Acknowledgements

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Oral Presentations
Dr. Matt Evans (BIO)
Dr. John Martin (ASP)
Dr. Yashanad Mhaskar (CHE)
Dr. John Martin (ASP)

Poster Presentations
Dr. Hua Chen (BIO)
Dr. Keenan Dungey (CHE)
Dr. Matt Evans (BIO)
Dr. Karen Mooney (PSY)
Dr. Amy McEuen (BIO)
Dr. Gary Trammell (CHE)
Dr. Jim Veselenak (CLS)

Judges

Special acknowledgement to student advisors, mentors and collaborators - your guidance is essential for the training of tomorrow’s scientists. Thank you.
Note: * = student; underline = presenter

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8:30-9:00 INFORMATION TABLE & REFRESHMENTS
University Hall – 2nd Floor Lobby Area

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MORNING ORAL PRESENTATIONS (9:00-11:40 a.m.)
University Hall, Room 2034

Moderator: Dr. John C Martin (Professor of Astronomy/Physics)

9:00-9:10 Opening Remarks – Paula Garrott
UIS Director of Science Division

TECHNICAL SCIENCE PRESENTATIONS

9:10-9:30 On Ramanujan’s “Most Beautiful Identity” and Its Generalization
Chen, Hei-Chi, Mathematical Sciences Department, University of Illinois at Springfield, Springfield IL 62712

9:30-9:50 Implementation of a Multi-Platform General Purpose Distributed Computation Grid
Verhulst, Michael*, Liberal Studies and Computer Science, University of Illinois at Springfield, Springfield, Illinois 62703.

9:50-10:10 Preparation of Lithium Cobalt Oxide by Emulsion at High Temperature and Low Temperature
Hansen, Jennette*, Steven Hunek, Andy Dunn, Anthony Kilburn, and Keenan Dungey Chemistry Department, University of Illinois at Springfield, Springfield, Illinois 62703

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10:10 – 10:20 REFRESHMENT BREAK

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Moderator: Dr. Matt Evans (Professor of Biology)

BIOLOGICAL SCIENCE PRESENTATIONS

10:20-10:40 Designing Primers to Amplify and Sequence Complete Mitochondrial Genomes in *Nautilus.*
Irlam, Justin* and Jim Bonacum, Biology Department, University of Illinois at Springfield, Springfield, Illinois 62703

10:40 -11:00 Secondary production of benthic macroinvertebrates from historical floodplain wetlands differing in restoration status along the Illinois River, Illinois
Negro, Jaclyn Michelle*, and A. Maria Lemke, Biology Department, University of Illinois at Springfield, One University Plaza, Springfield, IL 62703 and Illinois Chapter of The Nature Conservancy, 301 SW Adams St., Suite 1007, Peoria, IL 61602
<table>
<thead>
<tr>
<th>Time</th>
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<td>11:00 – 11:20</td>
<td><em>In Situ</em> and <em>In Vitro</em> Seed Germination of the Federally Endangered Hawaiian Orchid, <em>Platanthera holochila</em>. Kirk, Anna K.*¹, Rebecca L. Turnquist ¹, Steve Perlman ¹, and Lawrence W. Zettler ¹, ¹Orchid Recovery Program, Biology Department, Illinois College, Jacksonville, Illinois 62650; ²National Tropical Botanical Garden, 3530 Papalina Road, Kalaheo, Kauai, Hawaii 96741</td>
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<td>11:20 – 11:40</td>
<td>A Comparison of Genetic Variation in <em>Nautilus</em> Populations from Papua New Guinea, New Caledonia, and Vanuatu using Four Microsatellite Loci Mann, Trenae L.* and Jim Bonacum, Biology Department, University of Illinois at Springfield, Springfield, Illinois 62703</td>
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11:45 - 12:15 Lunch
On your own;
For our guests, we suggest dining at the UIS Food Court, Lower Level, Public Affairs Bldg.

12:15 – 1:15 POSTER SESSION EXHIBITS --- Health & Sciences Building 1ST & 2ND FLOORS CORRIDORS

CHEMISTRY, PSYCHOLOGY, PRE-PROFESSIONAL & BIOLOGICAL SCIENCES POSTERS

[1] Fuel Behind The Fire: Synthesis of $\text{La}_2\text{MVO}_6 (M = \text{Ni}^{2+}, \text{Zn}^{2+})$ Perovskites. Bley, Nicholas *¹, Alya Saqer, and Paris Barnes. Department of Chemistry, Millikin University, 1184 West Main Street, Decatur, IL 62522.


[3] Investigating of and Antioxidant Properties of Leaf Extracts From *Juglans Nigra*, *Quercus Alba*, and *Quercus Rubra* Cassavant, Megan ¹, Rachel Olson ², Wayne Gade ¹, Amy McEuen ¹, Gary Trammell ², Lucia Vazquez ¹, and James Veselenak ³. (1) Biology Department, (2) Chemistry Department, (3) Clinical Laboratory Science Department, University of Illinois at Springfield, Springfield, IL.

[4] The Role Of Pregnane X Receptor In Breast Cancer Chemotherapy Chen, Yukun*¹, Yong Tang, Shuqing Chen and Daotai Nie. Department of Medical Microbiology, Immunology and Cell Biology, Southern Illinois University School of Medicine and SimmonsCooper Cancer Institute, Springfield, IL, 62702.
Tolerance of Planorbis sp. to Varying Levels of Ammonium Hydroxide in Aqueous Environments
Daniels, Jordan E.*, Biology Department, MacMurray College, Jacksonville, IL 62650

Snow Goose Conservation in the Canadian Arctic
Dugan, Brian J. and Matthew Evans. Biology Department, University of Illinois at Springfield, Springfield, Illinois 62703

Pupil Dilation In Response To Violent Images: Gamers And Non Gamers
Fisher, Heidi.*, Psychology Program, University of Illinois at Springfield, Springfield, Illinois 62703

Applying The Principles of Green Chemistry to The Synthesis of Silica Sol Gels
Ganapathiraju, Pavan V.,* and Marc A. Klingshirn, Chemistry Department, University of Illinois at Springfield, Springfield, IL 62703

Chemical Studies on Agaricus Bisporus
Harshani, H., Weerakoon, M., and Athar Ata*, Department of Chemistry and Biochemistry, Bradley University, 1501 West Bradley Avenue, Peoria, IL 61625-0208

Critical Age-Related Loss of Cofactors of Neuron Cytochrome C Oxidase Reversed by Estrogen
Jones, Torrie T.* and Gregory J. Brewer, Department of Medical Microbiology, Immunology, and Cell Biology, Southern Illinois University School of Medicine, 801 Rutledge, Springfield, IL 62702

Identification of Bioactive Compounds From Bell Peppers
Khoury, M. Tina, Andrew R. Ruddy and Athar Ata*, Department of Chemistry and Biochemistry, Bradley University, 1501 West Bradley Avenue, Peoria, IL 61625-0208

SUMO1 suppresses c-Maf transactivation: an emerging role in the contribution of autoimmune diabetes.
Leavenworth, Jianmei Wu *, Yin-yuan Mo, and Mary E. Pauza*, †, ‡ Department of Medical Microbiology, Immunology and Cell Biology, and Internal Medicine, Southern Illinois University School of Medicine, Springfield, Illinois, 62702

HuR, an mRNA stability protein, interacts with PIGF mRNA
Leavenworth, Jonathan, Kathy Groesch, and Donald Torry, PhD., Molecular Biology, Microbiology and Biochemistry Graduate Program, Department of Medical Microbiology, Immunology, and Cell Biology Department of Obstetrics and Gynecology, SIU School of Medicine, Springfield, IL.

Analysis Of Self-Assembled Monolayers By Scanning Probe Microscopy
McLeod, Bronson, * Marc Klingshirn, Gary L. Trammell and Keenan E. Dungey, Chemistry Department, University of Illinois at Springfield, Springfield, IL 62703

This presents a problem for individuals with inherited mutations in the beta-globin gene. We are specifically interested in mediating the relative concentrations of several potential transcriptional “activators” of endogenous gamma-globin gene expression as a stem cell gene therapy approach for the treatment of Sickle Cell Anemia. To this end, we couple lentiviral vector-mediated gene transfer to CD34+ stem cells with an experimental culture system for generating massive numbers of red blood cells from a relatively small starting CD34+ population. Perturbed expression the gamma globin gene product can be demonstrated by elevated levels of HbF using hemoglobin gel electrophoresis, flow cytometry, and HPLC. Ultimately, findings from these studies could result in the development of a novel therapy for patients with hemoglobin disorders.
irradiated cells, most cells were CD133(+), but when the tumors grew bigger, the CD133 positivity was reduced. To further study the role of CSCs in radioresistance, we isolated CSCs from DU145 or LNCaP cells and expanded them as prostaspheres. The prostaspheres retained a high percentage of CD133(+) cells and were able to differentiate in serum-rich media and form tumors when injected into mice. When compared to parental DU145 cells, the CSCs from DU145 presented a higher resistance toward radiation at 200 and 800 cGy as indicated by colony formation assay. CSCs from LNCaP cells presented a much higher resistance toward radiation at 800 and 2,000 cGy than parental LNCaP. Taken together, our data suggest that prostate CSCs are inherently more resistant to radiotherapy than non-CSCs and surviving CSCs may lead to recurrence of tumors after radiotherapy.

An Erythroid Differentiation Assay to Test For Elevated Fetal Hemoglobin (HbF) Production After Lentiviral Vector-Mediated Gene Transfer to Human Hematopoietic Stem Cells

Wilber, Andrew¹, and Arthur Nienhuis². ¹Department of Surgery, Southern Illinois University School of Medicine, Springfield, Illinois 62794 and ²Department of Hematology, St. Jude Children’s Research Hospital, Memphis, Tennessee 38105

Sickle cell disease, which results from deficiency or severe impairment of the beta-chain of hemoglobin, is a devastating illness characterized by progressive organ damage leading to death before the age of 50. This disease represents one of the more common single gene disorders worldwide and the most common inherited blood disorder in the United States, however, treatment options are limited. Thus, the prospect of gene therapy presents a significant opportunity for improved clinical outcome in these patients.

Two major types of hemoglobin are produced during development (i) fetal hemoglobin (HbF), consisting of two alpha- and two gamma-globin subunits, and (ii) adult hemoglobin (HbA), where beta-globin molecules replace gamma. HbF is produced during embryonic development but progressively declines after birth giving way to HbA for the duration of life.

Mhaskar, Yashanad,¹ and Linda Toth². ¹Chemistry Department, University of Illinois at Springfield; ²Department of Pharmacology, SIU School of Medicine

[16] Analysis of GHB in Alcoholic Beverages
Miller, Stephanie¹, Clinical Laboratory Sciences at University of Illinois at Springfield and Illinois State Police, Division of Forensic Services, Research and Development Laboratory

Moore, Isaac J.,¹ Jason Barker, Psychology Department, University of Illinois at Springfield, Springfield, Illinois 62703

[18] Apoptotic Threshold Is Lowered By c-Maf Transactivation Of Caspase 6 In CD8 T Cells.
Peng, Siying¹, Kounosuke Watabe¹ and Mary E. Pauza¹,² ¹Department of Medical Microbiology, Immunology and Cell Biology, and ²Internal Medicine, Southern Illinois University School of Medicine, Springfield, Illinois, USA

[19] Using GIS to model habitat selection and nest site suitability of Peregrine falcons in Arctic Canada
Phillips, Brian L.,¹ Matthew Evans and Amy McEuen. Biology Department, University of Illinois at Springfield, Springfield, Illinois, 62703.

Randle, Michelle,¹ Nathaniel Blood,² Keenan E. Dungey,² Michael J. Lemke¹, Biology Department, ¹Chemistry Department, University of Illinois at Springfield, Springfield, IL.

[21] Shorebird Response to a Restoring Wetland Habitat: The Increase in Species Abundance and Species Diversity.
Scharaf, Michelle¹ and Matthew Evans,¹ Biology Department, University of Illinois at Springfield, IL 62703. Emiquon Field Station, Havana, IL 62644, USA

[22] Shifts in Avian Biodiversity at the Emiquon Wetlands Restoration Preserve
Simonson, Curtis¹ * and Matthew Evans. Biology Department, University of Illinois at Springfield, Illinois 62703

[23] Role of Progerin in Nuclear Abnormality during Tumorigenesis
TANG, Yong¹*, Daotai NIE.¹, Department of Medical Microbiology, Immunology and Cell Biology, Southern Illinois University School of Medicine and SimmonsCooper Cancer Institute, Springfield, IL, 62702.

[24] Habitat Selection and Interspecific Competition in Four Species of Loons in Arctic Canada
Villicana, Matthew A.¹,²¹ Matthew R Evans,¹ Department of Environmental Studies, ²Biology Department, University of Illinois at Springfield, Springfield, IL 62703 Department of Biology, University of Illinois at Springfield, Springfield, IL 62703
Stem-like Cancer Cells in Prostate Tumor Recurrence after Radiotherapy.

Wang, Man-Tzu; Yong Tang, & Daotai Nie. Department of Medical Microbiology, Immunology and Cell Biology, Southern Illinois University School of Medicine and SimmonsCooper Cancer Institute, Springfield, IL.

Radiotherapy is a primary treatment modality for prostate cancer but its efficacy is limited by the recurrence of resistant tumors. Cancer stem cells (CSCs) are a subset of tumor cells responsible for transplantability of tumors, but their role in tumor recurrence after treatment remain unproven. To investigate the biology of CSCs in tumor recurrence after radiotherapy, tumor cells were irradiated \textit{in vitro} and then injected s.c. into mice to model tumor recurrence from radioresistant tumor cells. It was found that DU145 cells, after irradiation at 800 cGy, were still able to form palpable tumors but the growth of tumors was significantly compromised. To investigate whether CSCs survived from radiation and gave rise to radioresistant tumors, we evaluated the presence of CD133 antigen, a putative marker for stem cells, in the recurring tumors by immunohistochemistry. Most cells were negative for CD133 antigen in tumors derived from sham-irradiated cells. In the small recurrent tumors derived from four loon species, and to determine if there is any interspecific competition between the different species relating to habitat selection. I believe that the four loon species have preferences for specific habitat characteristics that they search for when selecting an area to nest in and raise their young in. I also believe that the presence of competitors influences the selection process by each nesting pair, such that larger loon species are more able to defend the highest quality habitat over smaller species. Therefore, I predict a hierarchal pattern of habitat selection such that the larger more aggressive species will occupy the highest quality nesting habitats and the smaller species will be forced into lower quality areas. From my research, I will also attempt to compile a list of recommendations that allows managers to protect areas that provide the habitat characteristics that are important to nesting loons.
distributed computation can be found in the inherent scientific worth of certain difficult applications that can only be run in a distributed environment. For example, complex molecular structures can be analyzed by a distributed grid in an attempt to deepen our understanding of the nature of diseases such as human immunodeficiency virus (HIV) potentially leading to new treatments. The objective of this study is to verify the validity of a client-server based computation grid utilizing a minimalistic code base. My methods include programming, code optimization and reduction, fault tolerance testing, and performance benchmarking. My findings indicate that current technology allows for the creation of a functional distributed grid client using a few dozen lines of code. This means that very small clients can be easily distributed, modified, and debugged. This ease of maintenance is not commonly found in current distributed grid clients which are often compiled from large complex code bases. In summary, the significance of this research is that I have shown that large powerful computation grids can be more easily set up than was the case in the past.

HABITAT SELECTION AND INTERSPECIFIC COMPETITION IN FOUR SPECIES OF LOONS IN ARCTIC CANADA

Villicana, Matthew A., Matthew R. Evans

I am studying the habitat selection of four loon species that breed in the northern part of Baffin Island, Nunavut Territory, Canada. The four species of loons are the Yellow-Billed (Gavia adamsii), Common (G. immer), Pacific (G. pacifica) and the Red-Throated Loon (G. stellata). This study will involve location data collected from aerial surveys during the summers of 2006, 2007 and 2008. Loons have been well studied in other areas of the world, most notably Alaska; however, very little work has been conducted on the loons in Arctic Canada. My objectives are to determine the important characteristics of the preferred habitat by each of the
Leonard R. MacGillivray earned his Ph.D. in Chemistry from the University of Missouri-Columbia. After working as a Research Associate in the Functional Materials Program, at the National Research Council of Canada, Dr. MacGillivray started his academic career in the Department of Chemistry at the University of Iowa. He was tenured and promoted ahead of schedule. He has published over 120 journal articles and is a pioneering researcher in the field of Supramolecular Chemistry. He has won numerous prestigious awards including the American Chemical Society’s Arthur C. Cope Scholar Award, the Margaret C. Etter Early Career Award of the American Crystallographic Association and is an elected Fellow of the Royal Society of Chemistry.

Identified in patients with Hutchinson-Gilford progeria syndrome (HGPS), a severe disease characterized by accelerated aging. Since aging is one of the biggest risk factors for carcinogenesis, we examined whether progerin is expressed in cancer, and if so, whether progerin contributes to carcinogenesis. Using RT-PCR and western blotting, we detected the expression of progerin in PC-3, DU145 and LNCaP cells at both mRNA and protein level. Immunocytochemical staining of lamin A revealed substantial nuclear invaginations in several cancer cells similar to those described in HGPS cells. To study the potential role of progerin in tumorigenesis, we over-expressed progerin in PC-3 and MCF7 cells. It was found that increased expression of progerin induced increased nuclear invaginations and blebbings in PC-3 and MCF7 cells. However, the increased expression of progerin did not induce cellular senescence as suggested by staining for senescence-associated α2-galactosidase activities. To study the role of progerin in tumorigenesis in vivo, we injected progerin-transfected PC-3 cells into athymic nu/nu mice. It was found that increased expression of progerin in PC-3 cells stimulated tumor growth in vivo. Our study for the first time describes the expression of progerin in a number of human cancer cell lines. We found that progerin acted in a dominant manner to cause DNA damages, induce abnormal nuclear shape and stimulate tumor growth in vivo.

Implementation of a Multi-Platform General Purpose Distributed Computation Grid
Verhulst, Michael*, Liberal Studies and Computer Science, University of Illinois at Springfield, Springfield, Illinois 62703.

Many computationally expensive software applications (integer factorization, protein folding, etc.) cannot be feasibly run on mainstream off-the-shelf computer hardware. However, by utilizing the distributed computational resources of multiple individual computers, researchers can greatly expand the amount of processing power available to them. Currently, the installation of such a grid is time consuming, technologically complex, and often requires expert assistance. The importance of the field of
Lake Chautauqua. This is an exciting opportunity to monitor the success of a large-scale wetland restoration project. This study will not only aid in understanding avian dynamics in a restoring habitat but also help create a public awareness concerning the importance of restoring and preserving natural habitat and avian diversity.

**Shifts in Avian Biodiversity at the Emiquon Wetlands Restoration Preserve**

*Simonson, Curtis* and *Matthew Evans*. Biology Department, University of Illinois at Springfield, Illinois 62703

North America has lost around 75% of wetland habitat for water birds in the 20th century, due primarily to agriculture turning wetlands into farmland. During this time, drastic population declines have occurred among most water bird species. The Emiquon Wetland Restoration Project near Havana, Illinois is returning over 7000 acres of farmland back into its original wetland state. I hypothesize that as the preserve area ages, avian species diversity, and the abundance of each species, will gradually increase. To measure this, I will conduct bird surveys throughout the migration (April and September) and breeding seasons (June, July, August) of 2008 and 2009. Point-count surveys will be conducted three times from 6:00 AM to 12:00 PM. It is my intention to monitor how successful the restoration process is with respect to avian biodiversity in the first two years, and to document what species return to the area, and how many individuals of each species return. This will provide initial data for future studies at the Emiquon preserve that will continue to monitor changes as the area ages.

**Role of Progerin in Nuclear Abnormality during Tumorigenesis**

*Tang, Yong* and *Daotai NIE*. Department of Medical Microbiology, Immunology and Cell Biology, Southern Illinois University School of Medicine and SimmonsCooper Cancer Institute, Springfield, IL, 62702.

Progerin is a truncated form of lamin A in which 50 amino acid residues are deleted near the C-terminus as result of a point mutation (1824C>T) in the LMNA gene, which was first

**ABSTRACTS**

**Fuel Behind The Fire: Synthesis of La$_2$MVO$_6$ (M = Ni$^{2+}$, Zn$^{2+}$) Perovskites.**

*Bley, Nicholas * and *Alya Saqer, and Paris Barnes*. Department of Chemistry, Millikin University, 118 West Main Street, Decatur, IL 62522.

Perovskite samples targeted for synthesis focused on La$_2$MVO$_6$ where M = Ni$^{2+}$ and Zn$^{2+}$. It is the potentially interesting physical properties that “fuel the fire” associated with the search for novel vanadium-containing perovskites. Better and smaller electronic devices have been developed from perovskite-based materials and understanding the synthetic properties toward making new V-containing materials is the driving force behind this project. This goal can only be accomplished by learning how to control vanadium’s oxidation state at elevated temperatures. Two techniques used during this exploratory synthetic project include direct solid-state reaction of metal oxides and carbonates in air and under reducing conditions (5% H$_2$/95% Ar). The progress of this synthetic effort was monitored using X-ray powder diffraction. Results of these efforts to date will be presented here. After pure samples are synthesized, physical properties such as electrical conductivity and magnetism will be measured in the future.

**The Effects of Flood Pulsing on Four Wetland Plant Species: A Comparison of Native and Non-Native Responses**

*Borrowman, Megan E.* and *Amy McEuen*. Biology Department, University of Illinois at Springfield, Springfield, Illinois 62703

Invasive plants are a major contributor to wetland degradation and frequently hinder restoration attempts. Invasive plant seeds are able to incorporate into a seed bank and germinate given the proper conditions. The purpose of this study was to determine how flood pulsing regimes may differentially affect growth and survival of...
desired and undesired wetland plant species. This research tested different flood pulsing treatments to try to find a regime that increased the growth and germination of two desired native plant species over two unwanted nonnative invasive plants. Specifically, we compared the germination and growth abilities of nonnative *Phalaris arundinacea* and native *Boltonia decurrents*, under various flood pulsing treatments. These variables were tested by growing the wetland species in 4 different water regimes in a controlled greenhouse setting, a positive and negative control along with a 20-day flood pulse treatment, and a 40-70-40 pulsed treatment. Using above and below ground biomass comparisons along with maximum and average heights, it is clear that the saturated (+) control and 20 day pulse provided for the best growth conditions, with *B. decurrents* having the highest maximum height and above ground biomass in these treatments. There was also a decline in above and below ground biomass for *P. arundinacea* in all conditions when compared to the saturated (+) control, though average height stayed fairly consistent across all treatments. These data suggest the ability to manipulate flood pulse regimes to help control the germination and survival of nonnative wetland species may be a viable management option.

**Investigating of Antibiotic and Antioxidant Properties of Leaf Extracts From Juglans Nigra, Quercus Alba, and Quercus Rubra**

*Cassavant, Megan* 2*, Rachel Olson* 1,* Wayne Gade 3,* Amy McEuen 1,* Gary Trammell 2,* Lucia Vazquez 1,* and James Veselenak 3

1 Biology Department, 2 Chemistry Department, 3 Clinical Laboratory Science Department, University of Illinois at Springfield, Springfield, IL

We are interested in obtaining phytochemicals with enhanced antimicrobial and antioxidant properties. Leaf extracts of *Juglans nigra* (black walnut), *Quercus rubra* (red oak), and *Quercus alba* (white oak) were tested for antimicrobial and antioxidant activity. Leaves were extracted with methanol (crude samples). Crude extracts were partitioned between water and hexane. The aqueous extracts (purified samples) were lyophilized and fractionated on silica gel columns. Antimicrobial properties of all extracts were tested against *Bacillus cereus*, *Escherichia coli*, *Enterococcus* turbidity). Water subsamples were analyzed for additional water quality variables (i.e., chlorophyll a, nitrogen, phosphorus, total bacterial number and suspended solids). The samples were also divided into particle-associated bacteria (> 3.0 µm) and free-living (3.0-0.2µm) by filtration. Diversity was measured by separation of 180 bp 16S rDNA amplicons by denaturing gradient gel electrophoresis (DGGE). Canonical discriminate analysis of water quality variables revealed that the connected lakes grouped more closely than unconnected lakes. DGGE results were analyzed using Pearson’s Coefficient revealed that particle associated bacterial communities for both years were different between subsurface and bottom waters in 2006. Similar results were shown for 2006 free-living communities. Water strata variables may account for these differences (i.e., surface waters with higher dissolved oxygen, lower turbidity in 2006). These results support the idea that suspension status and water column position affect bacterial community composition within freshwater systems.

**Shorebird Response to a Restoring Wetland Habitat: The Increase in Species Abundance and Species Diversity.**

*Scharaf, Michelle* 5, 6, 7 and *Matthew Evans*, 5, 6, 7 Biology Department, University of Illinois at Springfield, Springfield, IL 62703. Emiquon Field Station, Havana, IL 62644, USA.

Wetland restoration projects are being conducted worldwide amongst these is the Emiquon Wetland Restoration Project at Havana, IL. A study of shorebirds at this site will monitor the changes in shorebird abundance and specie diversity in relation to the wetland restoration process in 2008 and 2009. It is the intention of this study to provide a better understanding of the avian dynamics associated with wetland restoration and the expected gradual increase in habitat quality. It is expected that shorebird biodiversity will increase as the restoration project progresses. Two to three point count surveys will be conducted each week between 6:00 A.M. and 12:00 P.M. from mid-April to Mid-September. Comparisons will be made to historical data from the area and to contemporary data from nearby areas such as
natural resources such as nesting and foraging habitat. This study will develop a distribution model of breeding habitat preferences of the Peregrine falcon, subspecies *tundrius*, in northern Baffin Island (Nunavut Territory, Canada) using GIS techniques to characterize topographic features including slope, aspect, and height of nest sites, as well as population measures such as density and nearest neighbor distance. Proximity to food resources will also be determined using distance to tundra, the primary hunting ground where *tundrius* typically preys on passerines and small mammals. Data for this study were collected during 2006 and 2007 largely through aerial helicopter surveys, as well as ground plot verification. The habitat variables for nest sites will be evaluated using Akaike's Information Criteria (AIC) to select the best combination amongst all variables considered that yields the most parsimonious model for breeding habitat suitability of the Peregrine falcon subsp. *tundrius*. This information may enable land and wildlife managers to identify and preserve potential breeding grounds to ensure the continued success and possible range extension of the once endangered Peregrine falcon.

Microbial Diversity and Water Quality in Connected and Unconnected Lakes of the Illinois River Floodplain

Randle, Michelle,1 Nathaniel Blood,2* Keenan E. Dungey,2 Michael J. Lemke1.1 Biology Department, 2Chemistry Department, University of Illinois at Springfield, Springfield, IL.

Because different populations of microorganisms respond differently to environmental variables, study of bacterial communities will likely yield good environmental indicators of water quality. The objective of this study was to determine if the bacterial community composition in subsurface and bottom waters was different in lakes with different water quality. We present results from two years of data comparing Illinois River floodplain lakes seasonally connected to the river (n=3) and three unconnected. Water samples (n=3; subsurface and near-bottom) were collected in July 2006 and June 2007 along with field measurements (dissolved oxygen, pH, conductivity, and

Use of Adenovirus Mediated Gene Delivery to Characterize Placenta Growth Factor (PlGF) Gene Expression in Human Primary Cells

Chang, Miao 1,2*, Kathy Groesch 1,2, Chris Chambers and Donald S. Torry 2 1. Departments of Medical Microbiology, Immunology, and Cell Biology, 2Obstetrics and Gynecology, and 3Surgery, Southern Illinois University School of Medicine Springfield, Illinois

Basal PlGF expression is high in trophoblast but is comparatively lower in most non-trophoblast. We previously characterized PlGF promoter regions and showed that PlGF transcription is cell type specific. However, tumor cell lines often aberrantly express various genes, especially angiogenic growth factors, and thus may not be an optimal model to study gene regulation. Therefore, we sought to investigate regulation
of PlGF transcription in primary human cells. A 1.5Kb region of the human PlGF 5’UTR linked to a β-galactosidase reporter was cloned into adenovirus and used to infect primary trophoblast and non-trophoblast cells. Primary cytotrophoblast were isolated from human placentae of uncomplicated pregnancies. Adenovirus infection conditions were optimized utilizing adenovirus construct with luciferase and GFP reporters in primary trophoblast. Cells were cultured under 21%O₂ or 1% O₂ for 24h or 48h to determine PlGF transcriptional responses to hypoxia. Adenovirus produced 85% infection efficiency in primary human cytotrophoblast with M.O.I of 200, 95% in skeletal muscle cells, 65% in fibroblast and 40% in human umbilical vein endothelial cells (HUVEC). PlGF 1.5Kb produced highest promoter activity in primary trophoblast, relatively low activity in HUVEC, but little activity in the lung fibroblast or skeletal muscle cells. Promoter activity of this region was significantly decreased in primary trophoblast specifically cultured at 1% O₂. These results confirm that basal PlGF promoter activity is differentially regulated in primary human cells. The differential effects of hypoxia regulating PlGF transcription suggest unique mechanisms govern PlGF expression in trophoblast under oxidative stress, which needs to be further delineated.

On Ramanujan’s “Most Beautiful Identity” and Its Generalization
Chen, Hei-Chi, Mathematical Sciences Department, University of Illinois at Springfield, Springfield IL 62712
Srinivasa Ramanujan (1877-1920) was one of India’s greatest mathematical geniuses. He once discovered an identity which G. H. Hardy (1988-1947), Sadleirian Chair of Mathematics at Cambridge, considered it to be Ramanujan’s “Most Beautiful Identity.” In this talk, we will discuss a generalization of this wonderful identity. Curiously, our generalization is closed connected to Ramanujan’s cubic continued fraction. Preprints related to this talk can be found at http://people.uis.edu/hchan1/.

On Ramanujan’s “Most Beautiful Identity” and Its Generalization
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Srinivasa Ramanujan (1877-1920) was one of India’s greatest mathematical geniuses. He once discovered an identity which G. H. Hardy (1988-1947), Sadleirian Chair of Mathematics at Cambridge, considered it to be Ramanujan’s “Most Beautiful Identity.” In this talk, we will discuss a generalization of this wonderful identity. Curiously, our generalization is closed connected to Ramanujan’s cubic continued fraction. Preprints related to this talk can be found at http://people.uis.edu/hchan1/.

Using GIS to model habitat selection and nest site suitability of Peregrine falcons in Arctic Canada
Phillips, Brian L. *, Matthew Evans and Amy McEuen, Biology Department, University of Illinois at Springfield, Springfield, Illinois, 62703.
The Peregrine falcon (Falco peregrinus) in North America continues to recover from its endangered status in large part because of the 1970's ban on the use of organochloride pesticides, as well as successful efforts at reintroduction into areas where populations had previously been extirpated. In addition to these conservation strategies, the persistent survival of this species depends on the ability to identify and effectively manage critical
Secondary production of benthic macroinvertebrates from historical floodplain wetlands differing in restoration status along the Illinois River, Illinois

Negro, Jaclyn Michelle,* and A. Maria Lemke. Biology Department, University of Illinois at Springfield, One University Plaza, Springfield, IL 62703 and Illinois Chapter of The Nature Conservancy, 301 SW Adams St., Suite 1007, Peoria, IL 61602

Our research focuses on macroinvertebrate secondary production and assemblage structure to better understand how wetland management and restoration status relate to biodiversity and ecosystem function. Macroinvertebrates were collected from main pool areas of Big Lake (BL), a wetland mitigation site with an unmanaged connection to the Illinois River, and Spunky Bottoms (SB), a highly managed wetland with no direct connection to the river. Tanypodinae and Chironominae dominated both wetlands, but had higher annual production in BL (191.7 g DM m⁻² y⁻¹) than SB (104.7 g DM m⁻² y⁻¹). Biomass estimates were similar between near-shore habitats of BL and SB, but were higher in open-water habitats for BL (1000-7500 mg DM m⁻²) than SB (400-1700 mg DM m⁻²). Taxa richness was higher in SB (32) than BL (22), reflecting the presence of mayflies (*Caenis* sp.), damselflies, caddisflies and snails that did not occur in BL. Higher taxa richness in SB likely reflects the diverse aquatic plant assemblage dominating SB at the time of the study compared to a lack of aquatic vegetation in BL. This study will contribute to research currently being conducted along the Illinois River addressing the complexities of restoring and managing floodplain habitats for biodiversity and ecosystem function.

Apoptotic Threshold Is Lowered By c-Maf Transactivation Of Caspase 6 In CD8 T Cells.

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c-Maf transactivates the IL-4 gene in T lymphocytes. Despite its critical role in T helper (Th) 2 cell differentiation, little else is

The Role Of Pregnane X Receptor In Breast Cancer Chemotherapy

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Resistance to drug treatment is a significant barrier to the effective management of breast cancer. Pregnane X receptor (PXR), an orphan nuclear receptor known for its activation by many important clinical drugs, is a major transcription factor regulating the expression of drug metabolism enzymes and transporters, such as Cytochrome P450 3A4 (CYP3A4), and MDR1 (multi-drug resistance gene). In this study, the expressions of PXR in breast cancer cell lines MDA-MB-231 and MCF-7 and both normal and cancerous human breast specimens were detected. Pretreatment of MDA-MB231 with SR12813, a potent and selective PXR agonist, led to an increased resistance to taxol at low concentrations. MCF-7 also showed a significantly increased resistance to tamoxifen with PXR preactivation. In addition, colony formations of SR12813-pretreated MDA-MB-231 and MCF-7 cells were significantly higher than that of no SR12813 pretreatment cells under the pressure of cancer treatment drugs. PXR expression was consistent during the SR12813 treatment, while a nuclear translocation of PXR and increased CYP3A4 and MDR-1 expression were revealed, indicating a possible mechanism for PXR-mediated drug resistance in breast cancers. For direct evidence on the role of PXR in breast cancer drug resistance, PXR expression was knocked down in MDA-MB-231 and MCF-7 cells. All PXR-ablated clones reduced PXR binding activity to the CYP3A4 promoter. Their sensitivities to taxol or tamoxifen were enhanced. The reduced resistance of PXR knockdown cells was further confirmed by reduced colony formation ability under the pressure of cancer treatment drugs. Our data suggest an important role of PXR in breast cancer resistance to drug treatment.
**Generating a MicroRNA Library for Biological Function Studies**

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MicroRNAs (miRNAs) are evolutional conserved, non-coding RNA molecules found in eukaryotes that are known to regulate gene expression at the posttranscriptional level. miRNAs have been reported to be essential in development and in particular, to be associated with oncogenesis. To date, over 500 human...
Changes in MAPK and PKC Pathway Proteins under stress due to sleep fragmentation.

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Sleep deprivation or fragmentation has been linked to various disease states and also reduces quality of life. We investigated if there are any changes in protein levels from the Mitogen Activated Protein Kinase and Protein Kinase C pathways, caused due to sleep fragmentation in two different strains (C57BL/6J and Balb/c) of mouse liver. Mice were subjected to sleep fragmentation for three days and protein array analysis technology was utilized to determine relative proportions of the proteins between controls and sleep fragmented mice. Our preliminary results show more than 50% increase/decrease in lots of proteins that act as serine/threonine specific kinases, transcription factors and signal regulatory protein. The changes were different between two different strains of mice. We also found a change in Estrogen receptor protein. Our results did not reveal which of the two forms (ER-α and ER-β) happen to get affected under sleep fragmentation. Estrogen receptors have a functional role in physiology and disease. Changing protein level of the estrogen receptor due to stress can have serious adverse effect. We now plan to investigate the protein levels of the two forms of estrogen receptor under stress conditions.

Analysis of GHB in Alcoholic Beverages

Miller, Stephanie*, Clinical Laboratory Sciences at University of Illinois at Springfield and Illinois State Police, Division of Forensic Services, Research and Development Laboratory

Gamma-hydroxybutyrate (GHB) is a substance that has become increasingly popular as a date rape drug since the 1980’s. GHB is abused recreationally and its ingestion causes sedation, mild amnesia and, higher doses can result coma and death. Improved field tests for GHB are urgently needed because a large number of sexual assaults occur after GBH is spiked into alcoholic beverages. In this study, one-ounce beverages were laced with one gram of GHB and tested with three colorimetric assays. miRNAs have been identified. However, the role of many miRNAs in oncogenesis has not been investigated.

To determine miRNA function, we attempted to clone all known miRNAs to generate a miRNA library. We first amplified each of pre-miRNAs and then cloned into a PCR vector. We finally cloned them into a lentiviral vector under control of CMV promoter. To determine whether these cloned fragments produce mature miRNAs, we introduced them individually into 293T cells by transfection. Real-time PCR was performed to detect expression of mature miRNAs from the transfected cells. To explore the potential of this library, we made viral particles and infected non-invasive breast cancer cell line MCF-7 and performed invasion assays.

We generated a first version of the library carrying 330 miRNAs. By real-time PCR we verified that these cloned miRNA constructs produced mature miRNAs from 10 to 1000 fold higher than the endogenous miRNAs. Moreover, preliminary results with invasion assay indicated that this miRNA library contained miRNAs that caused the non-invasive MCF-7 cells to invade matrix gel. Experiments are under way to identify which miRNAs are responsible for observed invasiveness.

The miRNA library has the tremendous potential and it can be used combined with a variety of assays to investigate clinical related questions. Therefore, its application is not limited to the area of cancer research.

Snow Goose Conservation in the Canadian Arctic

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We are studying snow goose habitat selection during spring and fall migrations in the Canadian Arctic (Baffin Island, Nunavut Territory). Over 100,000 snow geese use areas on Baffin Island for important migratory stop-over locations, to refuel, and to molt their feathers. Determining the locations and habitat
features of these stop-over sites will aid our ability to protect and conserve Canada’s largest population of breeding snow geese. It will also offer an opportunity to monitor the number of birds that migrate through this area every year, and to monitor the health of the population. Numerous aerial surveys were conducted from May-September of 2006 and 2007 and locations of snow goose flocks were recorded. Data analysis will include multi-variant comparisons between the habitat characteristics of those areas occupied by geese and those areas that are avoided. Determining the areas and habitat characteristics that are important to the successful migration of these animals will help us conserve and manage this large population. It is the intention of this study to recommend policy measures that will prevent the disturbance of these birds during the sensitive time of migration when they are nutritionally stressed.

Pupil Dilation In Response To Violent Images: Gamers And Non Gamers

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The intention of this study is to investigate the relationship between playing video games and desensitization, aggression, and empathy. It has been proposed that playing video games that expose the players to, and includes them in, violence leads to the player themselves becoming increasingly aggressive and violent. I examined the pupil response of violent game players and non violent game players when exposed to violent vs. neutral images. I also tested participants on measures of aggression and empathy. I am also looking into comparative results in sports players, examining the possibility that a competitive nature may also account for trends in aggression. I have obtained data from 55 participants and I am currently examining the results.

Analysis Of Self-Assembled Monolayers By Scanning Probe Microscopy

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Scanning probe microscopy (SPM) is an instrument for analyzing and imaging at the nanometer scale. Through a recent NSF grant, UIS has acquired an SPM and is incorporating it into the undergraduate chemistry curriculum. We will present our progress in implementing an experiment to analyze self-assembled monolayers. Thiols with long hydrocarbon chains spontaneously form ordered layers onto a gold or silver substrate. The surface properties of these layers differ greatly from the uncoated metal, as can be seen in the water contact angle. We have further characterized the surface properties by looking at images of the surface in contact mode atomic force microscopy and with lateral force microscopy. In addition, we have looked at the adhesive properties at certain points of the surface by collecting force-distance curves. The ultimate measure of the success of this project will be in the ability of other undergraduates to repeat these procedures and carry out the analyses themselves.

Guinea acted as the source population for the migrants that established these new populations. To determine if the populations in Papua New Guinea are the source of this modern day radiation, we will compare data for four microsatellite loci for 20 Nautilus samples collected from each of three populations of Nautilus in Papua New Guinea, New Caledonia, and Vanuatu. If the Papua New Guinea population is the source of the current radiation, comparisons of allelic variation at the four microsatellite loci will be expected to show the highest genetic diversity in the source population near Papua New Guinea. Presumably only a small number of migrants from this population would be needed to establish a new population. Consequently, we anticipate that only a subset of the genetic diversity in the source population will appear in the newly established populations in New Caledonia and Vanuatu. These data may also allow us to determine the route, order and timing of these migration events.
during hypoxia/oxidative stress. To initiate, the PlGF 3’UTR was analyzed for consensus 3’AREs, and PlGF mRNA half-life was measured in normal vs. stressed conditions. To characterize stability regulation, the PlGF 3’UTR was cloned into a reporter construct. To investigate association between PlGF mRNA and RNA Binding Proteins, a RIP assay was performed on trophoblast. Consensus ARE motifs were detected at 42nt and 91nt downstream of the human PlGF coding region. Identical and spatially conserved ARE motifs were found in bovine, rat, and mouse PlGF 3’UTR. Time-dependent decrease of PlGF mRNA was observed in stressed conditions. PlGF 3’UTR altered luciferase-reporter expression relative to a site-directed mutant. Real-Time PCR detected significant PlGF mRNA in an immunoprecipitation assay for HuR, which may suggest that PlGF mRNA and the HuR protein interact. These results suggest that post-transcriptional mechanisms may regulate PlGF mRNA expression in stressed trophoblast. This mechanism allows for rapid control of gene expression and may represent a new target for therapeutic attempts to restore PlGF expression in pathophysiologic conditions such as preeclampsia.

A Comparison of Genetic Variation in Nautilus Populations from Papua New Guinea, New Caledonia, and Vanuatu using Four Microsatellite Loci

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The Nautiloids are an ancient lineage of externally shelled cephalopods. The fossil record indicates that this lineage has repeatedly undergone periods of radiation following bottlenecks caused by mass extinction events. The lack of Nautiloid fossils in strata less than 5 million years old indicates that they have recently experienced another bottleneck event. A recent study indicates that Nautilus are currently undergoing a radiation event throughout the Indo Pacific that is establishing new populations and creating new phylogenetic species. This study suggests populations of Nautilus in the ocean near Papua New Guinea, New Caledonia, and Vanuatu have unique genetic variation.

Applying The Principles of Green Chemistry to The Synthesis of Silica Sol Gels

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Silica sol gels are an important class of designer materials. They have applications in areas such as optics, sensors, catalysis, and environmental separations. In each of these applications, it is important that the morphology (porosity) of the resulting material be controllable and be reproducible. One method that can be used to control the morphology is by incorporating a drying control chemical additive (DCCA) into the synthesis. One problem is that these additives are not always considered “green”, since they are often derived from petroleum based starting materials. In this work we plan to apply the Principles of Green Chemistry to the synthesis process by using sesame oil, sunflower oil, or corn oil as the DCCA. The resulting effects on the morphology of the new materials will then be determined. Using oils such as these would decrease hazards, use reagents that stem from renewable resources, and potentially allow for the reuse of waste materials, which all follow the Principles of Green Chemistry.

Preparation of Lithium Cobalt Oxide by Emulsion at High Temperature and Low Temperature

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Today’s gadgets are powered by lithium batteries. Our research is being conducted to increase the efficiency of the lithium batteries. The hypothesis is that porous LiCoO2 will improve the rechargeability of the battery, and so we are exploring synthetic schemes to increase the porosity. In this presentation we will report our preparation of LiCoO2 from porous precursors. Co(OH)2 was formed via an emulsion solution under either constant pH or variable pH. After drying in air, the cobalt hydroxide was heated to form Co3O4. Co3O4 and...
Li2CO3 were mixed and heated to form the final product of LiCoO2 in the high temperature preparation (900 °C). A low temperature preparation (600 °C) was performed by freeze-drying Co(OH)2 with LiOH. FTIR spectroscopy was used to verify acceptable purity. PXRD was used to confirm the identity of the products. SEM images of the LiCoO2 indicate the porous nature of the low temperature samples.

CHEMICAL STUDIES ON AGARICUS BISPORUS
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Natural products have been important for their medicinal properties for hundreds of years. Ancient medicine made use of plants to cure various diseases and infections. Today with new technologies, the active molecules of plants, fungi and marine organisms have been isolated to develop new drugs with various properties and potencies. *Agaricus bisporus*, the most popular mushroom in North America known as Portabella or Crimini, is a gilled mushroom with two-spored basidia, instead of the usual four. We are working on the isolation of anti-bacterial compounds from the methanolic extract of *A. bisporus*. The crude extract was evaluated for antibacterial activity and preliminary data was very encouraging and our chemical studies have resulted in the isolation of new natural products. In this presentation, isolation and structure elucidation of natural products and their antibacterial activity data will be discussed.

Designing Primers to Amplify and Sequence Complete Mitochondrial Genomes in Nautilus.
Irlam, Justin* and Jim Bonacum, Biology Department, University of Illinois at Springfield, Springfield, Illinois 62703
Current phylogenetic studies in Nautilus have been based upon two fragments of the mitochondrial genome, a 388 base pair region of the large ribosomal subunit (16s) and a 423 bp region of the Cytochrome Oxidase I gene (COI). In order to obtain additional data we are utilizing a long range PCR promoter in non-obese diabetic mouse model (NOD) CD4 cells following in vitro stimulation, demonstrated by chromatin immunoprecipitation (ChIP) assay. This defective binding activity is conferred by a novel modification of c-Maf by small ubiquitin-like modifier-1 (SUMO1). Sumoylation of c-Maf is facilitated by direct interaction with Ubc9, a SUMO E2 conjugation enzyme. SUMO-c-Maf level is enhanced in cells overexpressing SUMO1 and CD4 cells following TCR/CD28 engagement. We find that Lysine 33 at the c-Maf transactivation domain is the SUMO acceptor site. Luciferase assay shows that sumoylation of c-Maf represses its transactivation of the IL-4 gene, acting to reduce its binding to the IL-4 promoter. Corresponding to this impaired binding activity, SUMO1-modified c-Maf is sequestered into distinct nuclear bodies and thereby away from its target. Notably, an elevated SUMO-c-Maf is present in NOD CD4 cells compared to diabetes-resistant B10.D2 counterparts. These data suggest a potential mechanism in which SUMO-dependent attenuation of c-Maf transactivation ability may contribute to the development of T1D in NOD mice, implying sumo-c-Maf as a novel therapeutic target for treatment of human autoimmune diabetes.

HuR, an mRNA stability protein, interacts with PlGF mRNA
Leavenworth, Jonathan, Kathy Groesch, and Donald Torry, Molecular Biology, Microbiology and Biochemistry Graduate Program, Department of Medical Microbiology, Immunology, and Cell Biology Department of Obstetrics and Gynecology, SIU School of Medicine, Springfield, IL.
PlGF expression is downregulated in preeclampsia, a leading cause of maternal morbidity and mortality. The pathophysiology of preeclampsia is thought to be manifested in placental trophoblast through hypoxia/oxidative stress. Stress responses demand tightly-regulated mechanisms of gene expression. Post-transcriptional regulation of mRNA stability, which results from the interaction of trans-acting RNA stability proteins with cis-acting A/U rich elements (ARE), is one such control mechanism. We are investigating whether post-transcriptional regulation of PlGF mRNA occurs in trophoblast
medium (P723). Efforts are now underway to establish these seedlings *ex vitro* for eventual release into Hawaii.

**Identification of Bioactive Compounds From Bell Peppers**

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Natural product chemistry has played a significant role in discovering new pharmaceuticals. For instance, taxol, an anticancer agent, was isolated from pacific yew tree. It is well documented in the literature that approximately 60% of the commercially available drugs are of natural product origin. Bell peppers are reported to have anticancer, antioxidant and antibacterial activities. Our initial screening suggested that the active ingredient responsible for aforementioned activities is pipatiline. Based on these data, we designed a project to isolated this compound on a large scale using antibacterial activity directed isolation method. It is our intention to study the structure-activity relationships on this compound in order to determine the presence of active pharmacophore. Determination of this pharmacophore will help us in designing new antibacterial agents. In this presentation, isolation and structure elucidation of natural products and their antibacterial activity data will be presented.

**SUMO1 suppresses c-Maf transactivation: an emerging role in the contribution of autoimmune diabetes.**

*Leavenworth, Jianmei Wu*,<sup>1</sup> Yin-yuan Mo<sup>1</sup>, and Mary E. Pauza<sup>2,3</sup>, Department of Medical Microbiology, Immunology and Cell Biology, and <sup>3</sup>Internal Medicine, Southern Illinois University School of Medicine, Springfield, Illinois, 62702

c-Maf is a transactivator for IL-4 gene expression and mediates type-2 (Th2) immune responses. Defects in Th2 immune responses occur in autoimmune diseases, including type 1 diabetes (T1D), and may result from abnormal c-Maf function. Here we report that c-Maf fails to bind to the IL-4 approach. By combining the PCR primers that we use to amplify these fragments, with long range DNA polymerase we were able to amplify the 4,617 bp region of the mitochondrial genome between the two gene regions. Chromosome walking was used to obtain fragments of the sequence between the COI and 16s regions. These fragments were assembled into contigs that contain the entire sequence of this region. Recently, the complete mitochondrial genome sequence has been published for *N. macromphalus*. We compared our contigs to the positions of the genes from this study and the gene order appears to be conserved within *Nautilus* mitochondrial genomes. Using the published mitochondrial genome sequence, and amino acid sequences from a diverse set of taxa for the remaining mitochondrial gene regions, we are designing additional PCR primers to amplify the rest of the mitochondrial genome using the long range polymerase approach. Our goal is to design a set of primers that can amplify and sequence a series of short (1000-1500 bp) fragments that can be combined into entire mitochondrial genome sequences for all known species of Nautilus. These data will provide a valuable source of information for future phylogenetic and population level studies of *Nautilus*.

**The Effect of A Solubilizing Agent on Zone of Inhibition Size When Testing Antimicrobial Activities of Essential Oils Using the Disk Diffusion Method**

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The disk diffusion method in the absence and presence of a solubilizing agent, Tween 80, was evaluated for determining antimicrobial activity of essential oils, Eucalyptus Globulus, Eucalyptus Lemon, Lavender French, Basil Holly and Tea Tree. Ten replicates of the two assays were performed using *Staphylococcus aureus, Escherichia coli, Serratia marcescens, Pseudomonas aeruginosa* and *Candida albicans*. All of the essential oils with Tween 80 resulted in a greater zone of inhibition when tested against *E. coli*. A greater zone size was present when Basil Holly, Eucalyptus Globulus and Eucalyptus
Lemon with Tween 80 were tested against *P. aeruginosa*. None of the essential oils with Tween 80 showed an increase in zone size when tested against *Serratia marcescens*, *Staphylococcus aureus* or *Candida albicans*. The addition of a solubilizing agent such as Tween 80 can increase the ease with which the oil being tested moves through the agar. However, this was dependent upon the oil and organism tested. The results emphasize that the analysis of antimicrobial activity of essential oils by the disk diffusion method is difficult to standardize.

Critical Age-Related Loss of CoFactors of Neuron Cytochrome C Oxidase Reversed by Estrogen

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The mechanistic basis for the correlation between mitochondrial dysfunction and neurodegenerative disease is unclear, but evidence supports involvement of cytochrome C oxidase (CCO) deficits with age. Neurons isolated from the brains of old (24-month) and middle-age (9-month) rats and cultured in common conditions provide a model of intrinsic neuronal aging. *In situ* CCO activity was decreased in old neurons relative to middle-age neurons. Possible CCO-related deficits include holoenzyme activity, cofactor, and substrate. No difference was found between neurons from old and middle-age rats in mitochondrial counts per neuron, CCO activity in submitochondrial particles, or basal respiration. Immunostaining for cytochrome C in individual mitochondria revealed an age-related deficit of this electron donor. Old neurons did not have adequate respiratory capacity to upregulate respiration after a glutamate stimulus, in spite of a two-fold upregulation of respiration seen in middle-age neurons. Respiration in old neurons was inhibited by lower concentrations of potassium cyanide, suggesting a 50% deficit in functional enzyme in old compared to middle-age neurons. In addition to cytochrome C, CCO requires cardiolipin to function. Staining with nonylacridine orange revealed an age-related deficit in cardiolipin. Estrogen treatment of old neurons restored cardiolipin levels and upregulated respiration under glutamate stress. Attempts to induce mitochondrial turnover by neuronal multiplication also rejuvenated CCO activity in old neurons. These data suggest cytochrome C and cardiolipin levels are deficient in old neurons, preventing normal upregulation of respiration needed for oxidative phosphorylation in response to stress. Furthermore, the data suggest this deficit can be corrected with estrogen treatment.

**In Situ and In Vitro Seed Germination of the Federally Endangered Hawaiian Orchid, Platanthera holochila.**

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*Platanthera holochila* (Hbd.) Krzl. (Orchidaceae) is a U.S. Federally listed (endangered) terrestrial orchid endemic to the Hawaiian archipelago. Fewer than three dozen plants are thought to exist within the cloud forests of Kauai, Maui, and Molokai. Although protected, this species is threatened by feral pigs, habitat encroachment by exotic species, and human activity, prompting vigorous attempts to cultivate the species from seed. All orchids, including *P. holochila*, are thought to require mycorrhizal fungi in nature to prompt seedling development. Consequently, a seed baiting technique was employed to recover and identify the fungi associated with this orchid in situ, and to use the resulting fungal strains to cultivate the orchid in vitro (= symbiotic germination). Leafless, mycotrophic seedlings (protocorms) of *P. holochila* were recovered from seed baits placed on Molokai the previous year (2003). All seedlings yielded fungi assignable to the ubiquitous anamorphic genus *Epulorhiza*. These strains, along with a highly effective *Epulorhiza* strain from Florida (*E. repens*, UAMH 9824), were applied to *P. holochila* seeds in vitro. Leaf bearing seedlings were obtained from the fungus from Florida, but none of the Hawaiian isolates prompted development, raising conservation concerns. As a result, asymbiotic germination was also attempted spanning three different media (Knudson C, Murashige & Skoog, P723). To date, leaf bearing seedlings have been obtained on one