that is produced during the radioactive decay of uranium-238. Pressure differences between a home and the environment can cause radon to accumulate within a home and levels vary based on location, design, and use of the structure. Radon has been identified as the second leading cause of lung cancer next to cigarette smoking. Although there is no safe level of radon exposure, the United States Environmental Protection Agency (USEPA) has set an action level guideline of 4.0 picoCuries per liter (pCi/L). The USEPA recommends all homeowners test their homes for radon with either short-term (two to seven days) or long-term (up to one year) testing devices. In theory, the footprint of a home, the use of heating and cooling equipment, and meteorological conditions may influence indoor radon levels. Using long-term tests (in place for one full year) and four sets of short-term tests (in place for seven days once each season) a total of 49 homes were tested for radon in Central Illinois. Data was collected from April of 2003 through July of 2004 and analyzed to determine the following: (1) which season produces the highest indoor radon levels under closed conditions, (2) if there is a significant difference in seasonal radon levels, (3) how well the results of short-term testing devices predict the results of long-term testing devices, and (4) how the footprint of a residence affects radon levels. Results and implications of findings will be shared with the audience.
ABSTRACTS

A MODEL OF NUTRIENT MITIGATION IN SMALL-SCALE RESTORED WETLANDS
Tanton, Rusty*1, Keith Miller2, and Michael J. Lemke1. 1Biology and 2Computer Science Departments, University of Illinois at Springfield, Springfield, IL 62703.

Nutrient pollution contributes to the poor water quality of aquatic habitats. Wetlands can mitigate nutrient pollution, but are typically overlooked as too much effort for too little gain. We questioned whether restoring small-scale wetlands on land designated as open-space under Federal natural hazard mitigation programs could provide effective mitigation as an ideal but unexploited social benefit. The objective of this project was to develop a model for nutrient mitigation in small-scale restored wetlands that could help assess the effectiveness of potential restoration sites. To form the model, hydraulic loading and nitrogen removal rates were gathered from seven published studies covering thirty wetlands. A plot of rates vs. load with a best-fit logarithmic curve was produced, and a model core (% removal = 14.86 – (12.192 * ln(hydraulic load))) was derived describing the curve. The curve and model show a rapid decline in nitrogen removal rates (98% to 30%) as load increases from 0 to 0.3 M^3/M^2/day, and a gradual decline thereafter. Our model takes input of hydraulic load and nitrogen content and shows mass of nitrogen removed per day. The modeling effort lends insight to the limits of mitigation. The model shows low hydraulic load gives high mitigation efficiency, while high load removes more actual nitrogen as the removal rate declines more slowly. For determining efficiency, hydraulic load seems more important than location, composition or size of wetland, suggesting simple, small-scale wetlands can provide valuable mitigation services.

Nautilus: PHYLOGENETIC STUDY
White, A. Jeannette*, and James Bonacum. Biology Department, University of Illinois at Springfield, Springfield, IL 62703.

Previous phylogenetic studies based upon morphological characters, allozymes, and molecular data suggest that three of the proposed species in the genus Nautilus, N. stenomphalus, N. macromphalus, and N. belauensis are embedded within the broadly distributed N. pompilius. This implies that these are not true species in the phylogenetic sense but are actually morphological variants of N. pompilius. In contrast, each of these proposed species is confined to a specific reef system in the Indo Pacific. Since the depths of the ocean basins presumably present a formidable barrier to gene flow, these different morphotypes may represent new species arising from within N. pompilius as a result of geographic isolation. The implication of this is that Nautilus is currently undergoing a period of adaptive radiation secondary to geographic isolation. The present study will assess the status of various Nautilus populations by collecting sequence data for 2 mitochondrial genes, 16s rDNA and Cytochrome Oxidase subunit I (COI). In addition, data will be collected for four microsatellite loci. These data will be used to erect a more extensive phylogeny of the genus and also to assess levels of gene flow between different populations.

PARALLEL FAST FOURIER TRANSFORM ON A CLUSTER
Zhang, Jingyu, and Michael Stults. Department of Computer Science, University of Illinois at Springfield, Springfield, IL 62703.

In this presentation, a parallel radix-2 Cooley-Tukey FFT algorithm on a cluster is introduced. A cyclic distribution method is invented to distribute data points among processors such that no inter-processor communication is needed in one important step, the bit-reversal step, of the Cooley-Tukey FFT algorithm; each processor performs the bit-reversal on its local vector using a fast linear-time recursive bit-reversal algorithm. The experimental result shows that the parallel FFT algorithm achieves significant speedup over the fastest serial FFT algorithm.

The Fly: When good experiments go bad?
http://www.citizensofthegalaxy.com/mon_fly.jpg