CONFERENCE PROGRAM

CHICAGO AREA
Undergraduate Research Symposium

April 10, 2010

Monsingor Andrew J. McGowan Science Pavilion

DePaul University
Chicago, Illinois

DePaul University • Illinois Institute of Technology • Loyola University Chicago
Northwestern University • University of Chicago • University of Illinois at Chicago

CHICAGO AREA UNDERGRADUATE RESEARCH SYMPOSIUM

April 10, 2010

11:00 a.m. **Registration**
Atrium- Andrew J. McGowan Science Pavilion

11:30 a.m. **Opening Address**
Room 108 - Andrew J. McGowan Science Pavilion
Lynn Narasimhan Ph.D.
Associate Dean, DePaul University

11:45 a.m. **Poster Presentations, Session I**
1st and 2nd Floor Atrium - Andrew J. McGowan Science Pavilion

1:00 p.m. **Lunch with Roundtable Discussions**
Ballroom (Room 120)- Student Center

2:15 p.m. **Oral Presentations**
Andrew J. McGowan Science Pavilion
Rooms 103, 104, 105, 106, 107, 108

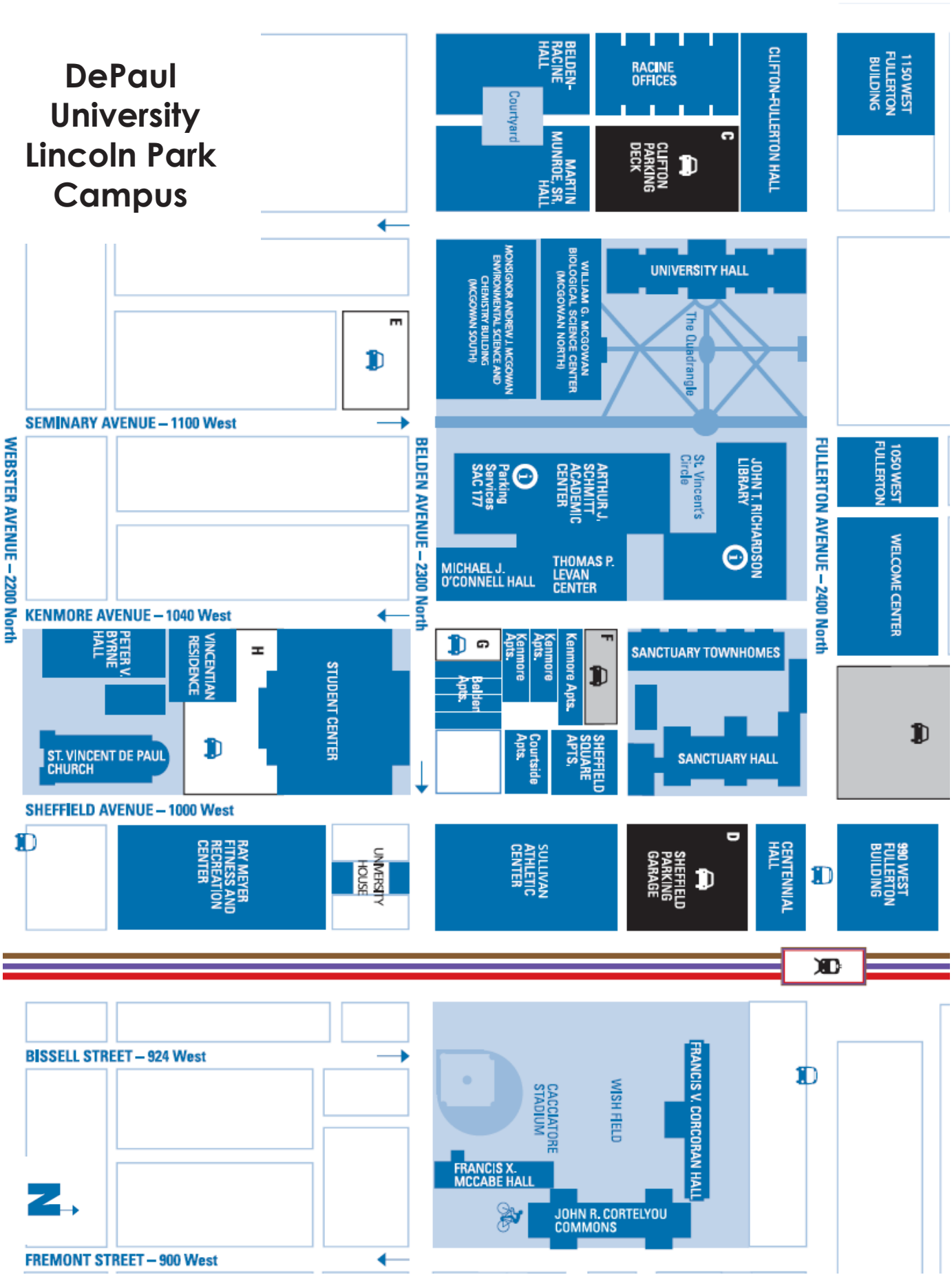
3:45 p.m. **Poster Presentations, Session II**
1st and 2nd Floor Atrium - Andrew J. McGowan Science Pavilion

5:00 p.m. **Reception**
Ballroom (Room 120)- Student Center

5:30 p.m. **Banquet Dinner and Awards Ceremony**
Ballroom (Room 120)- Student Center
Keynote Address by Rocky Kolb, Ph.D.
The University of Chicago

MAP

DePaul University Lincoln Park Campus



Contents

To CAURS participants, faculty, and guests,

Welcome to the 6th annual Chicago Area Undergraduate Research Symposium! This symposium was created to celebrate the efforts of undergraduate researchers across the Chicago area who have worked extremely hard, devoting countless hours in the lab or in the field for the sake of discovery. This year's event promises to be an exciting one as we continue the tradition of collaboration between Chicago's fine research institutions.

This year we have experienced an exponential growth and have a record turnout of participants! More importantly, we are extremely impressed that this staggering increase in participation was accompanied by an increase in the quality of submissions. As you take a look at this program, you will notice the presentations cover a wide range of subjects, from Iranian politics to tissue engineering and bioethics. Our participants yield from all four years and all participating institutions, as well as numerous students from the City Colleges of Chicago and schools outside of the Chicago area! We extend a warm welcome to everybody taking part in this year's event and hope you will gain much from attending CAURS.

We would also like to take this opportunity to express our deep gratitude to those students who helped make this event a reality. CAURS is completely student-run and requires months of careful planning. The Inter-School Board is comprised of an incredibly talented group of students who have devoted countless hours orchestrating this event. Their commitment to CAURS ensures the continued growth and success of the event and they deserve a hearty recognition. It has been our pleasure for the last year to work with such an outstanding group of dedicated and bright individuals!

Finally, we wish to extend our appreciation to the faculty members and administration who supported this event. Numerous professors from each institution year after year participate in advising these research projects and as judges at CAURS as a testament to their strong support of undergraduate research. For this, we cannot thank them enough.

We sincerely hope you enjoy this year's event and that you will take the time to appreciate and learn from the projects of your peers from neighboring institutions!

Manuel Lopez and Stephanie Reeve
CAURS Regional Directors
Illinois Institute of Technology
DePaul University

DEPAUL UNIVERSITY

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April 10, 2010

Dear CAURS participants,

On behalf of the DePaul University community, I am pleased to welcome you to our Lincoln Park Campus for the 6th Annual Chicago Area Undergraduate Research Symposium. I am glad that you'll have the opportunity to experience our new Monsignor Andrew J. McGowan Environmental Science and Chemistry Building, which recently earned gold-level LEED® certification from the U.S. Green Building Council.

Chicago has a rich tradition of research, and it is fitting that DePaul University has joined the Illinois Institute of Technology, Loyola University, and University of Illinois at Chicago, Northwestern University and the University of Chicago in sponsoring this symposium. As a university that places a premium on teaching and applied learning, DePaul is proud to be part of such an innovative event that provides an outstanding opportunity for students to receive hands-on experience in presenting and discussing research projects in a professional environment.

Research entails not only the discovery, acquisition and dissemination of new knowledge but also the development of methodologies of inquiry, instruction and professional practice. It is my hope that today's interactions provide you not only greater insight into your fields of study, but also a deeper appreciation for the research process and how it benefits students, academia and society at large.

On behalf of DePaul, I would like to thank all of the student organizers whose time and dedication made today possible. This cross-university collaboration is truly impressive and an undertaking that takes a tremendous amount of energy. I congratulate all of you and wish you continued success with this richly rewarding event.

Sincerely,

Rev. Dennis H. Holtschneider, CM

Rev. Dennis H. Holtschneider, C.M.
President

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NORTHWESTERN
UNIVERSITY

April 10, 2010

Dear CAURS Participants, Supporters and Guests:

On behalf of Northwestern University, I am delighted to welcome you to the 2010 Chicago Area Undergraduate Research Symposium. As a research university, Northwestern is pleased to help sponsor this symposium and the research activities of undergraduate students. It is gratifying to have so many students showcase their ideas and research through poster sessions and presentations.

Research is an integral part of higher education and is vital to the advancement of the new knowledge that will benefit mankind. I hope that your participation here will strengthen your appreciation of the research process and encourage you to invest yourself even further in it. By engaging in research projects, you gain valuable insight into a topic area, strengthen your critical thinking skills and integrate your learning more deeply. These skills will lead many of you to become accomplished researchers and contribute to the advancement of knowledge in your chosen field of endeavor.

I want to acknowledge the American Undergraduate Research Society for its efforts to promote excellence in undergraduate research. In addition, I want to recognize the symposium sponsors whose support made this event possible. Your support of undergraduate research will help to create the next generation of scholars and researchers. Finally, I thank all the student organizers of this symposium. Coordinating this cross-university program involves a great deal of time and effort; their dedication to this exceptional event is apparent and appreciated.

Best wishes for a successful symposium.

Sincerely,

Morton Schapiro
President and Professor

ILLINOIS INSTITUTE OF TECHNOLOGY

Transforming Lives. Inventing the Future.

March 24, 2010

Dear CAURS Participants and Guests:

Congratulations to all the students who are showcasing their work at the Chicago Area Undergraduate Research Symposium this year.

Research is a vital component of a quality undergraduate education. Research has no "right answer", so this type of work complements the normal classroom studies by demanding that priorities be set and decisions be made often with incomplete knowledge. Furthermore, CAURS students are gaining valuable experience by engaging in the investigative process and presenting their findings to a forum of their peers. Participation in the symposium will help to prepare these students for future research activities. It is also important to acknowledge the role of the advisors who help to inspire and mentor these future leaders.

I thank DePaul University and the student organizers for hosting this collaborative event. IIT is honored to be a part of this growing tradition for our students.

Sincerely,

www.iit.edu

John L. Anderson
President

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Water Tower Campus
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Phone 312.915.6400 | Fax 312.915.5414

April 10, 2010

Dear CAURS Participants and Friends,

On behalf of Loyola University Chicago, I am pleased to welcome you to the 6th Annual Chicago Area Undergraduate Research Symposium. Loyola is delighted to once again join with Chicago area research universities in sponsoring this important and exciting event which supports the research interests and activities of the students here today.

This year, 50 of Loyola University Chicago's brightest and most accomplished undergraduate student researchers are participating in the Symposium. I know that they enthusiastically await the opportunity to share their findings with you. At Loyola, we believe that rich and engaging learning experiences, such as undergraduate research, are at the heart of a transformative education. Research offers a unique opportunity for students to discover and apply knowledge to the betterment of society as whole, and I commend our students and faculty for their passionate commitment to and active participation in the types of research projects you will see at this Symposium.

I hope that your participation in the Symposium encourages you and your student colleagues to continue to use your intellectual talents and research skills to improve the lives of others and to serve society.

Congratulations and best wishes for a successful Symposium.

Sincerely,

Michael J. Garanzini, S.J.
President

GUEST SPEAKERS

Lynn Narasimhan, Ph.D., DePaul University

Associate Dean and Professor of Mathematics
Opening Address

Lynn Narasimhan is currently Associate Dean of the College of Liberal Arts and Sciences at DePaul University and a Professor in the Department of Mathematical Sciences. Dr. Narasimhan received her Ph.D. in Mathematics from Northwestern University in 1977 and joined the faculty at DePaul two years later. She has taught numerous undergraduate courses, for both majors and non-majors, and received the university's Excellence in Teaching Award in 1992. For the past 10 years, she has been active in mathematics and science education and is currently Director of DePaul's Interdisciplinary Science and Technology Center, which oversees programs to support minority students and women in mathematics and science, such as the Alliance for Minority Participation program and the Clare Boothe Luce Scholarship program, and programs for teachers funded by the Illinois Board of Higher Education and the National Science Foundation.

Rocky Kolb, Ph.D., The University of Chicago

Professor and Department Head
Department of Astronomy and Astrophysics
Keynote Speaker

Rocky is the Arthur Holly Compton Distinguished Service Professor of Astronomy & Astrophysics and the College and Chair of the Department of Astronomy and Astrophysics at the University of Chicago, as well as a member of the Enrico Fermi Institute, and the Kavli Institute for Cosmological Physics. In 1983 he was the founding head of the Theoretical Astrophysics Group and in 2004 the founding Director of the Particle Astrophysics Center at Fermilab.The field of Rocky's research is the application of elementary-particle physics to the very early Universe. In addition to over 200 scientific papers, he is a co-author of The Early Universe, the standard textbook on particle physics and cosmology, and the author of a book for the general public, Blind Watchers of the Sky.
His scientific research was recently recognized by the 2010 Dannie Heineman Prize of the American Institute of Physics and the American Astronomical Society (shared with Michael Turner). He received the Oersted Medal of the American Association of Physics Teachers for outstanding, widespread, and lasting impact on the teaching of physics. His classroom teaching at the University of Chicago has been recognized by the 1993 Quantrell Prize for teaching excellence and the 2009 teaching award of the Graham School of General Studies. He received the 1996 Emme Award of the American Aeronautical Society for science writing.
Rocky is a Fellow of the American Academy of Arts and Sciences and a Fellow of the American Physical Society.

ORAL PRESENTERS

Andrew J. McGowan Science Pavilion - Room 103

Sarah Corbridge, Northwestern University
Spatial and Verbal Working Memory Networks with Large and Small Reward and Large Delayed Reward in Typically Developing Children

Sarah Corbridge is a senior majoring in Communication Sciences and Disorders and minoring in Global Health at Northwestern University. She began working on her honors thesis in the Developmental Cognitive Neuroscience lab with Principal Investigator James Booth, PhD, this past fall. The overall goal of the lab's research is to understand mechanisms of brain development. In particular, Sarah is interested in investigating the working memory networks with the influence of reward in typical and atypical children. Following graduation, Sarah plans to attend medical school and pursue a career in infectious diseases.

Kelly Patterson, University of Chicago
Gender Differences in the Effects of Social Support and Self Efficacy on Perceived Stress

Kelly Patterson is a senior majoring in psychology at Loyola University Chicago. She has worked with three different psychology research labs in her undergraduate career, including Dr. Colleen Conley's lab which she has been a part of since last summer. Her primary research interests are gender and sexuality as well as college student mental health and adjustment. In addition to research, Kelly is also involved in many human services organizations, including Misericordia, Loyola4Chicago, and Big Brothers, Big Sisters. Following graduation, Kelly plans to work in a Bay Area school teaching and assessing children with autism and cognitive delays for a year before pursuing a doctorate degree in clinical psychology.

Christine Stiehl, Northwestern University
Age Effects on Social Motivation in Children with Autism

Christie Stiehl always has a great story to tell about the children she works with. Since she volunteered at a camp for children with autism in high school, she's been hooked on all things autism. This spring, Christie will complete her BS in Communication Sciences and Disorders from Northwestern University. While at Northwestern, Christie contributed to research in the Aphasia and Neurolinguistics Lab and the Early Learning Lab, including the pilot study for the Son Rise Program and her thesis study on autism and social motivation. She also works as a paraprofessional developmental therapist for children with developmental disorders and volunteers as a Special Olympics swim coach. Christie's interests include autism therapy, research, and diagnostics; phonology; learning disabilities; gender and sexuality; and napping in the sunshine.

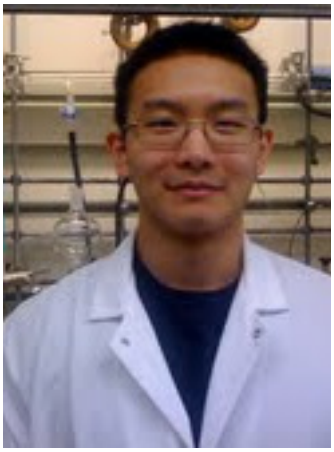
Marian Vernon, DePaul University
Changing Environmental Attitudes and Behaviors of College Dormitory Residents

Marian Vernon is a junior at DePaul University pursuing a degree in Environmental Studies. She began her studies at DePaul as a cello performance major, but quickly realized that her true passion lied in environmental thinking and the sciences. She is currently conducting research with Dr. Mark Potosnak and Dr. Judy Bramble on the effects of different types of messages that can be used to change the environmental attitudes and actions of college dormitory residents. She is grateful for the support she has received from professors in the Environmental Science department, and looks forward to doing further research in the future. In addition to her studies at DePaul, Marian is an education volunteer at the Peggy Notebaert Nature Museum, and in the upcoming summer, she will be participating in one of the Chicago Botanic Garden's President John H. Stroger, Jr. internships, entitled Living Plant Documentation. Following graduation, Marian plans to pursue graduate studies in either conservation biology or restoration ecology.

Presenters

Andrew J. McGowan Science Pavilion - Room 104

Dennis Hu, Northwestern University
The Enantioselective Total Synthesis of Streptorubin B

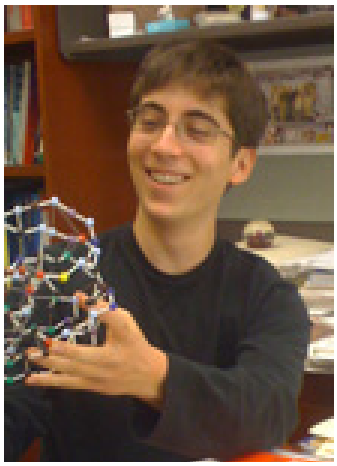


Dennis Hu is a junior in the Weinberg College of Arts and Sciences at Northwestern University. In 2007, he joined the research group of Professor Regan Thomson, and has conducted research toward the chemical synthesis of complex, biologically-active natural products since. His research is currently focused on the enantioselective synthesis and structural elucidation of Streptorubin B. Following graduation, Dennis intends to continue research in chemistry and chemical biology as a graduate student.

Jeffrey Krimmel, Northwestern University
The Synthesis and Characterization of a β-galactosidase Activateable MRI Contrast Agent

Jeffrey Krimmel is a senior majoring in Biomedical Engineering at Northwestern University. After finding a passion for science in organic chemistry and biology, he began scientific research in March 2009 with Dr. Thomas Meade. With his graduate student mentor David Ballweg, Jeffrey works on the synthesis and characterization of a β-galactosidase activateable MRI contrast agent, and received a Weinberg College of Arts and Sciences Research Grant to continue research over the summer of 2009. When not in the laboratory or class, Jeffrey enjoys playing Northwestern's many intramural sports and teaching health workshops in Chicago high schools through Peer Health Exchange. After graduation, Jeffrey will be joining a gene therapy research group as a laboratory technician at the Evanston Northshore Hospital. Jeffrey intends to apply for M.D./Ph.D. training in 2011 in pursuit of a career in academic medicine.

Samuel Pollock, University of Chicago
The Kinetics of Native Chemical Ligation with Proline Thioesters



Sam Pollock is a third year majoring in the Biological Sciences at the University of Chicago. He has worked in the laboratory of Dr. Stephen B.H. Kent since January, 2008 studying synthetic protein chemistry. Apart from his work at the laboratory bench, Sam created and maintains the Kent lab website. He is grateful for the assistance and sound advice that he has received from many scientists over the years, and excited at the opportunity to share his work with other Chicago students and hear what they have to say as well. After graduation, Sam hopes to pursue a doctoral degree in biochemistry in a place that is warm and sunny.

Maria Zawadowicz, Lake Forest College
Method Development for Non-Equilibrium Sampling of Trace VOCs in Ambient Air Using Solid-Phase Microextraction and Gas Chromatography/Mass Spectroscopy

Maria Zawadowicz is a sophomore Chemistry and Physics major at Lake Forest College. During the summer of her freshman year she participated in the Richter Scholar Program at her college, which involves independent research in a selected field. She joined Dr. Lori Del Negro's lab where she focused on finding simple yet effective analytical methods of measuring Hazardous Air Pollutants in ambient air. This experience fostered her interest in analytical chemistry, especially in instrument design and construction. She looks forward to continuing working on her project during the upcoming summer. In addition, Maria works as a tutor at the Lake Forest College Writing Center. After college, she plans to pursue graduate education, hopefully leading to a career in research.

Presenters

Andrew J. McGowan Science Pavilion - Room 105

Alexandra Gast, Northwestern University
Unraveling the Catalytic Mechanism of Topoisomerase V

Alex Gast is a senior majoring in biological sciences at Northwestern University. Thought-provoking classes as well as participation in the Gateway Science Workshops initiated her interest in the sciences as a freshman and encouraged her to pursue this field of study. She has been grateful for the opportunity to gain valuable hands-on experience in Dr. Alfonso Mondragón's group at NU.Currently, her research interests focus on the mechanism of action of topoisomerase V, an enzyme with DNA relaxation activity. Following graduation, Alex intends to pursue a career in medical research.

Vanessa Gonzalez, University of Illinois at Chicago
Early Urinary Markers of Acute Kidney Injury in Medical Intensive Care Unit Patients

Vanessa Gonzalez is a senior at the University of Illinois at Chicago. She will be graduating this May with a bachelor's degree in Kinesiology - Movement Sciences concentration. Vanessa has participated in various community outreach and biomedical research projects during her undergraduate career. Her research interests include diabetes, kidney disease, and obesity. In addition to conducting research, Vanessa is also active on campus by serving as president for the largest pre-health student organization at school, founding a mentorship program for incoming freshmen students, and volunteering in the community with various national organizations.

As proud daughter of immigrant parents, Vanessa has been greatly impacted by the inequalities and struggles faced by minority communities that she has witnessed throughout her life. In particular, she has taken a keen interest in healthcare disparities found within the Chicagoland area Latino community. Her experiences have led her to pursue a career as a medical scientist in order to better assess the science of illnesses present in underserved populations. In the future, Vanessa hopes to go into academia and serve as an active advocate for health-related research in minority communities.

James Tasch, Loyola University Chicago
Protein expression studies of Thioredoxin-1 and Thioredoxin(469) throughout the life cycle of the rodent model malaria parasite Plasmodium berghei

James Tasch is a senior majoring in molecular biology at Loyola University Chicago. He began researching in Dr. Stefan Kanzok's, PhD malaria lab in August 2008. He has been awarded the Provost Fellowship (summer 2009) and the Mulcahy Scholarship (2009-2010 school year) for his work on expressing and purifying recombinant proteins that have putative antioxidant qualities in Plasmodium berghei. He presented this work at Argonne National Laboratory in Nov. 2009. Currently his research has expanded to include performing immunofluorescence studies on the malaria parasite to determine protein expression patterns of antioxidant genes throughout the parasite's complex life cycle. Outside research, James has worked as a unit leader at Foglia YMCA's summer day camp and has been a volunteer at Good Shepherd hospital. Following graduation, James intends to continue researching with the goal of continuing his education at a professional school.

Hatim Thaker, Northwestern University
Urinary Bladder Regeneration Utilizing Mesenchymal Stem Cells Seeded onto Elastomeric Thin Films

Hatim Thaker is a senior Biology major at Northwestern University, where his course work has integrated his research interests and artistic passions. Hatim's research has focused on bladder regeneration at the Institute for BioNanotechnology in Medicine and Children's Memorial Hospital with Dr. Arun Sharma. Before this, Hatim was involved in genomics projects dedicated to breast cancer at the Genome Institute of Singapore with Dr. Edison Liu. Though basic science research has been of great importance to him, Hatim has also interned at the Prime Minister's office in Singapore and has served as a Senior Sergeant and Instructor of Military Police for the Singapore Civil Defence Force. He is an avid world traveler and performs regularly as the principal trombonist of the Northwestern Philharmonia Orchestra. Recently, Hatim has taken a great interest in teaching, and is currently a TA and workshop facilitator for an intensive biology course. Hatim will be attending medical school next year.

Presenters

Andrew J. McGowan Science Pavilion - Room 106

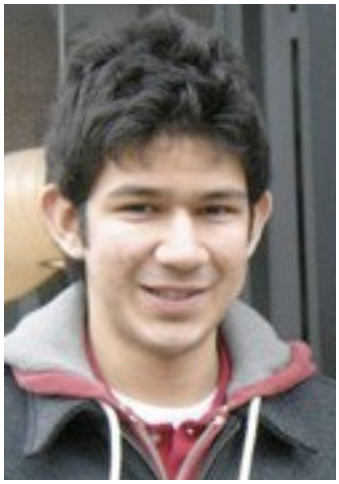
Kuan-Ying Fang, Northwestern University
Radially Compressed Silica-Aerogel

Kuan-Ying Fang is a junior majoring in the Integrated Science Program, math, and physics at Northwestern University. He has joined professor William Halperin's Ultra-Low Temperature physics laboratory since freshman year. His research focuses on developing synthesis-methods and characterization of silica aerogels for the study of superfluid 3He. He has also participated in collaborations with research groups from various other universities and has synthesized special aerogel samples for them. After graduation, he intends to pursue a career in mathematical research and education.

Brent Jarvis, DePaul University
Synchronizing a System of Coupled Oscillators

Brent Jarvis is a senior majoring in Physics at DePaul University. He has been conducting research over the past two years within the department. This last year he has been working on a nonlinear dynamics project focusing on a system of coupled oscillators. His main research interests center around characterizing connections within a system in order to determine its overall behavior. Besides doing research, Brent is also working as a mathematics tutor in the math department at DePaul University. Following graduation Brent is planning on attending UIC in pursuit of a PhD. He hopes to specialize in either condensed matter or biophysics.

Omaditya Khanna, Illinois Institute of Technology
Synthesis of multilayered alginate microcapsules for the sustained release of fibroblast growth factor-1



Omaditya 'Goldey' Khanna is a junior in the Department of Chemical and Biological Engineering at the Illinois Institute of Technology. He has worked in Dr.Eric Brey's research group at IIT for the last two years, where he has focused on developing a new drug delivery system that uses multilayered alginate microcapsules as a dual region for cell and protein encapsulation that can be targeted for use as a treatment for type 1 diabetes. Goldey's extracurricular activities include serving as a resident advisor at a residence hall on campus, working as a teaching assistant for organic chemistry, and volunteering at a hospital. He intends to attend medical school after graduating from IIT.

Kelsey Stoerzinger, Northwestern University
Screening Nanopyramid Assemblies to Optimize Surface Enhanced Raman Scattering

Kelsey Stoerzinger is a senior at Northwestern University majoring in Materials Science and Engineering. Since her sophomore year, she has conducted nanoscience research with Professor Teri Odom's group at Northwestern. Specifically, Kelsey has investigated the assembly of nanopyramids and their behavior when irradiated with light; she has used plasmonic nanoparticles as localized therapeutic agents to help kill breast cancer cells. Kelsey has presented her research at numerous conferences and symposiums; she also recently published her first peer-reviewed paper. Kelsey has interned as an engineer with General Motors and at Dow Corning, where her research concerned silicone photovoltaic encapsulants. She is also an active member of the Society of Women Engineers, plays oboe in the NU Philharmonia Orchestra, and serves as house manager for all concert venues on Northwestern's campus. Next year, Kelsey will pursue an MPhil in Physics at the University of Cambridge as a Churchill Scholar. She will then return to the states for a PhD program and aspires toward a career in academia.

Presenters

Andrew J. McGowan Science Pavilion - Room 107

Anisa Rahman, Northwestern University
Effect of Western Enculturation on Risk Factors for Type II Diabetes among Indian Immigrant Women

Anisa Rahman is an Anthropology Major concentrated in Human Biology, and a Global Health Minor at Northwestern University. After volunteering with the International Centre for Diarrheal Disease Research (ICDDRB) hospital in Dhaka, Bangladesh during the summer of 2008, Anisa became increasingly interested in healthcare research among South Asian populations. She developed her senior thesis project, The Effect of Acculturation on Risk Factors for Type II Diabetes among Indian Immigrant Women, after observing the disproportionately high prevalence of Type II diabetes among her Indian parents' generation and the vital need to explore this disparity. Aside from her independent research, Anisa works as a microbiology research assistant under Professor Aaron Packman, and is actively involved in the Muslim-cultural Students Association, Rotaract and Globemed at Northwestern. Upon graduating Northwestern University, Anisa intends to enroll in medical school and pursue a career as a physician.

Mohammad Sagha, DePaul University
Iranian Political Behavior in the 2009 Presidential Elections

Mohammad Sagha is a sophomore Political Science and Economics major at DePaul University. Last summer, he traveled to Iran shortly before the presidential elections, where he blogged for Chicago Now and conducted political science research. He is fluent in Farsi, was granted press credentials and open access to polling locations on election day. Mohammad's current primary research interests include Persian and Islamic studies, political economy of developing countries, and Middle Eastern history. Mohammad is also a research assistant, focusing on comparative presidential systems. He hopes to pursue professional journalism and enter academia in the future.

Jamie Shaw, DePaul University
Macena Barton and 20th Century Chicago Portraiture as Feminist Activism

Jamie Shaw is a senior majoring in the History of Art and Architecture and Women's and Gender Studies with a concentration in Cultural Constructions and Gendered Violence at DePaul University. She is in the process of publishing an essay for Creating Knowledge: DePaul University's College of Liberal Arts and Science's Undergraduate Research Journal. Jamie is also working on publication for the Illinois Women Artists Project, an online database devoted to including the forgotten and lost biographies of women artists practicing between 1840 and 1940. In addition to her research in feminist art historical discourses; she is committed to critical race theory and anti-violence work. She interned last year for Take Back the Halls, a teen dating violence prevention program initiated by the Women's and Gender Studies Department at DePaul University. Currently, Jamie is assisting with a Youth Anti-Violence Conference with Dr. Laila Farah of the Women's and Gender Studies Department. Following graduation, she intends to pursue graduate school toward a career in academia.

Lu Yao, Northwestern University
Testing Evolutionary Brain Size Change in Bats

Lu Yao is a junior majoring in Anthropology, Biology, and the Integrated Science Program at Northwestern University. She has been fascinated in science ever since she was a child and has now discovered the world of research where she could pursue her interests while furthering scientific knowledge. After spending over a year in biomolecular research, she worked at the Field Museum studying the evolution in bat brain size under Dr. Robert D. Martin. Currently, she is focusing on the application of the island rule on mammal brain size. After graduating, Lu plans on attending graduate school.

Presenters

Andrew J. McGowan Science Pavilion - Room 108

John Froberg, Northwestern University
Nucleosome Positioning in A+T-rich DNA

John Froberg is currently a junior at Northwestern University majoring in Biological Sciences with a concentration in Genetics and Molecular Biology. John has been fascinated by science since he was a small child, and has been very fortunate to have been able to pursue his research interests. As a first year student at Northwestern, John took a strong interest in the chemistry underlying biological processes. He joined Dr. Jonathan Widom's lab shortly before his sophomore year, and has worked there ever since. John is currently working to understand the forces that determine how DNA is packaged in the nucleus, and what effect the packaging has on gene regulation. Outside of the lab, John is on the executive board of Northwestern's Biology Student's Association, tutors biology, cooks and enjoys playing guitar. Following graduation, John would like to attend graduate school and eventually become a principal investigator.

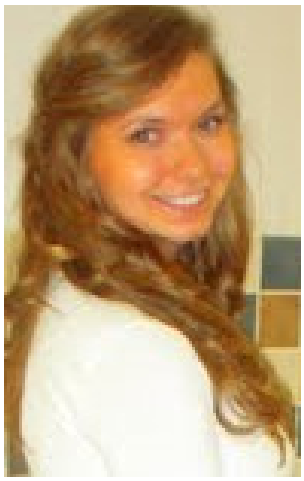
Elizabeth Gaston, University of Chicago
Isolation and Culture of Candidate Probiotics from the Bottlenose Dolphin (Tursiops truncatus)

Elizabeth Gaston is a 2nd year biology major at the University of Chicago interested in microbiology and infectious diseases. Currently, Elizabeth works in the Missiakas lab studying the mechanisms of a Staphylococcus aureus inhibitor. She has undertaken summer research projects at the University of Virginia Medical School, MD Anderson Cancer Center and, most recently, Baylor College of Medicine. The Baylor SMART Program gave her the opportunity to conduct research with the United States Navy's Marine Mammal Program in Dr. James Versalovic's Lab. When not studying or researching, Elizabeth rows with the University of Chicago's crew team and volunteers as a health educator for high school students with Peer Health Exchange. Elizabeth plans to pursue an MD/PhD after graduation.

Kevin Peine, DePaul University
The Effect of Genistein plus Estradiol on Apoptosis in MDA-MB-231 Breast Cancer Cells

Kevin Peine is a senior majoring in biology with a concentration in molecular and cellular biology at DePaul University. He is interested in using science to isolate cellular regions that better targeted for the treatment of disease. His research interests are protein- protein interactions within cellular signaling as well as DNA methylation and gene transcription. He began his work in Dr. Talitha Rajah's lab in February of 2008. He currently examines the effects of the phytoestrogen Genistein on breast cancer. In addition to research, Kevin co-founded the Biotechnology Club at DePaul and tutors for the DePaul Athletic Department. After graduation, Kevin is attending The Ohio State University's doctoral program in Molecular, Cellular, and Developmental biology in order to pursue a career in research.

Angelika Zalewski, Loyola University Chicago
Expression analysis of oxidative defense genes in the mosquito stages of the malaria parasite Plasmodium



Angelika Zalewski is a senior at Loyola University Chicago majoring in Biology with minors in English and Women and Gender studies. Since December of 2008, she has been researching in the malaria lab of Dr. Stefan Kanzok, PhD. The focus of her research consists of relative antioxidant gene expression of Plasmodium berghei in culture and mosquito using quantitative real-time PCR. She enjoys the direct application of science in her work as well as the broader purpose of working on an infectious disease that negatively impacts millions of lives. Her achievements include recipient of the Provost Fellowship (summer 2009) and the Mulcahy Scholarship (2009-2010 academic year). Aside from research, Angelika serves as an executive officer for two campus organizations (American Medical Student Association, Alpha Epsilon Delta), volunteers at the Loyola Community Literacy Center teaching English to adults, and enjoys playing the violin. Following graduation, Angelika intends on attending medical school with the goal of becoming a physician.

CHEMISTRY

1 **Early-Stage Aggregates in Alzheimer's Disease**

Amanda Abauf, DePaul University
Field: Alzheimer's Disease Advisor: Sandra Chimon Peszek, Ph.D.

The neurodegenerative symptoms of Alzheimer's Disease have long been connected to aggregations of fibrilized beta amyloid (Aß) peptide on the brains of patients. The polymerization of Aß peptide leads to a characteristic ß-sheet structure, which has been found to be the composition of the plaques. Increasing evidence shows that in a course of fibril formation, early-stage aggregates exist and that the neurotoxicity of the early-stage aggregates may be responsible for neural cell death in AD. In this study, we examined a shorter fragment of 14 residues Aß(22-35) for the most-abundant 40-residue Aß peptide, Aß(1-40) in order to study its conformational change and how it compares to that of the 40 residue Aß peptide. Very little information has been obtained about this fragment and its effects on neurotoxicity. In our study, we found that formation of only transient intermediates having ß-sheet structure (ß-sheet intermediates) was detected by fluorescence spectroscopy using a Thioflavin T (ThT) dye. ThT is a marker that exhibits light absorbance as it binds to ß-sheet and can elucidate the Aß polymerization process and dictate when the intermediate structure begins to form. Data gathered will not only verify that the Aß(22-35) region polymerizes into ß-sheets just as the entire Aß(1-40) region does, but it will also demonstrate the time intervals in which intermediate structures may be captured for analysis.

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2 **Generation of a Mutant Antibody for Single Molecule Fluorescence Spectroscopy**

Ian Agne, DePaul University
Field: Biophysical Chemistry Advisor: Cathrine Southern, Ph.D.

Of the various antibodies, immunoglobulin G, or IgG, is the most common found in the human blood stream. The carbohydrate moiety of an IgG molecule has a major impact on the conformation of the antibody's crystallizable fragement (Fc) region, which affects the antibody's ability to illicit an immune response. In order to study the effect of altering the carbohydrate moiety on the conformations of the antibody using single molecule Förster Resonance Energy Transfer (FRET) spectroscopy, the DNA sequences of assorted antibody carbohydrate fragments were altered to allow the attachment of dye molecules. Furthermore, to study the conformations of the antigen binding fragment, the DNA sequences of two single chain variable fragments (scFv) were altered in order to be dye selective. Without dye selectivity, the sample in question could exhibit three different dye molecule combinations: donor-acceptor, donor-donor, or acceptor- acceptor. The inability to distinguish between these signal pairs serves as a potential source of error in FRET spectroscopy. To study the effects of having donor-donor or acceptor-acceptor dye molecule pairs, a bivalent scFv, with binding sites selective for either a donor or acceptor dye molecule, is being constructed. As a first step in this process, scFv DNA sequences were mutated utilizing non-PCR mutagenesis to accommodate the selectivity of the donor and acceptor dye molecules.

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3 **Crystal structure and reactivity of an ionic palladium dimer**

Karla Arias, DePaul University
Field: Inorganic Chemistry Advisor: Quinetta Shelby, Ph.D.

[Di(ortho-tolyl)phosphinomethyl]diphenylphosphine), otppm, is an unsymmetric ligand that becomes chiral when one of its methylene hydrogens is removed. The reaction of PdCl2(otppm)

with n-butyllithium yields the dimer [Li(Et2O)]2[Pd2(otppm-H)2], where otppm-H implies that the ligand is deprotonated. Its crystal structure shows that the Pd2P4C2 ring adopts an elongated chair conformation. Each otppm-H ligand has a methylene carbonanion that interacts strongly with the lithium atom of a [Li(Et2O)]+ cation. These cations occupy opposite sites above and below the Pd2P4C2 ring cavity. The methylene carbanions are stereocenters. The reaction of [Li(Et2O)]2[Pd2(otppm-H)2]with ethyl iodide has been studied, and characterized by 1H and 31P{1H} NMR spectroscopy.

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4 **Nitrate/Nitrite concentration change after capillary flow through**

Vitaly Avilov, University of Illinois at Chicago
Field: Analytical Chemistry Advisor: Scott A. Shippy, Ph.D.

Nitrate and nitrite are commonly measured as the stable metabolites of NO. The limits of detection of these analytes are limiting for analysis from biological samples. In this work we study a concentration effect of prepared mixtures, after they flow under pressure through a capillary segment. To determine concentrations of nitrate and nitrite in the solutions, capillary electrophoresis (CE) apparatus with UV-VIS were used. Various sizes of inner diameter capillary were used (10, 20, and 50μm in i.d.) The solutions were collected using a vacuum pump at constant flow rates of 20.0 and 50.0 nL/min. Different concentrations of nitrate and nitrite were prepared in physiological saline, such as: 2.5, 5, 10, 20, and 40 μM. Calibration curves were prepared to monitor the effects of analytes under different conditions. The effects of inner diameter, the flow rate and the pH were studied for nitrate and nitrite. After passing known amounts of nitrate/nitrite mixture, there has been a noted significant increase of concentration of nitrate, and a significant decrease in concentration of nitrite. With smaller concentrations of nitrate, the percentage of increase is greater than for larger concentrations. With larger concentrations of nitrite, the percentage of decrease is large than for smaller concentrations. The increase in nitrate and decrease in nitrite concentration trend was seen in capillaries of all sizes and with different flow rate. Different saline solutions were prepared acidic, basic, and normal. The biggest percentage of increase in nitrate level and the largest decrease in nitrite level was observed with acidic pH. Results indicate that the concentration change is dependent on capillary's inner diameter, different starting concentrations, different starting volumes, different flow rates and different sample's pHs. The results show an ability to manipulate nitrate and nitrite concentration, that may be exploited to improve their bioanalysis.

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5 **Heteroatom Substituted Porphyrazines as Optical Probes for Tumor Diagnosis and Treatment**

Carl Blumenfeld, Northwestern University
Field: Chemistry Advisors: Evan R. Trivedi and Brian M. Hoffman, Ph.D.

Porphyrazines (pzs) are tetrapyrrolic macrocycles in which meso-nitrogen atoms provide potential for biomedical applications. A series of benzo- and naptho- pzs with sulfur and oxygen heteroatom substituents have been reported and studied for their favorable optical properties and biocompatibility. By altering the aromaticity of the pz core, optical properties can be tuned, while peripheral modifications result in variable solubility and cellular uptake. The transparency of mammalian tissue to near-infrared light (700 nm < λ < 900 nm) allows porphyrazines, with proper tuning, to serve as potential optical imaging agents due to their intense fluorescence in this region. Intracellular fluorescence, observed in both in vivo and in vitro systems, show that pzs are preferentially taken into cancerous tumors. Combination of fluorescent pzs with other clinically proven imaging modalities reveals the potential for multi-modal imaging that includes positron emission tomography (PET) and magnetic resonance imaging (MRI) in conjunction with fluorescence optical imaging.

6 **Isothermal Titration Calorimetric Study of Copper (II) Binding to Amino Acids**

Irina Doncheva and JoAnn Bialobrzewski, DePaul University
Field: Biochemistry Advisor: Lihua Jin, Ph.D.

The binding properties of amino acids are essential in understanding the biomolecular interactions of proteins with any small molecules in the cells. The knowledge of how particular amino acids interact with divalent metal ions such as copper or zinc can be applied in the study of very large polypeptide chains. Even though in proteins the amino acid residues may behave slightly differently around metal ions, mainly due to differences in conformation, compared to when a single amino acid coordinates to the same ions, a specific trend of reactivity and affinity applicable to proteins can be obtained when individual amino acids coordinate to metal ions. Amino acid – metal ion interactions can be studied using various computational and experimental methods. In our experiments, amino acid binding to copper (II) ions has been investigated using isothermal titration calorimetry (ITC). Four thermodynamic parameters, stoichiometric ratio, binding affinity, enthalpy and entropy changes have been determined for each amino acid. It was found that three of the amino acids ,Ser, Thr, and Gly, bind in 1:1 stoichiometric ratio with copper and the affinity of the binding was about 104 M -1. Alanine also was bound in 1:1 stoichiometric ratio but its affinity was (7.4 + 0.3) x 103 M-1. The interaction for these four amino acids was endothermic. Histidine, however, was found to have two binding sites for copper (II) ions. The first binding site had affinity of (2.5 + 1.0) x 105 M-1. The second binding site had affinity of (3.0 + 0.9) x 103 M-1. Moreover, the binding of histidine to copper (II) was exothermic. Based on the changes in entropy and enthalpy, it was found that the binding has been entropically driven in the case of serine, alanine, glycine and threonine whereas for histidine both changes in enthalpy and entropy favorably contribute to the binding.

7 **Spectroscopy of Cooking Related Aerosols**

Paula Hoffmann, DePaul University
Field: Air Chemistry Advisor: Richard F. Niedziela, Ph.D.

The process of cooking usually involves temperatures that are high enough to drive oils and other organic compounds out of food that is being prepared for consumption. These materials can be carried away from the cooking surface into the atmosphere where, upon cooling, they can form an aerosol. Given the high concentration of cooking in urban areas, cooking-related aerosols likely contribute to the overall amount of particulate matter on a local scale. Our laboratory has recently been working on developing a device to trap particles from food that have been subjected to high temperatures. The particles are injected into an aerosol flow cell where their infrared optical properties are measured using Fourier-transform spectroscopy. This poster will present some of our first results for different types of meats and fish. Plans for monitoring the chemical processing of these aerosols will also be discussed.

8 **The Enantioselective Total Synthesis of Streptorubin B**

Dennis X. Hu, Northwestern University
Field: Organic Synthesis Advisor: Regan J. Thomson, Ph.D.

In 1975, Prof. Nancy Gerber found that injection of either metacycloprodigiosin or streptorubin B at a dosage of 40 mg/kg subcutaneously into mice infected with a strain of malarial parasite nearly doubled their survival times. However, the limited availability of prodiginines relative to traditional medications put a halt to further investigations of these drug candidates. In 2008, Prof. Greg

Challis and Prof. Kevin Reynolds re-evaluated the efficacy of metacycloprodigiosin, and found it to be potently parasite-cidal against even drug-resistant strains of malaria, with IC50 values in the 4-6 nM range. A single dose of metacycloprodigiosin (100 mg/kg) injected intraperitoneally into infected mice was found to reduce parasitemia by 99.9%, with no apparent toxic effects. Streptorubin B is suspected to have similar activity based on Gerber's original results, but data have been scarce due to its very low biosynthetic availability. Thus, I have developed a convergent, highly modifiable, enantioselective synthesis of this complex natural product from commercially available cycloheptene, employing a novel one-pot intramolecular-Aldol/Wittig reaction as the key stereogenic step and an anionic oxy-Cope rearrangement as the key ring-forming step. This synthesis has finally opened the door for complete structure/functional studies of Streptorubin B with respect to its unique anti-malarial activity.

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9 **Analysis of Polyunsaturated Fatty Acid Oxidation in Capsules and Bottled Omega-3**

Lynn Huynh and Paul Cervantes, Wilbur Wright College
Field: Oxidation of Omega-3 Advisor: Doris Joy Espiritu, Ph.D.

Omega-3 fatty acids are essential polyunsaturated fatty acids that help prevent diseases such as coronary heart disease, osteoporosis, cancers, asthma, and depression. Omega-3 can be obtained from eating fresh marine fish but the potency of Omega-3 from the diet is difficult to maintain because Omega-3 is subject to rapid oxidation. Omega-3 fatty acids are available in either capsulated or bottled preparation. The liquid contains antioxidants but most Omega-3 in capsules does not. The capsule is more convenient to take than bottled fish oil but the capsule is not completely impervious to air. Exposure of Omega-3 to air will cause oxidation. The aim of this study is to evaluate the integrity of commercial capsulated Omega-3 and commercial bottled fish oil after it was opened. We hypothesize that extended exposure to air will oxidize of Omega-3 fatty acids in capsule form faster than the bottled fish oil. We tested fatty acid oxidation by analyzing the Peroxide value. We will further test secondary oxidation using Anisidine value in order to calculate the total Omega-3 fatty acid oxidation of freshly opened Omega-3 and Omega-3 already expose to air for 2, 4, 8 and16 weeks.
Our results show that Omega-3 fatty acids is oxidized, whether in capsules or in liquid form, upon extended exposure to air. After eight weeks of air exposure, Omega 3 in capsules has a peroxide value 20 fold higher than fresh omega 3 and the liquid form has a peroxide value nine fold higher than freshly opened fish oil. Although, both the capsule form and the liquid for oxidized, our results supported our hypothesis that bottled fish oil will oxidize slower due to the presence of antioxidant.

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10 **Structural studies and neurotoxic effects of a soluble oligomer of the amyloid beta peptide fragment (22-35) with the D23N Iowa mutation**

Forest Hynes, DePaul University
Field: Biological Chemistry Advisor: Sandra Chimon Peszek, Ph.D.

Various natural mutations in Alzheimer's ß-amyloid peptides (Aß) (39-43 residues) have been shown to promote an early-onset of Alzheimer's disease (AD). Most mutations promote amyloid fibril formation of Aß and exhibit neurotoxicity. Recent studies demonstrated that the Iowa mutation (D23N) enhances neurotoxicity of 40-residue Aß(1-40) and 42-resdue Aß(1-42) while promoting formation of subfibrilliar intermediates rather than fibrils. In spite of the unique properties of the Iowa mutant and various kinetic studies, little experimental evidence has been obtained about structures of the intermediate species for this mutant. Our interest is a shorter (14 residue) fragment of the Aß. The 22-35 residue was chosen because residues 10-22 and 30-40 are separated by a non-ß-sheet "bend region" which appears from solid-state NMR and

other indications to be an ordered structure and a salt bridge occurs between the side chains of Asp23 and Lys28. Most Aß mutations associated with familial AD occur at or near this bend region, in residues 21-23. Tycko recently showed that folding of the bend region is a critical or rate-limiting step in the fibrillogenesis of at least one form of Aß fibrils. We studied the misfolding kinetics of the D23N mutant for 14-residue Aß peptide in order to examine the possibility of isolating the intermediates for structural studies by nuclear magnetic resonance (NMR). The intermediate species in the course of fibril formation of D23N was detected by multiple methods such as UV/Vis, IR, and fluorescence spectroscopy.

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11 **Antioxidant Relative Absorbency in Loose-Leaf Natural Green Tea & Green Tea Extract Pills in in vitro and ex vivo Conditions**

Ummul Kathawalla, Feifei Huang and Birju Rao, Northwestern University
Field: Antioxidants in Food Advisor: Shelby Hatch, Ph.D.

Tea is one of the most popular drinks in the world, second only to water. Numerous studies have shown that the antioxidants in green tea reduce the free radicals in living systems preventing cell destruction. In this study, we compare the antioxidant activity between natural green tea leaves and green tea extract pills. We further analyzed the two samples for antioxidant activity in vitro and ex vivo conditions, using the Trolox equivalent antioxidant activity assays (TEAC). We found pre-digestion green tea extract and natural green tea leaf TEAC values to be 4.58 and 4.48 respectively. Post digestion green tea extract and green tea leaves were 3.81 and 4.76. Thus, digestion increases efficacy of the antioxidant activity in natural green tea leaves, while factory produced green tea extract pills are not as efficient in the living system. This implies that natural green tea is more beneficial to health and contains components that are enhanced through digestion.

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12 **The Synthesis and Characterization of a β-galactosidase Activateable MRI Contrast Agent**

Jeffrey D. Krimmel, Northwestern University
Field: Organic Synthesis Advisors: Thomas J. Meade, Ph.D.

Magnetic Resonance Imaging (MRI) allows tomographic, temporal, and non-invasive imaging without the use of ionizing radiation. Whereas the primary drawback of MRI is its decreased sensitivity as compared to other techniques, contrast agents can serve to enhance resolution. The focus of this project is the synthesis and characterization of an MRI contrast agent that responds to the presence of β-galactosidase, the enzyme commonly encoded for by the reporter gene lac z. A contrast agent sensitive to β-galactosidase could be used to follow gene expression throughout an experimental organism over time by MRI. Two obstacles currently hinder the success of these agents: poor cellular uptake and slow enzymatic cleavage. This research is focused on improving enzyme kinetics through the synthesis of an agent based on a self-immolative mechanism precedented by drug delivery systems. The chemical synthesis of several successfully synthesized agents will be described, as well as their respective characterization data obtained from relaxivity assays, enzyme kinetic tests, and cell studies. The in vitro enzyme kinetic data suggests that the synthesized agents will cleave on an MRI-relevant timescale. However, initial relaxivity tests demonstrate an unfavorable relaxivity change for the synthesized agents, meaning that the agents would probably not enhance MRI contrast in vivo. The shortcomings of these agents will hopefully be overcome in a revised target compound that combines the fast enzymatic cleavage characteristics of the previous agents with the structure of a Zn2+-activated agent that has demonstrated a favorable relaxivity change. If successful, the synthesis and characterization of a β-galactosidase activateable MRI contrast agent would represent a potentially revolutionary advancement for biological research.

13 **Estimation of Intramolecular Hydrogen Bond Energy in 1,3,5-triols**

Sarah Lopez, DePaul University
Field: Computational Chemistry Advisor: Ruben Parra, Ph.D.

Complications in direct measurement of the intramolecular hydrogen bond energy have resulted in employment of indirect methods such as spectroscopy and electron density topography. Some of the few direct methods are conformational analysis, isodesmic reactions, and the recently proposed molecular tailoring approach. A comparison of data from both indirect and direct techniques was made to determine the effectiveness of the tailor approach for 1,3,5-triols. Our results, using molecular orbital theory, show that the tailor approach does not correlate with other indicators of hydrogen bond strength such as electron density and hydrogen bond lengths.

14 **Structural Studies and Future Neurotoxic Effects of a Soluble Oligomer of the Wild Type Amyloid Beta Peptide Fragment (22-35)**

Andrew Miller, DePaul University
Field: Neurodegenerative Diseases Advisor: Sandra Chimon Peszek, Ph.D.

Amyloid Beta peptides, (Aβ), with the 39-42 amino acid fragment, self assemble into fibrils which result in the formation of amyloid plaques found in the extracelluar region of the brain in Alzheimer's patients. In multiple studies for both Aβ1-40 and Aβ1-42, a trend of fibril formation has been identified to start from a non-toxic monomer state self-assembling into a toxic fibrilliar state. More recent studies, such as those by Hoshi, Klein, and Chimon, showed an existence of various intermediate species. These intermediates are morphologically different than the fibrils, yet based on their secondary structural conformation they are similar to those of the fibrils. In our research project we propose to look at a shorter Aβ fragment, 22-35, which has not been studied due to its complexity and instability. Our aim is to identify an existence of an intermediate species, its secondary structure, and its neurotoxic effects along with its morphology. In our current research, we have been able to characterize the secondary structure of an Aβ22-35 intermediate through UV/Vis, IR, and NMR spectroscopies. In future research, we plan to examine this intermediate's morphology and neurotoxicity in comparison to the well researched Aβ1-40 fragment.

15 **The Kinetics of Native Chemical Ligation with Proline Thioesters**

Samuel Pollock, University of Chicago
Field: Biochemistry Advisor: Stephen B.H. Kent, Ph.D.

Native chemical ligation is a chemistry in which the side chain thiol of the N-terminal Cys in a cysteine-peptide attacks the thioester moiety of a peptide-thioester, and then rearranges to form a product in which the two peptides are covalently linked by a native peptide bond. The rate of this reaction is highly dependent on the identity of the C-terminal amino acid on the thioester segment , and the current understanding is that more sterically hindered amino acids adjacent to the thioester will block the attack site and cause the reaction to proceed more slowly. Proline—which apparently lacks significant steric hindrance—reacts the slowest of all natural amino acids as a peptide-Pro-thioester and so constitutes a direct challenge to this hypothesis. To address this inconsistency, model peptides were created using solid phase peptide synthesis and their ligation rates were monitored using liquid chromatography-mass spectrometry (LCMS). Steric hindrance was eliminated as a possible explanation for proline's slow ligation rate, and hydrogen bonding, lone pair donation, and "folding over" were investigated as alternative hypotheses. Currently pseudo-proline amino acids—

amino acids with an internal 5-membered ring structure that may be selectively transformed into fast ligating serine or cysteine—are being investigated with the aim of controlling reactivity in native chemical ligation and thus developing a novel tool to be added to the arsenal of synthetic protein techniques.

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16 **Synthesis and Structure of Metal-Organic Frameworks**

Phillip Romanello, Aman Gabriel, Adrien Garcia, Alice-Gray Lewis, and Olabosipo Ogunnubi
Harry S. Truman College
Field: Chemistry Advisor: Raymund C. Torralba, Ph.D.

In the past two decades, Metal-Organic Frameworks (MOFs) have emerged as a rapidly growing class of materials with potentially important commercial applications. MOFs are made up of metal ions or metal clusters linked together by organic compounds via covalent bonds. Due to their stable, highly porous structures, MOFs have been shown to be useful in the storage of gases and small molecules (e.g., carbon dioxide and hydrogen), separations, catalysis, and molecular recognition.1 Since 1978, thousands of different MOFs have been prepared.2
In this study, various transition metals (Cr, Fe, Cu, La) together with dicarboxylate and/or nitrogen containing ligands will be used to synthesize new MOFs. The elucidation of the structures if the isolated materials can be accomplished using powder and single crystal X-ray diffraction (XRD) as well as 1H and 13C nuclear magnetic resonance (NMR) spectroscopy.

17

Zachary Wahrenburg and Alex Spore, DePaul University
Field: Inorganic Synthesis Advisor: Roger D. Sommer, Ph.D.

Reactions of cuprous (I) halide salts with derivatives of the caged molecule closo-tetraphosphorushexamethylimide in acetronitrile were prepared. This tetradentate, non-chelating ligand links metal centers in various dimensions to form expanded polymer structures. Products have been synthesized with varying R groups on the cage such as methyl, ethyl, and benzyl structures. Further reactions with cuprous (I) halides yield a range of unique structures based on ligand to metal ratios.

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18 **Method Development for Non-Equilibrium Sampling of Trace VOCs in Ambient Air Using Solid-Phase Microextraction and Gas Chromatography/Mass Spectroscopy**

Maria Zawadowicz, Lake Forest College
Field: Analytical Chemistry Advisor: Lori A. Del Negro, Ph.D.

Increasing awareness of human toxicity of many VOCs present in ambient air lead to the focus on early detection and temporal pattern monitoring of trace pollutants. Measuring ambient air concentrations of trace volatiles requires expensive equipment and use of preconcentration methods that often generate toxic waste. This study developed analytical methods based on solid-phase microextraction (SPME), which is a cost-effective technique of selective VOC extraction from a gaseous or aqueous sample matrix. Two techniques of VOC analysis with SPME were characterized and compared: dynamic method, in which analyte is extracted directly from a moving stream of air, and static method, in which stagnant air is sampled in a polymeric sample bag. Method detection limits were found to be ~2.00 ppbv in both cases. The dynamic method showed more promise for field applications because of its better precision (17.2% compared to 23.7%), and less sample contamination. However, its MDL and sensitivity must be improved before pollutants present in ambient air at sub-ppbv level can be successfully measured.

Physics

19 **Radially Compressed Silica-Aerogel**
Kuan-Ying Fang, Northwestern University
Field: Low Temperature Physics and Quantum Fluids Advisor: William P. Halerin, Ph.D.

Anisotropic quasi-particle scattering from high porosity silica aerogel has been predicted to modify the phase diagram of superfluid 3He. Specifically, anisotropy induced by axial stretching is predicted to stabilize the "polar" phase in superfluid 3He.1 Previous studies on radially deformed cylindrical aerogels did not indicate a region of stable polar phase. However, the orientation of the orbital angular momentum vector perpendicular to the cylinder axis was observed.2 Using optical birefringence, we have investigated the structural anisotropy of aerogels prepared by two different methods. In the first method, anisotropy was induced by radial compression of an initially homogeneous isotropic aerogel. The second method produces radial compression during the growth and drying stages. The growth induced anisotropy is axial. The anisotropy axis in mechanically compressed aerogel has both axial and radial components, and they are inhomogeneously distributed throughout the gel.

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20 **RADAR Detection of Cosmic Rays**
Maxwell Grady, Loyola University Chicago
Field: Cosmic Ray Physics Advisor: John Cunningham, S.J., Ph.D.

It has been theorized that Ultra High Energy Cosmic Rays, UHECRs, may be detected using simple RADAR methods. The underlying principle being that the ionization column produced by the Extensive Air Shower will reflect electromagnetic radiation such as that of a TV signal. This principle is similar in concept to radio meteor scattering, which has been well studied and documented. At Loyola University Chicago, in conjunction with Argonne National Lab, we have tested a detection system for studying cosmic rays known as Loyola University Cosmic Event Detection System or LUCEDS. Presented will include a brief discussion of the detection mechanism as well as a review of experimental tests conducted at Loyola and finally an outlook to the future of the detection method.

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21 **Type Ia Supernova Sample Contamination Studies**
Tara Hufford, Loyola University Chicago
Field: Dark Energy and Cosmology Advisor: John Cunningham, S.J., Ph.D.

Recent studies have concluded that 95% of the Universe is not comprised of ordinary matter with 73% attributed to dark energy. Type Ia supernovae (SNe Ia) are well accepted as standard candles that can be used to study dark energy parameters. However, there is concern about contamination from non-SN Ia sources. To study non-SN Ia contamination, a parametric supernova simulation package (SNANA) was used to simulate SN light curves using prototypical templates of all SN types, and to assess the probability that each light curve was from a SN Ia (the fit probability). Each simulation generated contained a set of data for the spectroscopic redshift of the host galaxy as well as the photometric redshift. The Sloan Digital Sky Survey cosmological fitter was used to return the constant dark energy equation of state parameter, w0, implied by these simulations. A value of w0= -1 was used when generating SN light curves. It was found that w0 was biased by 2-6 standard deviations depending on the fit probability cut as compared to w0 for a pure SN Ia dataset. It was further found that a significant loss of true SNe Ia due to the fit probability cut did not greatly impact the accuracy of the fitted w when using a pure SN Ia dataset. Current work on the simulations seeks to prepare a

cut on the average distance modulus given a redshift range such that it is comparable to that for SNe Ia. Continued study on other SN selection cuts may further decrease contamination and improve the accuracy of the cosmological fit without a significant loss of true SNe Ia.

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22 **Structure of Relativistic Spherical Stars**

Tara Hufford and Kyle Duckert, Loyola University Chicago
Field: General Relativity Advisor: John J. Dykla Ph.D.

For many years, researchers have created and studied equations of stellar structure based on relativistic parameters. However, the quest continues for solutions to these equations in closed form. It is possible to choose an equation of state and use the equations of stellar structure to formulate the pressure and density gradients inside a star. A specific equation of state places restrictions on the physical conditions believed to be present within a star. Instead of postulating the equation of state, we choose to assume the mass as a function of radius. The boundary conditions on this function imply that the star has zero mass at the center and finite mass at the surface. By choosing this "Ansatz" we are able to solve for basic parameters of pressure and density as well as the gravitational potential as a functions of radius. We then use mass, pressure, density, and gravitational potential to search for a closed form solution to these equations. From our analysis, the Tolman-Oppenheimer-Volkoff equation for the pressure gradient appears to be a Ricatti differential equation which implies a solution exists in closed form. Using Mathematica (Mathematical Analysis Program) we can analyze requirements and restrictions placed as limits for our function.

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23 **An Accelerated Double Pendulum: An Experimental Approach**

Jessica Hyker, David Haberkorn, Unleen Kiverkis and Joshua Taylor, Loyola University Chicago
Field: Mechanics Advisor: Kyle Duckert

We are the experimental subgroup of a first-year physics student research team divided into three groups – theoretical, computational, and experimental. This team was formed to stress the importance of research for first-year students. We investigated a system in which a compound pendulum is uniformly accelerated down a track attached to a cart, and the experimental group sought to build an apparatus to represent this system and accurately collect data. Our team was able to compare this data to the theoretical results from the other two subgroups. To model this system, we attached a double pendulum to a car and accelerated the car-pendulum apparatus on a frictionless track at a constant acceleration. We used two methods to uniformly accelerate the apparatus: first by dropping a mass through a pulley system and second by using a motor. The track the car follows is long enough for a significant amount behavior to emerge and is essentially frictionless. The data is collected by a video camera that is attached to the other side of the cart accelerating in the same reference frame as the double pendulum. We effectively provided experimental data to compare to the theoretical results.

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24 **Application of a Coupled Pendulum System for Demonstration of Seismometer Principles**

Jessica Hyker, David Haberkorn, Mason Brown and Nicholas Bush, Loyola University Chicago
Field: Mechanics Advisor: Aleksandr Goltsiker, Ph.D.

A seismometer shows the impact of external forces applied to the base of a spring pendulum instead of directly to the hanging mass. This form of excitation to the pendulum reverses the effect of dampening on the recorded amplitude at a certain point beyond resonance. The principle objective of this study is to demonstrate this phenomenon in a controlled environment. This will allow for

practical demonstration of the basic principles underlying seismometer function.
To simulate this behavior, we employed a coupled pendulum system (introduced earlier by Texas University to demonstrate the resonance phenomena) with vertically arranged springs. In our design the upper spring is a physical pendulum which represents the external force, for example seismic excitation, applied to the dampened spring in a seismometer. The second spring simulates a seismometers' response to this force. The amplitudes and frequencies of both of these pendulums are then measured. Keeping in mind the limitation caused by impulsive rather than harmonic excitation on the driving spring, we will attempt to demonstrate the inversion point of the dampening effect. A vast quantity of data is obtained and compared to one another through the variance of the driving spring constant, the distribution of mass attached to our system, and by the altering of viscosity used to dampen the driven spring. We will also demonstrate the relationship between the transmissive property our experiment shows in the ratios of amplitudes between the first and second spring as compared to the frequency.

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25 **Synchronizing a System of Coupled Oscillators**

Brent Jarvis, DePaul University
Field: Nonlinear Dynamics Advisor: Christopher Goedde, Ph.D.

The behavior of a system of coupled oscillators is examined. This system can be understood as a collection of masses connected by springs which are confined to move along the rim of a circle. One oscillator this system was subjected to a periodic driving force in an attempt to synchronize the system. Various frequencies and amplitudes were used to achieve synchronization. The possible paths toward synchronization have been explored through symmetry and potential energy calculations. A simple model to predict where the driven oscillator be over time has been developed and compared to numerical results.

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26 **Patterns in Vertically Oscillated Granular Layers: Experiment and Simulation**

Dustin Kimble, Loyola University Chicago
Field: Granular Dynamics Advisor: Jon Bougie, Ph.D.

Vertically oscillated layers of grains provide an important testbed for studying the physics of granular materials. I will present an ongoing undergraduate experimental research project investigating the self-organization of granular media. When shaken vertically and sinusoidally, grains self-organize into patterns such as squares, stripes, and hexagons. Using a modified subwoofer I have built an apparatus to fluidize grains so that granular phenomena can be examined. I will present results in granular media, fluids, and non-newtonian fluids. Fluids provide a strong motivation to take a hydrodynamic approach for modeling granular flows. This experimental project is designed to complement an ongoing computational study of hydrodynamic models of granular media, and can be extended beyond pattern formation to study other granular phenomena. Finally, this experimental component was initiated by an undergraduate student, illustrating the importance of student initiative in establishing research opportunities.

Abstracts - Physics

27 An Accelerated Double Pendulum: A Computational Approach

Nicholas Macholl and Joseph Wiseman, Loyola University Chicago
Field: Mechanics Advisor: Asim Gangopadhyaya Ph.D.

We are the computational subgroup of a first-year physics student research team divided into three groups – theoretical, computational, and experimental – formed to stress the importance of research for first-year students. The team is investigating the motion of a double pendulum undergoing constant acceleration. Using Wolfram's Mathematica software, our subgroup graphically and numerically solved a system of coupled differential equations provided by the theoretical subgroup. These equations theoretically describe the motion of a double pendulum undergoing constant acceleration. We compared the numerical solutions to the experimental data recorded by the experimental group; this comparison allowed the team to explore the chaotic behavior of such a pendulum. Our data shows a very sensitive dependence on initial conditions and how the discrepancies between our theoretical and experimental solutions are analyzed.

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28 An Accelerated Double Pendulum: A Theoretical Approach

Stefanie Moertl, Rosie Drosos and Charles Wilson, Loyola University Chicago
Field: Mechanics Advisor: Kyle Duckert

We are the theoretical subgroup of a first-year physics students in a research team divided into three groups - theoretical, computational and experimental - formed to stress the importance of undergraduate research for first-year physics students. In this study, our team investigates the motion of a double pendulum undergoing constant acceleration. As the theoretical subgroup, we employed the Euler-Lagrange equations to formulate the equations of motion for this particular system. In order to collaborate with the experimental subgroup, we chose our frame of reference to accelerate with the pendula. To reduce the number of free variables, our formulation takes advantage of polar coordinates. As a final result, we generated two second-order differential equations in terms of the two rotational degrees of freedom. It is the task of the computational subgroup to solve these numerically solve these differential equations and present results.

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29 Hydrodynamic Simulations of Density Inversion in Granular Layers

Veronica Policht, Loyola University Chicago
Field: Fluid Dynamics Advisor: John Bougie, Ph.D.

Granular hydrodynamics studies the flow, movement, and general behavior of grains, i.e. collections of roughly spherical macroscopic particles. We have created a computer program to carry out continuum simulations of a bed of grains being shaken upon a vertically-oscillating plate. My research focuses on the nature of density inversion: density inversion is observed when a very low-density layer of grains is close to the plate of oscillation with a high-density layer of grains above it. To model density inversion, I use a continuum simulation for three-dimensional, time- dependent forms of hydrodynamic conservation equations. I have computationally tested different frequencies and amplitudes of shaking in an attempt to identify a set of ideal circumstances for density inversion. These simulations also allow us to examine the transition that takes place where the beds go into the density inversion. We will also extend our exploration to the special case of density inversion called the Leidenfrost state. The Leidenfrost state occurs when the high-density layer of grains is in a steady state, almost like a solid, seemingly floating above the plate. In this case, the energy imparted to the grains by the plate's motion initiates something analogous to a phase-change with the bottom level behaving as a gas and the upper level behaving like a liquid and, in special cases, a solid. What we

can expect to generate from this research is a more thorough understanding of what contributes to density inversion as well as a better understanding of what is taking place within the density inversion.

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30 **Wireless Network Study**

Stephen Sundberg, Illinois Institute of Technology
Field: Wireless Networks Advisor: Dennis Roberson

Illinois Institute of Technology is on the verge of the switch from 802.11g to 802.11n; one might ask if there significant gains from this switch. A study of the wireless coverage across the campus and a survey of the student body will help determine the impact of 802.11n. In a related question, can the capacity of a network be used to estimate its use? By monitoring packet rate and signal strength it will be determined if there is a direct relation between the two. This paper will discuss the benefits from moving to 802.11n and the relationship between power and packet rate in wireless communication.

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31 **Continuum Simulation of Impact into Granular Bed**

Eric Wilkinson, Loyola University Chicago
Field: Granular Fluid Dynamics Advisor: Jon Bougie, Ph.D.

We study the dynamics of accelerating objects impacting into a granular media using a continuum simulation. A granular bed consists of a layer of macroscopic particles such as sand or glass beads which are stacked upon each other. When an object that is more massive than the grains is dropped into the layer there is a possibility that the bed may become locally fluidized near the impact. In these cases grains may flow freely yielding behaviors similar to that found in ordinary fluids. Examining this system could give a deeper understanding of meteor impact, enable the development of better protective materials such as body armor and helmets, and provide insight into biological locomotion over sand. We use a continuum model which treats the granular bed as if it were composed of a continuous density instead of containing discrete particles. This work serves as a simple test case for the validity of the continuum approach.

Engineering

32 Anomaly Detection in RF Spectrum

Jeff Engel, Illinois Institute of Technology
Field: Wireless Networking Advisor: Dennis Roberson

The proliferation of wireless technology greatly impacts modern society; what was once the realm of government operations and major corporations is now ubiquitous and available to anyone with a Wi-Fi router. The IIT Spectrum Observatory group has been conducting ongoing spectrum measurements across Chicago over a wide frequency range for the last five years. Systems have been developed to perform offline processing of the data after it has been captured, but such systems are slow and only serve to aid human analysis. This makes it difficult to systematically identify the entire dataset in real time. Given the volume and diversity of the data collected, there was a need to develop automated processing tools for detecting abnormal events, including transmitter problems and unintended interference. To solve that problem, I developed a system that applies both image processing and analytical data processing techniques to continuous wireless spectrum measurements. This system allows for automated complex interpolations of the data in order to produce meaningful results. It performs a near-real time analysis of the collected data in a frequency band, and scales to all collected frequencies through complex adoption models. Since every band has different characteristics of intentional and unintentional transmitters, the system adopts to each band via machine learning techniques and processes each band using customized analytical procedures based on the learned information. The system is able to determine the reliability of deployed network systems, useful to owners of such systems who wish to understand how well their network is operating. Information produced is also useful to regulators and lease holders to pinpoint unintentional or unauthorized transmissions. Ultimately, this information will enable further innovation and tap the full potential of wireless to serve society as a whole as we become ever unplugged and ever mobile.

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33 Synthesis of multilayered alginate microcapsules for the sustained release of fibroblast growth factor-1

Omaditya Khanna, Illinois Institute of Technology
Field: Biomedical Engineering Advisor: Eric M. Brey, Ph.D.
Emmanuel C. Opara, PhD

Alginate microcapsules coated with a permselective poly-L-ornithine (PLO) membrane have been investigated for the encapsulation and transplantation of islets as a treatment for type 1 diabetes. This therapeutic potential of this approach could be improved through the local stimulation of microvascular networks in order to meet mass transport demands of the encapsulated cells. Fibroblast growth factor-1 (FGF-1) is a potent angiogenic factor with optimal effect occurring when it is delivered in a sustained manner. In this paper, a technique is described for the generation of multilayered alginate microcapsules with an outer alginate layer that can be used for the delivery of FGF-1. The influence of alginate concentration and composition (high mannuronic acid (M) or guluronic acid (G) content) on outer layer size and stability, protein encapsulation efficiency, and release kinetics was investigated. The technique results in a stable outer layer of alginate with a mean thickness between 113-164 □m, increasing with alginate concentration and G-content. The outer layer was able to encapsulate and release FGF-1 for up to thirty days, with 1.25% of high G alginate displaying the most sustained release. The presence of the outer layer did not alter the perme-selectivity of the PLO coat. Released FGF-1 retained its biologic activity when heparin was incorporated into the outer layer. This technique could be used to generate encapsulation systems with outer layers with tunable release kinetics in order to deliver proteins that stimulate local neovascularization at the islet transplantation site.

34 **Crosslinking of Tissue-Derived Extracellular Matrix (ECM) Hydrogels using Glutaraldehyde (GA)**

Sophia Pilipchuk, Illinois Institute of Technology
Field: Tissue Engineering Advisor: Eric Brey, Ph.D.

Hydrogels have been investigated extensively as biomaterials for three-dimensional tissue reconstruction and regeneration. It is difficult, however, to incorporate tissue-specific features into synthetic materials. Our lab previously developed a novel method for generating extracellular matrix (ECM)-rich, tissue-derived hydrogels from soft tissues. These natural materials have composition and structure specific to the ECM source and are able to induce cell differentiation and vascularized tissue formation in vivo. However, low stiffness and rapid degradation in vivo hinder the potential clinical application of these hydrogels. Crosslinking of these materials could improve mechanical properties, delay degradation, and prolong in vivo lifetime. The present study investigates the effect of glutaraldehyde (GA) as a crosslinking agent to increase resistance to degradation and improve mechanical properties of tissue-derived hydrogels. Dermis samples were harvested from rats and the ECM extracted based on our previous protocol. Extracts assembled into hydrogels through pH or temperature-induced mechanisms, and hydrogels were crosslinked with GA from 1hr to 24hrs. Results show significant differences in swelling ratios of crosslinked and non-crosslinked gels ($p<0.05$). Preliminary compression testing results suggest an increase in stiffness of dermal 24hr-crosslinked gels, corresponding to an increase in durability under mechanical stress. Cytotoxicity assay (MTS) data also indicates a significant increase in cell viability with 5 post-crosslinking washes in PBS required to reduce toxicity of residual GA in hydrogels ($p<0.05$). These results indicate the potential of dermal gels to obtain a more mechanically durable structure through crosslinking with GA. Our work continues to focus on optimizing crosslinking conditions while evaluating the unique biological properties of tissue-derived hydrogels.

35 **Screening Nanopyramid Assemblies to Optimize Surface Enhanced Raman Scattering**

Kelsey Stoerzinger, Northwestern University
Field: Materials Science Advisor: Teri W. Odom, Ph.D.

This project describes how gold pyramidal nanoshells (nanopyramids) can be assembled into two architectures with different surface-enhanced Raman scattering (SERS) responses. We have demonstrated control over the assembly of nanopyramids into low-order side-to-side and high-order stacked structures by decreasing both the rate of solvent evaporation and surface wettability. To test which assembled architecture supported the Raman scattering, we compared the SERS intensity of the resonant Raman molecule methylene blue ($\lambda ex = 633$ nm). We discovered that high-order structures exhibited more Raman scattering compared to low-order assemblies. We compared single-particle and individual-cluster dark field scattering spectra on isolated dimers and trimers of nanopyramids. Finite difference time domain modeling revealed that the highest electromagnetic field intensities were localized in assemblies between adjacent particle faces. Hence, measurements and modeling suggest that high-order assemblies are more promising than low-order assemblies as SERS substrates because they support a larger geometric region of high electric field intensity. This work has demonstrated that the local spatial arrangement of assembled nanoparticles is an important design parameter for optimizing nanoparticle-based SERS sensors.

Abstracts - Engineering

36 Nanoscale Refractive Index Measurement via Near-field Scanning Optical Microscopy

Samantha Dale Strasser, Northwestern University
Field: Biomedical Engineering Advisor: Vadim Backman, Ph.D.

The laboratory of Professor Vadim Backman at Northwestern University is exploring a novel backscattering microscopic technique for detection of early-stage cancers of the colon, pancreas, and lung: partial-wave spectroscopy (PWS). Currently, this technique is being applied in preclinical trials of cancer screening involving several hundred patients, and has shown sufficient promise to merit extensive funding support. The hypothesis underlying PWS is that the degree of disorder of nanometer-scale optical refractive index (RI) fluctuations within a cell serves as a sensitive measure of cellular changes indicative of early-stage cancer. To validate the PWS hypothesis and thereby place this promising diagnostic technique upon a firm foundation, we require direct RI measurements within cells with unprecedented nanometer-scale spatial resolution. However, such nanoscale RI fluctuations are invisible to conventional optical microscopy. Furthermore, a comprehensive literature search reveals that no method currently exists to directly measure the RI within biological cells at the required nanometer spatial resolution, which is much finer than the Abbe diffraction limit. However, my current research has established the feasibility of such measurements using a novel application of the near-field scanning optical microscope (NSOM). While NSOM is a proven technique for scanning nanometer-scale surface features of structures, the key innovation of the present research is the use of the NSOM probe to penetrate materials such as biological cells to map out internal features. To date, collected data for liquids of known RI indicate that there exists a linear relationship (to a correlation factor R2 = 0.9863) between the mean NSOM photon frequency and the RI of a sample over the range nD = 1.3000 to nD = 1.6000 for a 50 nm diameter probe. This RI range encompasses and exceeds the biological range of interest. Furthermore, the z-axis spatial resolution of this technique for this probe diameter has been measured to be approximately 25 nm. In addition to permitting rigorous, direct testing of the fundamental hypothesis underlying PWS, observation of specific nanometer-scale changes within biological cells will add to the current basic-science knowledge of malignancy progression, thereby providing a springboard for future research.

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37 Thermal Imaging of Anisotropic Thermal Conduction in Cross-Linked Polymer

Min Zheng, Illinois Institute of Technology
Field: Transport Phenomena Advisor: David C.Venerus, Ph.D.

Polymer processing flows involve a strong coupling of mechanical and thermal effects that have a significant impact on the final properties of the material. Simple molecular arguments suggest that Fourier's law must be generalized to allow for a tensorial thermal conductivity in polymers subjected to deformation. In this study, we investigate the effects of anisotropic thermal conduction in cross-linked polymers subjected to uniaxial elongational deformation. This involves a combination of experiments based on the technique of infrared thermography, and theoretical modeling. The results of this study are used in conjunction with complimentary experiments from our laboratory that directly measure flow-induced anisotropy in polymeric materials.

Mathematics

38 **Anomaly Detection in RF Spectrum**

Andrei Tarflea, University of Chicago
Field: Graph-, Game-, and Automata-Theory Advisor: Sasha Rubin, Ph.D.

Parity Games have roots and applications in Verification Theory. These games are of infinite duration, in which two players move a token along the edges of a finite, labeled graph. The players try to control the vertices that occur infinitely often in the resulting play. Parity Games are of particular significance in Computational Complexity as they remain one of the few natural problems known to be in NP and co-NP, but not known to be in P. To every Parity Game we associate a natural number called its trap depth. This parameter measures how players alternate restricting each other's movements (before reaching a final vertex set that determines who will ultimately win). Interestingly though, it is a purely structural characterization, requiring no mention of formal strategies or plays. We show that the trap depth of every game is bounded by the size of the game. Moreover, we supply an algorithm, running in polynomial time in the size of the input, which solves parity games of first non-trivial trap depth. Hopefully, this work can be extended to find a polynomial time algorithm for parity games of arbitrary trap depth.

Humanities

39 **Kerala Catholicism in the U.S.: Perspective, Community, and Catholicity**

Benita Antony, DePaul University
Field: Catholic Studies Advisor: Peter Casarella, Ph.D.

In A.D. 52, St. Thomas the Apostle came to the Malabar Coast of India, otherwise known as Kerala and instituted the Syro Malabar Catholic tradition. Today, more than 100,000 St. Thomas Syro Malabar Catholics have immigrated from Kerala to North America. The Syro Malabar faith, its ecclesial identity and spiritual traditions, simultaneously anchors the lives of its members and adds another complex dimension to their identity. This study investigates how a spiritual and liturgical experience of Christian faith permeates both the personal and communal identity of Kerala Catholics in Chicago and the Bronx, New York. There is little scholarly literature concerning the life of the participants in the Syro Malabar liturgical rite in the U.S. This study utilizes an interdisciplinary method to examine the religious and social identity of this group. Through interviews with lay and ordained faithful, information was gathered about the experience of the rite both as it relates to the personal identities of U.S. Kerala Catholics and as it contributes to the global richness of the Catholic Church. As such the study also explores the theological concept of "unity in diversity" from the Constitution on the Church of the Second Vatican Council and asks whether and how Syro Malabar Catholics have realized this concept in actual practice.

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40 **Effect of Western Enculturation on Risk Factors for Type II Diabetes among Indian Immigrant Women**

Anisa Rahman, Northwestern University
Field: Anthropology Advisor: William Leonard, Ph.D.
Christopher Kuzawa, Ph.D.

The rate of diabetes among Indian immigrants in America is increasing rapidly, facilitated in part by enculturation to western life. This study attempts to elucidate the relationship between duration of time lived in the US and increased risk factors for diabetes. The study population consists of low socioeconomic status Indian immigrant women recruited from a Chicago-based health clinic (n=90). Additionally, this study explores the biological or lifestyle factors that contribute to why Indian immigrants are more susceptible to Type II diabetes in America. Also, this study explores the quality of how Indian diabetics care for their disease. We found a significant relationship between duration of time lived in the US and abdominal obesity (p=0.01), and a somewhat significant relationship between body fat percentage (p=0.09) and body mass index (p=0.09). The female Indian subject population had higher rates of diabetes, overweight/obesity, hypertension, high cholesterol, and more sedentary lifestyle when compared to the rest of the US population. Finally, diabetics within this female Indian sample population (n=39) did not take care of their diabetes well in accordance to current standards of biomedicine, with 53.8% having an a1c hemoglobin measurement above 7.0% and 64.1% reporting less than 2 hours of weekly exercise. This study calls for a focus on educational interventions about Type II diabetes and ways to control it and prevent its onset while living in the US.

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41 **Macena Barton and 20th Century Chicago Portraiture as Feminist Activism**

Jamie Shaw, DePaul University
Field: 20th Century Chicago Portraiture Advisor: Joanna Gardner-Huggett, Ph.D.

Macena Alberta Barton (1901-1986), a Chicago modernist painter, has unfortunately long been forgotten. This reclamation essay illustrates that she and her contemporaries significantly contributed to art history and feminist art historical discourses, although they have apparently to vanished from the field. In fact, their influences are still quite visible in Chicago. Barton and her colleagues were implementing feminist devices through portraiture and creative alliances well before the category of feminist art was named in the early 1970s. Consequently, this essay critiques the institutionalized structures that caused their erasure from art history to begin with, but additionally introduces a new feminist art historical framework that expands feminist art's starting date. The expansion and re-articulation of feminist art historical discourse would allow deserving artists like Barton, who practiced in the early twentieth century, to be represented and recognized for their influence on later feminist organizations and art history more generally.

Biology

42

Mary Ayers, Loyola University Chicago
Field: Microbiology Advisor: Domenic Castignetti, Ph.D.

An oligotrophic environment is one that has less than two milligrams of total organic carbon per liter, which is not an ideal living environment. In oligotrophic environments, such as caves, how nutrients are cycled is not well understood. We have about fifty bacterial isolates, thought to be members of the bacterial genus Pseudomonas, from a cave in Venezuela. It is thought that microbes are active in this cave because there is visible pitting of the rock minerals by ammonia, a product of the nitrogen cycle. These isolates are thus being examined for their capabilities to perform aspects of the nitrogen cycle, ranging from denitrification, nitrate reduction and ammonification.

The nitrogen cycle is a process in which gaseous nitrogen is taken from the air and made available to organisms. By removing nitrogen from the air and converting it into nitrate, nitrite, or ammonia, organisms are able to use it in making their amino acids, proteins, DNA, and RNA. The process of denitrification reduces nitrate to nitric oxide and nitrous oxide and then back into atmospheric nitrogen. Not all organisms are capable of performing denitrification. Specific enzymes must be synthesized to denitrify; the genes nirS and nirK code for the signature enzyme of this pathway, nitrite reductase, which reduces nitrite to nitric oxide. Ammonification is the reduction of nitrite to ammonia, a reaction catalyzed by a different nitrite reductase, nrfA. Whether denitrification or ammonification is able to occur is important to knowing how nitrogen is cycled in the cave.

The purpose of our current work is to examine our Venezuelan cave pseudomonads for characteristic genes of denitrification and ammonification. The presence of the nirS, nirK, and nrfA genes is being assessed by polymerase chain reaction (PCR) and gel electrophoresis. To date, the bacteria contain neither the nirS nor the nirK genes. We are currently examining them for the presence of nrfA. It is our aim to determine if these microbes are capable of the above processes and thus may be potentially capable of cycling nitrogen in the cave.

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43 **Size-assortative Mating in Gammarus Locusta**

Sarah Blackstock, DePaul University
Field: Marine Biology Advisor: Timothy C. Sparkes, Ph.D.

Size-assortative mating (SAM) is one of the most common mating patterns in nature, and occurs when organisms either choose a mate preferentially based on size or when organisms are distributed in a size-dependent manner in nature. The presence or absence of SAM, as well as large male mating advantage (LMMA) was investigated in a population of the crustacean amphipod Gammarus locusta collected from the intertidal regions of Broughton Bay, Wales, UK. A strong positive correlation between the lengths of the male and female in each pair indicated the occurrence of SAM. A shift in size distribution was observed between unpaired and paired males, in which paired male were generally longer. No such shift was observed between paired and unpaired females. These results demonstrate the existence of both SAM and LMMA and indicate a potential role of either mate choice or microhabitat segregation.

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44 **The Effects of Butylated Hydroxytoluene in Processed Cereals on Alpha-Tocopherol Concentrations in Tenebrio Molitor**

Roberto Bonilla, Harry S. Truman College
Field: Biochemistry Advisor: Mahesh Gurung, Ph.D.

This project observed the changes in concentration of alpha-tocopherol, commonly referred to as Vitamin E, in Tenebrio molitor that consumed cereal processed with the synthetic antioxidant 2,6-di-tert-butyl-4-methylphenol, commonly known as butylated hydroxytoluene. Organisms were fed industrially produced cereal containing BHT, organically produced cereal that lacked BHT, and a control food. All organisms were incubated for 30 days at 30˚ Celsius, with sacrifice occurring roughly every 48 hours. Preliminary data indicated that over time the control group had a mean mass of 0.050 (+/-0.001) grams per worm, the industrial group 0.047 (+/- 0.001) grams per worm, and the organic group 0.054 (+/- 0.001) grams per worm. Statistical analysis showed an F-ratio2.81=8.270 with a P=0.001. Therefore no statistical difference was observed in mean mass per worm between the industrial and control groups, while the organic group had a significant difference in mean mass per worm. These mass results may indicate a greater concentration of alpha-tocopherol in these particular worms. Biochemical analysis of homogenized worms using High Performance Liquid Chromatography to quantitatively measure alpha-tocopherol concentrations in currently underway.

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45 **Quantitative relationships between tooth size and body length in modern porbeagle shark (Lamna nasus) as tools for ecological and paleoecological studies**

Sonia Chavez, DePaul University
Field: Conservation Biology Advisor: Kenshu Shimada, Ph.D.

The porbeagle shark (Lamna nasus) is a lamniform shark found primarily in the North and South Atlantic Oceans and reaches up to 3.00 m total length (TL). The species possesses at least 13 upper teeth and 12 lower teeth on each side, that are suited to feed on squid and small to medium-sized fishes. Whereas the species is known in the fossil record that is represented primarily by isolated teeth, extant L. nasus, which is commercially fished in certain regions, is an important trophic component as a top predator in the modern marine ecosystem.
We used linear regression analysis to quantitatively examine the relationships between the TL and Height of the tooth crown (CH) of each tooth in 19 L. nasus individuals ranging 104-244 cm TL from northern Atlantic. We obtained a total of 25 independent regression equations, and they all suggest that increase in CH of each tooth through tooth replacements is proportional to increase in TL with a high predictability of TL from CH. Sized of organisms, particularly top predators have played an important role in ecosystem dynamics through geologic time, and these regression equations can be used to extrapolate the TL of fossil L. nasus from isolated teeth that would help paleoecological inferences. As the extant population of L. nasus is threatened, stock monitoring is critical for the conservation effort, and our regression equations can also increase the efficiently of the TL data collection from captured individuals.

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46 **Neuronal Regulation of the Cadmium Stress Response in *Caenorhabditis elegans***

Ravi Chopra, Northwestern University
Field: Cellular Stress Responses Advisor: Richard Morimoto, Ph.D.

Cadmium is a teratogenic, mutagenic, and potentially lethal heavy metal to which humans are often exposed as a result of burning fossil fuels and municipal waste. To address cadmium toxicity, cells rely upon a well-established heavy metal stress response. Because this response affects the aging, growth, and brood size of multi-cellular organisms, there is likely an organism-wide regulation

system. With C. elegans as a model, we hope to investigate possible neuronal regulation of downstream cellular stress responses. Using chemosensory-defective mutants with non-functional ASH, ADL, or ASE neurons, we plan on examining the effects of diminished cadmium sensation on behavior and chaperone expression. Combining this with previous work regarding neuronal regulation of the heath shock response, we hope to eventually discover an overall mechanism for neuronal regulation of cellular stress responses.

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47 **Aggregation and toxicity of ADan in C. elegans models**

Kelsie Eichel, Northwestern University
Field: Molecular Biology Advisor: Richard Morimoto, Ph.D.

Many similarities exist between Familial Danish dementia (FDD) and Alzheimer's disease (AD). FDD is a rare neurodegenerative disease mapped to a mutation in the BRI2 gene that results in the expression of ADan, an amyloidogenic peptide longer than the wild-type peptide. Aβ aggregation and oligomerzation is involved in AD. Misfolding, oligomerization, and accumulation of aggregates of these peptides disrupt cellular protein folding eventually leading to cellular dysfunction and death. Neuropathological lesions such as neurofibrillary tangles, parenchymal amyloid, and pre-amyloid deposits in FDD are similar to those seen in AD. The similarities between FDD and AD suggest that protein aggregation, irrespective of sequence, can result in similar neuropathology. However, recent literature suggests that there could be alternative explanations for the similarities observed since the wild-type BRI2 gene appears to have an inhibitory effect on production and aggregation of Aβ. To further investigate ADan aggregation related toxicity, we have generated C. elegans models expressing the peptide in body-wall muscle cells and neurons. Both models exhibit early-onset aggregation, but appear to be associated with very limited toxicity. We have therefore started to investigate whether or not interplay between the ADan and Aβ peptides could explain the similarities of the disease phenotypes.

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48 **Nucleosome Positioning in A+T-rich DNA**

John Froberg, Northwestern University
Field: Molecular Biology Advisor: Johathan Widon, Ph.D.

The DNA in each of our cells is a million times longer than the nucleus. In order to fit inside the nucleus, DNA folds tightly around protein complexes called nucleosomes. DNA must bend extremely sharply to coil around a nucleosome, and some sequences are more flexible than others. This means that nucleosomes prefer to wrap certain sequences. It is important to understand why some sequences are more likely to be occupied nucleosomes than others because the positions of nucleosomes relative to promoters and regulatory elements are important for understanding transcriptional regulation. Previous work demonstrates that the yeast genome uses these preferences to encode favored locations for its nucleosomes. It is possible to predict with high accuracy whether any given base pair in the yeast genome is covered by a nucleosome. Although the "nucleosome positioning code" successfully explains much of the organization of nucleosomes in yeast, nucleosome positioning in higher eukaryotes is less precisely understood for a variety of reasons. One particular reason is that mammalian genomes contain very large regions of A+T-rich DNA, and A+T-rich sequences are preferentially excluded from nucleosomes in yeast. This means that predictive models of nucleosome positioning derived from yeast nucleosomal DNA may be especially inaccurate in the A+T-rich regions of the human or mouse genome. It is currently too expensive to sequence enough nucleosomal DNA to build a positioning model for the human or mouse genome. However, Plasmodium falciparum, the causative agent of malaria, has a small, extremely A+T rich genome. I have mapped 4 million nucleosomal sequences across the P. falciparum genome in vivo and I

am currently analyzing the sequence preferences of this organism's nucleosomes. These studies will hopefully allow us to predict nucleosome occupancy in A+T-rich DNA, an important step to be taken before nucleosomal organization is understood in higher eukaryotes

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49 **Nucleosome Positioning in A+T-rich DNA**

Nancy Fru, Northwestern University
Field: Molecular Biology Advisor: Blanca Camoretti-Mercado, Ph.D.

Lymphangioleiomyomatosis (LAM) is a rare but often fatal pulmonary disorder that occurs almost exclusively in young women. It is characterized by abnormal proliferation of smooth muscle-like cells in the lung parenchyma leading to the formation of nodules and cysts, progressive parenchymal destruction, and respiratory failure. Cultured LAM-derived cells established from lung lesions showed increased proliferation compared to non-LAM cells. We constructed and analyzed a Sequence Analysis of Gene Expression (SAGE) library from LAM cultured cells, and compared the global expression data with that of a normal lung library (GSM762) deposited in SAGEmap. Consistent with its LAM origin, we were unable to detect TSC2 transcripts in our library. Expression of many genes including caveolin, TGF-□, and several transcripts encoding ribosomal proteins were equivalent in both libraries. We found up-regulation of several genes involved in TGF-β signaling such as Smad3 and connective tissue growth factor. Up-regulation of TGF-β responsive genes like collagen members and fibronectin was evident in our LAM library. Components involved in extracellular matrix (ECM) remodeling such matrix metalloproteinase (MMP) 1, 2, 3, 14, and 19 but not MMP-7 were also more abundant in LAM-derived cells than in normal lung. SAGE revealed augmented abundance of tissue inhibitor of metalloproteinase (TIMP)-1, TIMP-2 and TIMP-3 transcripts. Our data suggest the presence of active remodeling in LAM relative to normal lung. We speculate that this process is likely driven by activation of the TGF-β signaling pathway. Our goal was to validate these findings in at least two independent LAM-derived cells and non-LAM (ROBI) cells. We focused on genes involved in ECM turnover and contractility, and studied candidate gene expression at the mRNA and protein levels.

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50 **Saponins: Isolation and Purification**

Gwendolyn Fulgern, Gladys de Guzman and Willie Jones, Richard J. Daley College
Field: Biochemistry Advisor: Rowean Misayah, Ph.D.
Catherine Han, Ph.D.

Saponins are complex compounds widely distributed in the plant kingdom. Each saponin consists of one or more sugar chains attached to a steroid triterpene. Saponins have detergent properties and are employed as foaming agents in soft drinks, food products. The ability of saponin to foam is caused by the combination of the non-polar sapogenin and the water soluble side chain. Their detergent properties have also resulted in their use in shampoos and cosmetic products. Saponins have also demonstrated anti-microbial and anti-fungal properties as well as pharmacological benefits.

Traditional methods of extracting and isolating saponins from dry vegetable materials consist of extraction with various alcohols (ethanol, propanol, and methanol). To increase purification of saponin, a defatting step using non-polar solvents such as ether or hexane may be performed prior to the extraction process or on the extraction itself. Crude saponins are then precipitated by washing with acetone or ether.

Many methodologies have been employed for saponin analysis; however, a standard methodology has yet to be developed. Cost efficient methods are currently being explored to produce higher concentrations of pure saponin as opposed to the expensive and laborious methods used to purify proteins such as dialysis, size-exclusion chromatography, and ion-exchange chromatography.

Soybean seeds (Glycine max, leguminosae) contain about 0.5% by weight saponins. Soybeans are an abundant source of saponins. Despite the cultivation and processing of large quantities of soybeans, soy saponins are not a significant product of commerce at the present time, due to the difficulty of isolation and purification.
Mounting consumer demand for natural products coupled with their surfactant properties, and increased evidence of their biological activity, has led to the emergence of saponins as commercially significant compounds with expanding applications in food, cosmetics, and pharmaceutical sectors.

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51 **The RNA interference pathway regulates virus-host interaction in Drosophila melanogaster**

Catherine Gao, Northwestern University
Field: Virology Advisor: Richard Carthew, Ph.D.

Pathogenesis is determined by virus-host interactions; both host and virus are driven to co-evolve. Drosophila melanogaster is a good model to study this relationship; it shares many conserved antiviral pathways with mammals. Among these are the RNA interference (RNAi) and NF-B pathways. Nora virus is a picorna-like virus that can cause persistent infections in wildtype (WT) flies; it serves as a model to study virus-host interactions. Immunocompromised flies lacking the NF-B-like transcription factor Relish or a functional RNAi pathway display consistently higher Nora virus levels that correlate with decreased lifespan.
To study Nora virus in a clean system, we purified virus from immunocompromised flies and injected uninfected WT flies. Samples from a timecourse post-injection showed increasing levels of Nora virus. In contrast to previous observations, where Nora virus seemed to cause asymptomatic persistent infections, we observed significantly decreased lifespan and lower fecundity, suggesting that Nora virus can cause pathological effects.
We also injected RNAi mutants with Nora virus. Unlike infection with other Drosophila viruses, RNAi mutants and WT flies showed similar levels of viral replication. However, in the RNAi mutant flies, we observed increased efficiency in establishment of an infection that persisted through generations of progeny. Our data suggest a new unique function for RNAi in preventing the establishment of persistent infections.
Sequencing analysis indicated RNAi mutants are infected with strains different from the virus in Relish mutants. These strains cluster phylogenetically in a manner seemingly dependent on immunocompromised background. These sequence differences might suggest strains are selected due to unique pressures imposed by different antiviral pathways. We intend to further address these questions, providing greater insight into coevolution strategies. Further elucidation of virus-host interactions can aid the development of RNAi-based techniques in a wide array of clinical contexts: from controlling West Nile virus to targeting HIV.

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52 **Unraveling the Catalytic Mechanism of Topoisomerase V**

Alexandra Gast, Northwestern University
Field: Biochemistry Advisor: Alfonso Mondragon, Ph.D.

Found in all three domains of life, topoisomerases are ubiquitous enzymes that relax supercoiled DNA. Their function is essential to DNA replication, transcription, and recombination. A new topoisomerase designated Topoisomerase V was recently isolated from the hyperthermophile Methanopyrus kandleri. While previously discovered topoisomerases fit into the current classification scheme, structural studies suggest that "topoV" represents the first member of an entirely novel class. In particular, the unusual arrangement of the active site residues within a unique fold indicates that topoV employs a novel catalytic mechanism. Although structural analyses and mutational studies

support this proposal, the details of the mechanism remain unclear. To give a more complete picture of this mechanism, I generated mutations at three putative active site residues and assayed the mutations' effects on DNA relaxation. A total of 11 conservative and nonconservative substitutions at residues Arginine-131, Histidine-200, and Glutamic acid-215 were analyzed, with the majority introduced into two protein constructs. After comparison of the mutant and wild-type enzymatic activity, I was able to delineate the function of each of these three catalytic amino acids. Given that there are other amino acids involved, my research provides a starting point for further investigation into the unique mechanism of topoV.

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53 **Isolation and Culture of Candidate Probiotics from the Bottlenose Dolphin (Tursiops truncatus)**

Elizabeth Gaston, University of Chicago
Field: Microbiology Advisor: Maria Alejandra Diaz, Ph.D.

The United States Navy Marine Mammal Program (MMP) funds research on dolphin health, and an important part of any mammal's health is its microbiome. Little is known about the commensal gastrointestinal microbiota of marine mammals. Although some evidence in the literature suggests that Helicobacter spp. may cause gastric ulcers in marine mammals, its relation to health/disease is still unclear. With an interest in exploring complementary marine mammal health management strategies, we have embarked on a collaborative effort involving culture independent -metagenomics- and culture-dependent approaches to characterize the dolphin microbiota and to isolate and identify candidate probiotic bacteria derived from the bottlenose dolphin commensal microbiota. We screened for potential probiotics from oral swabs, gastric fluid, and rectal swabs obtained from bottlenose dolphins, Tursiops truncatus, isolating 304 strains from 38 dolphins screened. We focused our search on lactic acid bacteria and evaluated immunomodulatory and antipathogenic probiotic properties of selected isolates. We also developed, validated and optimized a SYBR-Green based real-time PCR assay to detect and quantify Helicobacter spp. in marine mammal samples. We recovered Lactobacillus salivarius strains which secreted factors that stimulated TNF production in human monocytoid cells. Dolphin-derived Lactobacillus strains also inhibited growth of selected marine mammal and human pathogens similarly to laboratory strains with proven probiotic properties in humans and mice. We also recovered a novel Lactobacillus strain with 96.3% 16SrDNA sequence similarity to L. ceti (previously isolated from beaked whales), and 99.8% identity to sequences obtained by a culture-independent metagenomics approach. The real-time PCR assay allowed us to detect Helicobacter spp. in gastric fluid samples from dolphins with gastric ulcers, but also from dolphins with no known gastric disease. Lactobacillus spp. strains isolated from bottlenose dolphins appear immuno-stimulatory and inhibitory with respect to marine mammal pathogens. These strains are primary candidate probiotics for clinical studies in marine mammals.

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54 **Early Urinary Markers of Acute Kidney Injury in Medical Intensive Care Unit Patients**

Vanessa Gonzalez, University of Illinois at Chicago
Field: Medicine Advisor: W. Brian Reeves, M.D.

Acute Kidney Injury (AKI) is a frequent complication among hospitalized Medical Intensive Care Unit (MICU) patients and is associated with a high mortality rate. There is a need to develop tests for both the early diagnosis of AKI and to predict its outcome. Several urinary proteins have been identified as possible biomarkers of AKI, including NGAL, IL-18 and KIM-1. Inflammatory cytokines and chemokines have also been detected in the urine of patients with AKI, but the value of these proteins as biomarkers of AKI in MICU patients has not been established. The goal of this study is to investigate the value of IL-6 and IL-8 in the early detection of AKI, prediction of severity of AKI, and prediction of outcome of AKI in MICU patients. Newly admitted MICU patients underwent four consecutive urine

collections for measurement of biomarker levels. Serum creatinine values were measured daily to determine changes in kidney function and to determine the stage of AKI using the AKIN criteria. Of 55 patients studied, 30 (55 %) developed AKI and 38% had no AKI (7% had insufficient data). Among the AKI patients, 43% were classified as Stage 1, 20% as Stage 2 and 37% as Stage 3. 54% of stage 1 patients had complete recovery of renal function (within 0.3 mg/dl of baseline) whereas only 27% of stage 3 patients had complete recovery. Urine biomarkers were measured on the first MICU day in 5 non-AKI patients and 16 patients with stage 2 or 3 AKI. Urine IL-6 and IL-8 levels were undetectable in the majority of non-AKI patients but were elevated (>10 pg/ml) in 63% (IL-8) and 81% (IL-6) of AKI patients. Urine cytokine levels may be useful as early diagnostic markers for MICU-AKI. Analysis of additional markers and of prognostic value is in progress. Funding: NIDDK/NIH grant R25 DK078381

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55 **Impacts of Invasive Typha on Denitrifier Communities in Freshwater Wetland Sediments**

Tanya Grancharova, Loyola University Chicago
Field: Microbial Ecology Advisor: John J. Kelly, Ph.D.

Wetlands are located at the transitions between terrestrial soil and surface waters and can remove nitrogen before it enters bodies of water. Nitrogen removal depends on the activity of wetland plants and microorganisms, including denitrifying bacteria. Many wetlands in the Midwest have been invaded by aggressive exotic plant species that have significantly altered wetland habitats. These habitat changes have the potential to impact nitrogen removal and the activity of denitrifying bacteria. This study examines the impact of an invasive Typha species on the rates of denitrification and the composition of denitrifying bacterial communities at the Cowles Bog Wetland Complex in the Indiana Dunes National Lakeshore. This wetland has been invaded by the exotic cattail species Typha angustifolia and Typha x glauca, an aggressive hybrid of T. angustifolia and the native cattail Typha latifolia. Denitrification rates were measured in wetland sites dominated by native plants, invasive plants, and mixtures of natives and invasives. There were significant differences in rates of denitrification, with the site dominated by T. angustifolia having the highest rate (6.3 nmol N2O/gram/day). Vegetation type had a significant effect ($p<0.004$) on the number of denitrifiers in wetland sediments as indicated by nirS copy numbers determined by quantitative PCR (Q-PCR). Sediments from the native site had significantly higher nirS copy numbers than those from the restored, T. glauca, and T. angustifolia sites. NirS copy numbers for the restored site, which had the T. glauca herbicided and native replanted, were not significantly different from those found at the T. glauca sites. These results indicate that the invasive plants are having a significant impact on the denitrifying bacterial communities within the Cowles Bog Wetland Comple**x.**

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56 **Impacts of Invasive Typha on Denitrifier Communities in Freshwater Wetland Sediments**

Reid Gustafson, DePaul University
Field: Chemical Ecology Advisor: Judith Bramble, Ph.D.
Justin J. Maresh, Ph.D.

The Tree of Heaven (Ailanthus Altissima) is a plant that is known to produce an allelopathic chemical, ailanthone, which prevents the germination/growth of other plants. In this experiment a chemical assay was developed to study the breakdown of Ailanthone. The chemical assay was developed by separating a methanol extract of A. Altissima root tissue by silica gel chromatography. The separated solutions were then analyzed by HPLC with UV detection to locate fractions containing ailanthone. Presence of the chemical was confirmed against both a bioassay and a chemical standard. A chemical assay was designed to evaluate the degradation of ailanthone over time. A series of ailanthone extracts was prepared under different environmental conditions consisting of sterile soil, non-sterile soil, and ailanthone by itself. These extracts were analyzed by HPLC each

day to monitor the breakdown. The results show that Ailanthone decomposes rapidly, having lost most of its allelopathic properties by day 6 for all three experimental conditions. The presence of soil did not appear to affect degradation over time. The rate is decomposition is unexpected for a chemical suggested to have an effect on the ecology of neighboring plants through allelopathy. This chemical assay will be a useful tool for further examining the nature and function of this plant chemical.

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57 **Computational & Experimental Analysis of the Malaria Parasite's Gene Expression**

Mallory Hall and Bryan Quach, Loyola University Chicago
Field: Bioinformatics Advisor: Stefan Kanzok, Ph.D.

Malaria is a disease caused by parasites belonging to the genus Plasmodium that affects 500 million people globally and causes over one million deaths annually. The parasite is transmitted by the bite of female Anopheles mosquitoes. The parasite's successful transition from vertebrate host to insect vector requires significant adjustments in the expression of particular genes. The time specific and coordinated expression of genes results from regulatory processes in which transcription factors (TF) bind to specific regulatory sites (motifs/patterns recognized) in the genomic DNA sequence thus controlling gene expression. Due to its high genomic AT content transcriptional regulation little is known about transcription factor binding sites (TFBS) in Plasmodium species. In this project we combined computational and experimental efforts to identify and characterize TFBS. We hereby focus on antioxidant genes that are expressed by the parasite in response to the presence of cytotoxic reactive oxygen (ROS) and reactive nitrogen species (RNS).
Here we present experimental data showing that two related antioxidant genes of the malaria parasite are simultaneously upregulated in the presence of the reactive oxygen species nitric oxide (NO). This simultaneous expression is likely the result of a single protein (the TF) initiating transcription through the recognition of a specific TFBS present in the regulatory sequences of both parasite genes. Existing TFBS detection algorithms are not capable of analyzing an AT-rich genome such as Plasmodium, thus necessitating alternative methods. Computationally, we have identified several putative TFBS of interest in the promoter regions of these candidate genes as a possible source of co-expression by the same TF. The ability to recognize such sites provides invaluable insight into the regulation and functionality of the parasite's genes within this two-host system.

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58 **Comparison of Type I interferon Activity in Patients with Systemic Lupus and Neuromyelitis Optica**

Addie Hill and Mounica Yanamandala, University of Chicago
Field: Neurology Advisor: Anthony Reder, M.D.
Xuan Feng, Ph.D.

Objective: To determine whether IFN-induced gene responses are similar in systemic lupus erythematosus (SLE) and neuromyelitis optica (NMO).
Background: Type I interferons activity is associated with disease worsening in SLE. Many NMO patients share serological similarities with patients with SLE. Some NMO patients even have co-existing SLE. Exogenous interferon often worsens NMO disease. We hypothesized that interferon-induced gene responses would be similar in these diseases with evidence of systemic autoimmunity, as opposed to MS.
Methods: All NMO and SLE patients had never been treated with interferons. Serum type I IFN-alpha/beta activity was measured by RT-PCR induction of 3 genes (sensitivity, 0.1 U IFN-a/b/ml). In vitro IFN-beta-induced activation of phospho-tyrosine-STAT1 transcription factor (P-Y-STAT1), phospho-serine-STAT1 (P-S-STAT1), and of IFN-induced MxA and viperin proteins were quantitated with Western blots in

mononuclear cells from NMO, SLE, MS, and healthy controls.
Results: Serum IFN-a/b activity is significantly higher in untreated and partially immunosuppressed NMO patients compared to fully immunosuppressed NMO patients. Serum IFN-a/b activity was highest in SLE patients compared to NMO, MS, and controls. In vitro, activated P-S-STAT1 levels were highest in SLE, followed closely by patients with NMO compared to therapy-naïve MS and controls. Kinetics of in vitro IFN-beta stimulation from 30 minutes to 24 hours showed high levels of P-S-STAT1 in SLE and NMO but not in MS and normal controls. IFN-beta-induced proteins (MxA, Viperin) were markedly elevated in NMO compared to MS and controls.
Discussion: Responses to IFN are abnormally up-regulated in SLE and NMO patients versus MS and controls. Similar to SLE patients, NMO patients also have enhanced IFN-induced responses, arguing for similar disease pathogenesis. Our lab data corroborate clinical observations of NMO disease worsening after IFN treatment. We argue that type I IFN therapy should be used with caution in NMO.

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59 **Identification and Analysis of Lead Hyperaccumulators in Soil**

Amanda Hoff, Harold Washington College
Field: Botany Advisor: Junoo Tuladhar, Ph.D.

Lead is a toxic heavy metal commonly found in urban areas. Sources of this pollution stem from leaded paint, leaded gasoline, and industrial sources such as mining and smelting. Our purpose is to identify lead hyperaccumulating plants for the use of soil remediation, while simultaneously growing food crops in lead-polluted soil to test for safety of consumption. These plants are being grown in different concentrations of lead-enhanced soil to test for lead accumulation in the roots and shoots. The results of these experiments will indicate how lead is absorbed by different plants and the ratio of absorption to pollution levels. This information can be used to determine the safety of urban gardening, and the effectiveness of hyperaccumulators for remediation..

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60 **New Data Structures for Heterogeneous Genetic Data**

Marguerite Hoving, Loyola University Chicago
Field: Bioinformatics Advisor: Catherine Putonti, Ph.D.

With recent advances in biomedical technology, it is now possible to examine all ~3 billion nucleotides of an individual's entire genomic sequence. The minute variations present not only make each one of us unique but also have been shown to correlate with our susceptibility to diseases and response to medications and vaccines. In order to elucidate this correlation, genome-wide association studies (GWAS) are conducted comparing the variations between patients with and without a condition/disease. Identifying the set of single nucleotide polymorphisms (SNPs) contributing to the condition/disease is far from trivial. While there are numerous computational and statistical challenges in analyzing the results of a GWAS, we will focus on just one – the inherent challenge of the data itself. In order to ascertain with statistical significance that a SNP or set of SNPs is in fact connected to the condition, a large collection of both control data and test data is needed. Generating such a large set of patient data is typically not feasible for a single investigator thus necessitating multiple studies to be pooled together.
The results of several of the larger GWA studies are now available. There is no universal format established for this data; rather it largely serves as a repository in which each individual study uploads their data with no special accommodations made with respect to format. Variations between the data sets can be attributed to differences in the platform used for typing of patient SNPs, reliability of patient data with respect to innate biases for an individual platform, availability of replicate data, and/or the availability of supplemental patient data. Given these differences, integrating such data is a logistical nightmare.
Herein we present novel data structures and algorithms for establishing a universal syntax for GWAS

data, thus making it possible to pool multiple different studies together.

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61 **Cholesterol Metabolism in TTR-Abcb11 Transgenic Mice**

Mark Kavesh, Northwestern University
Field: Pathobiology
Advisor: Anne S. Henkel, M.D.
Richard M. Green, M.D.

Background: Bile salts are synthesized from cholesterol in the liver. Consequently, bile salt metabolism is critically important for cholesterol homeostasis. Abcb11, which regulates the transport of bile salts into bile, is highly polymorphic in humans. The impact on cholesterol metabolism of this variable expression is yet unknown. We have generated a transgenic mouse model of hepatic Abcb11 overexpression, TTR-Abcb11, that hypersecretes bile salts and biliary cholesterol. We now aim to characterize cholesterol metabolism in this mouse model.
Methods: FVB and TTR-Abcb11 mice were fed control or 0.2% cholesterol diets for 12 weeks. Hepatic cholesterol and triglyceride content was measured by spectrophotometric assay and relative hepatic gene expression measured by real-time PCR. Intestinal lipid absorption was quantified by the fecal dual-isotope method.
Results: Higher intestinal cholesterol absorption was observed in TTR-Abcb11 mice compared to FVB mice (74.98±8.16% vs. 39.14±20.92%, $P < 0.05$). No difference in oleic acid absorption or labeled cholesterol uptake in the liver four days after gavage was observed. On the 0.2% cholesterol diet, TTR-Abcb11 mice accumulated less hepatic cholesterol (106.9±28.0 vs. 149.4±19.0 µg/mg total protein, $P < 0.05$) but trended toward higher triglyceride concentrations (444±172 vs. 293±83 µg/mg total protein, $P = 0.075$). HMG-CoA reductase was downregulated 57.7±23.0% in control-fed TTR-Abcb11 mice in comparison to FVB mice but was equally suppressed by both strains on the 0.2% cholesterol diet. SREBP-2 and Neimann-Pick C1-like-1 were suppressed to a lesser degree in TTR-Abcb11 compared with FVB mice on the 0.2% cholesterol diet (39.5±12.9% vs. 75.8±20.6% and 51.1±23.0% vs. 77.4±33.9%). ABCG5 and ABCG8 were equally upregulated in both strains on the 0.2% cholesterol diet.
Conclusions: Overexpression of hepatic Abcb11 in mice results in enhanced intestinal cholesterol absorption. TTR-Abcb11 mice demonstrate decreased hepatic cholesterol accumulation when challenged with a high cholesterol diet, however, likely due to increased biliary secretion of cholesterol. In response to decreased cholesterol accumulation, SREBP-2 and NPC1L1 are suppressed to a lesser degree in TTR-Abcb11 mice compared to FVB mice on a high cholesterol diet.

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62 **European Buckthorn (Rhamnus cathartica) Seed Germination and Seedling Growth in Mulch Amended Soils: Implications for Restoration**

Meaghan Kern, DePaul University
Field: Environmental Science
Advisor:Lauren Umek
Liam Heneghan, Ph.D.

European buckthorn (Rhamnus Cathartica) is a common invasive species that spreads rapidly and threatens the biodiversity of savannahs, woodlands and prairies throughout the Midwest. The modification of soil properties and processes in buckthorn invaded areas are thought to facilitate buckthorn invasion. Soils under buckthorn thickets are characterized by having higher available Nitrogen (N) levels, moisture, pH, as well as elevated soil biological communities and decomposition rates (Heneghan et al. 2008). Current studies are exploring methods to address these soil modifications in order to successfully restore a buckthorn invaded ecosystem to a biologically diverse native habitat. One potential method under investigation is the addition of high carbon (C) woody material into soil to alter C/N ratios and to slow down modified N cycles (Reever-Morghan and Seastedt 1999; Averett et al. 2004). This experiment explores the potential for this method

for reducing buckthorn reinvasion both in the field and in a greenhouse. The field experiment examines the reinvasion of R. carthartica seedlings from recently cleared areas following carbon soil amendments of two different types of mulch (Commercial and Buckthorn) and those with no soil amendments. The results of this field experiment show a reduction in buckthorn reinvasion in both soil amendment treatments with the greatest reduction in reinvasion in the buckthorn mulch treatment. The greenhouse experiment examines the impacts of buckthorn-seedling germination and growth in these same soil treatments. Based on initial field results, it is expected that the addition of mulch will significantly deter growth and that this effect will be greater with buckthorn mulch. Germinated seedlings were weighed and transplanted into larger pots of the same soil treatments and allowed to grow for three months in a growth chamber. Stem length, biomass, and leaf number were recorded. There was a significant reduction in plant growth in both soil amended pots compared to the no amendment control. Overall, mulch addition to soil seems to slow invasion but not completely deter invasion.

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63 **Role of miR-182/miR-96 cluster in prostatic zinc homeostasis**

Ekaterina Khramtsov, University of Illinois at Chicago
Field: Cancer Biology Advisor: Larisa Nonn, Ph.D.

Zinc is an essential element that is required for the activity of more than 300 enzymes, structure of proteins, and control of genetic expression. It plays an important role in cellular processes such as cell division, growth, differentiation, development, aging, and synthesis and repair of DNA, RNA, and protein. Prostatic secretary epithelial cells accumulate large amounts of zinc and have a high expression of human Zinc transporter 1 (hZIP1). However, prostate cancer (PCa) tissue exhibits lower levels of zinc and hZIP1 compared with surrounding normal-appearing areas. Previously, we examined several miRNAs in formalin-fixed paraffin-embedded prostate tissue. Based on those studies, we hypothesize that miR-182/96 cluster is responsible for regulation of hZIP1 levels in PCa. In this study, we examined the relationship between the levels of miR-182/96 and hZIP1 using cell culture models. We observed an inverse correlation between hZIP1 and miR-182 levels in several prostate cell cultures; primary normal epithelial cells, normal stromal cells, and prostate cancer cells (PC3 and LNCaP). miR-182 is transcribed in a cluster with miR-96 and the miRNAs have an overlapping mRNA target sequence. As expected, miR-96 expression was identical to that of miR-182, thus also inversely correlated with hZIP1 in prostate cell cultures. Overexpression of miR-182 in both normal and LNCaP cells decreased hZIP1 mRNA levels, further implicating miR-182 as a regulator of zinc transport. Ongoing experiments focus on validating the two putative miR-182/96 binding sites in the 3'UTR of hZIP1 and the effect of miR-182 and miR-96 overexpression on zinc transport. Our results may establish a role for miR-182 in prostatic zinc homeostasis. Because zinc levels are linked to PCa risk, these miRNAs may be useful as a prognostic or diagnostic marker in prostate biopsies to identify patients with high risk of PCa recurrence and for identifying individuals for zinc replacement.

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64 **Assessing Pathogen Adaption through Genetic Manipulation**

Alex Kula, Loyola University Chicago
Field: Evolution Advisor: Catherine Putonti, Ph.D.

Small, viral pathogens often rely on their host species for translational machinery. Given that their host has a particular bias or preference in the usage of codons, the viral species often exhibits this same preference in an effort to expedite its replication. To explore the degree to which a virus selects for host-preferred codons, we altered segments of the coding regions, replacing host-preferred codons with those which are used less frequently. Working with the bacteriophage phiX174 and its bacterial

host Escherichia coli C, we created two mutants – the H-mutant and J-mutant, for the H protein and J protein, respectively. These two proteins were selected as both are important in the formation of the prohead complex. Furthermore, the number of proteins incorporated into each spike differs; H is present in one copy, whereas J is present in five. The mutant strains exhibited a reduced fitness as expected. We then evolved each mutant, in triplicate, along with three lines of the unaltered wild-type strain (serving as a control) for several hundred generations assessing their fitness. The altered region in each mutant line was sequenced over the course of the experiment revealing a tight correlation between fitness and codon usage.

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65 **Size Assortative Mating in the Marine Isopod *Idotea baltica***

Kathryn Kupczyk, DePaul University
Field: Aquatic Biology Advisor: Timothy C. Sparkes, Ph.D.

Size assortative mating (SAM) patterns commonly occur within a species in nature. Mechanisms for size assortative mating (SAM) include, mate availability, mate choice and possible mating constraints. The aquatic organism Idotea baltica, collected at Broughton Bay, Wales, UK were tested for presence of SAM as well as large male mating advantage (LMMA) and large female mating advantage (LFMA). Although these mating patterns are common to other marine isopods, little descriptive analysis has been allotted to the intertidal zone habitat of I.baltica, and therefore selective environmental factors that may influence mating behavior. A total of ninety-nine single I. baltica organisms and twenty-five paired couples underwent analysis. All I.baltica were collected at Broughton Bay, Wales, UK on July 6-10, 2009. Length measurements were taken using a 6" Dial Caliper in millimeters from the attachment of the antennae to the body's end. Width measurements were taken using a 6" Dial Caliper in millimeters from the body's midpoint which differed slightly to males and to females. No size assortative mating (SAM) was shown within the sample when comparing male and female body length in paired couples. No evidence of large female mating advantage (LFMA) in I.baltica was deduced. Evidence was seen in large male mating advantage (LMMA) in I.baltica. Although no size assortative mating (SAM) was exhibited by the organism, several factors could contribute to the mating behaviors of I baltica. The chaotic intertidal system of which I.baltica resides, may not be an environment suited for mating assessments. Large male mating advantages could correlate to parasitic interactions within the organism. Parasitic interference with an organism's mating behavior, poses a serious threat to the reproduction and survival of the organism itself. Further research could provide insights into the mating behavior produced by the inclusion of parasites into the marine isopod. Funding (DePaul University) Department of Biological Sciences University Research Council supported this research.

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66 **The search for the deferrioxamine B-metabolizing gene in the bacterium Mesorhizobium loti**

Richard Linchangco and Monica Ghadia, Loyola University Chicago
Field: Microbiology Advisor: Domenic Castignetti, Ph.D.

The bacterium Mesorhizobium loti is able to degrade the siderophore deferrioxamine B (DFB) (Pierwola et al., 2004). Siderophores are a part of normal microbial physiology and metabolism, but they are also virulence markers for pathogenesis in both animals and plants (Zaya et al., 2002). Four mutants (18, 26, 34, 42) unable to metabolize DFB were produced using transposon mutagenesis (Tn5: OT182) by a previous student. The transposon, also called a "jumping gene", can jump from the plasmid and insert itself into the chromosome of the bacteria, thus causing a mutation and "knocking out" those genes into which it inserts (Merriman and Lamont, 1993) The transposon apparently has inserted itself into one or more of the genes that enable M. loti to degrade DFB, knocking them out. Since the transposon's nucleotide sequence is known, it can act as a marker. This was used to probe

the mutants' DNA for the interrupted genes. The DNA of four mutants was digested using EcoRI and BglII restriction enzymes and then run on a Southern blot using the nucleotides of the transposase gene on the transposon as a probe. These enzymes produce fragments that contain transposon DNA, but also M. loti DNA. The fragments obtained from the BglII digest were then ligated with T4 DNA ligase and transformed into E. coli. To ensure the quality and composition of the isolated recombinant plasmids from BglII digest, as well as check the plasmid formation from Mutant 34 and 42 an electrophoresis experiment was conducted. Furthermore, to determine the size of the resultant fragments expected around 15kb each, calibrated plasmid digestion from Mutant 34 and 42 with EcoRI. After the calibration, sequence analysis for the mutants will be performed.

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67 **Isolation of ADDL proteins by Magnetic Nanostructures**

Chang Lu, Northwestern University
Field: Neurobiology Advisor: William Klein, Ph.D.

My research focuses on isolating a protein that has been implicated in the onset and development of Alzheimer's disease, a neurodegenerative disease that severely damages the brain's ability to form new memories. Aβ-derived diffusible ligands (ADDLs), soluble neurotoxic proteins formed by the self-aggregation of the amyloid beta peptide, were discovered by the Klein lab at Northwestern University to be strongly linked to Alzheimer's disease. Currently there is no clinical method for detecting the presence of ADDLs and quantifying their levels in cerebral spinal fluid or serum from patients. Such a detection method may allow for the enhanced diagnosis of Alzheimer's disease and ability to monitor the efficacy of disease treatment. I address the issue of detection by exploring the capabilities of Magnetic Nanostructures (MNS) in isolating ADDLs by immunoprecipitation. MNS show promising utility in vivo because they are small enough to pass through the blood brain barrier to detect ADDLs in the brain and can potentially be visualized by microscopy and MRI. However, MNS immunoprecipitation is still in the developmental stage and previous studies have shown mixed results. My research project focuses on improving the efficacy of MNS in isolating ADDLs by varying parameters of the procedure. Thus far I have successfully isolated synthetic ADDLs with MNS conjugated to ADDL-specific antibodies and have additionally demonstrated specific binding in cell culture with co-localization of fluorescent ADDLs and MNS-conjugated fluorescent antibodies. The next goal of my project is to isolate ADDLs from human tissues by modifying and applying the existing immunoprecipitation protocol as well as exploring other methods. Together, these findings will make significant progress on the development of an ADDL detection tool that can potentially advance the diagnosis and treatment of Alzheimer's disease.

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68 **A critical test of the hypothesis that ultra-short loop feedback via GnRH receptors coordinates pulsatile GnRH secretion**

Charles Muller, Northwestern University
Field: Neuroendocrinology Advisor: John Levine, Ph.D.

The pulsatile release of gonadotropin releasing hormone (GnRH) from neurons in the hypothalamus is essential for reproduction, however, the mechanism for this coordinated pulsatile release has not yet been identified. The diffuse arrangement of GnRH neurons stands in stark contrast to the coordinated release of the hormone. One proposed mechanism is an ultra-short feedback system within the hypothalamus that coordinates the pulses (1). Such a feedback system would involve the activation of GnRH receptors (GnRHR) in GnRH neurons themselves or in other cells that interact with GnRH neurons to coordinate the secretion of GnRH. We tested the hypothesis that cells in the hypothalamus containing GnRH receptors were part of an ultra-short loop feedback system.

To test this hypothesis, a novel mouse model was used in which cells expressing GnRHR were ablated using CRE-LOX technology. Mice in which a gene coding for diphtheria toxin (DTA) was flanked by LOX P sites (R-26-DTA mice) (2) were crossed with mice expressing CRE under control of the GnRHR promoter (GnRHR-internal ribosome entry site-Cre (GRIC mice)) (3). The presence of both CRE and LOX results in CRE activation allowing the cells to express DTA which kills the cells. This cross results in mice with selective ablation of cells expressing GnRH receptors (3). Groups of R26-DTA/GRIC (KO) mice were prepared for experiments to monitor GnRH release with GRIC or R-26-DTA mice serving as controls (WT). Adult females (>8 weeks) were fed a low phytoestrogen diet (Harlan-Teklad 2916) for two weeks prior to surgery and throughout the experiment. Six KO and 2 WT mice were implanted with a guide cannula directed toward the median eminence of the brain using stereotaxic coordinates (-1.94 AP, -0.25 LM, -4.9 DV relative to Bregma). After one week, mice were subjected to microdialysis to extract GnRH. Microdialysis was performed with artificial cerebrospinal fluid (aCSF) (flow rate 1.5 µl/min) with samples collected every 5 min for 3 hr. Mice were then dialyzed with KCl for 30 min, followed by aCSF for 30 min, again with samples collected every 5 min. GnRH content was measured by RIA.
The KO mice clearly exhibited pulsatile GnRH secretion. Although additional samples from WT animals of similar genetic background need to be collected, these data suggest that communication among cells via GnRH receptors is not required for the coordinated secretion of GnRH pulses.

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69 **Fossil Marine Vertebrates from the Upper Cretaceous in southeastern Colorado**

Matt Nagrodski, DePaul University
Field: Environmental Science Advisor: Kenshu Shimada, Ph.D.

The Hartland Shale Member of the Greenhorn Formation is a sedimentary rock unit that was deposited under the middle of an epicontinental sea in North America, the Western Interior Seaway, approximately 94.3 million years ago (Upper Cretaceous: middle Late Cenomanian). Fossiliferous rock samples were collected from the Hartland Shale in southeastern Colorado in order to analyze the taxonomic composition of its vertebrate fauna. Vertebrate remains were extracted through acid treatment of rock samples. So far, 26 marine vertebrate taxa have been identified, including eight chondrichthyans (sharks and rays), at least 17 osteichthyans (bony fishes), and one marine reptile (marine lizard). Because the identified marine vertebrates are mostly carnivores, the trophic structure of the paleocommunity must have been complex.

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70 **Sub-cellular Localization of PPT-1 in Neuronal Ceroid Lipofuscinoses: Does Gene Therapy Really Work?**

Anna Norton, University of Chicago
Field: Neuroscience Advisor: Glyn Dawson, Ph.D.

In order to determine if gene therapy would be beneficial for patients suffering from Neuronal Ceroid Lipofuscinosis (NCL), we determine the subcellular localization of over-expressed palmitoyl-protein thioesterase-1 (PPT-1). Our gene therapy model attempted to answer the following critical questions. 1. Since genes can only be superficially administered to the brain, any therapy depends on diffusion of the enzyme and uptake by adjacent cells, so do PPT-1 deficient cells take up secreted PPT-1? 2. Does the over-expressed gene product go to the correct (lysosomal) compartment since treatment is ineffective if the additional protein is not distributed to the correct subcellular compartment? Normal PPT-1 is mainly a lysosomal hydrolase, so over-expressed thioesterase in alternative subcellular compartments could actually have deleterious effects on NCL patients. We found that the human

neuroblastoma cell line LA-N-5, transfected with PPT-1 in a pCMV vector and subcloned to generate LA-N-5-PPT, expressed >3 times the normal level of PPT-1 but also secreted PPT-1 into the surrounding culture media. This media was collected, concentrated, and added to both normal (17381) and PPT-1 deficient (C12488) human lymphoblastoid cell lines. After 72h the cells were harvested and the broken cells fractionated into organelles on a Percoll gradient. Density fractions were collected and tested for lysosomal (with a β-hexosaminidase marker) and PPT-1 content by fluorometric assay. Our results indicate that the secreted PPT-1 was taken up but shuttled to alternative subcellular compartments in PPT-1 deficient cells. When LA-N-5 cells were grown in chamber slides, treated with concentrated media, stained with anti-PPT-1 and the immunofluorescence distribution examined by confocal microscopy, the PPT-1 was mainly in lysosomes. In contrast, following treatment with PPT-1 secreted by LA-N-5 cells, we confirmed that PPT-1 was distributed to organelles other than the lysosome.

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71 Absents of vimentin Protects under Hyperoxic Conditions by Attenuation of the Immune Response

Kendra Oliver, Loyola University Chicago
Field: Medical Biology Advisor: Domenic Castignetti, Ph.D.

Intermediate filaments (IF) have been thought to act as key components within the innate immune response due to their role in cell motility and in activation of the inflammatory response. We hypothesized that absence of vimentin, a type III IF with a known role in mobility and cell morphology, could confer a potential protection in mice exposed to hyperoxic conditions. Hyperoxia, which is the exposure to high levels of O2 (>95%), has been shown to cause acute lung injury (ALI) and elicit an inflammatory response within the alveolar space. We used western blotting to demonstrate that the vimentin null (Vim-/-) mice exhibited no vimentin compared to their wild-type counterparts (Vim+/+). To determine if vimentin deficiency confers protection to mice under hyperoxia, we compared the survival rates of Vim+/+ mice to Vim-/- mice in a hyperoxic (>95% oxygen) environment. The Vim-/- mice exhibited an increased survival (LD50=142.5) compared to the wild-type mice (LD50=117). To determine the degree of alveolar epithelial barrier damage and inflammation within each group we measured permeability, wet-to-dry ratio. We also preformed total cell count, and cell differentiation to determine the amount and type of immune responsive cells reacting to the hyperoxic stress. By using these read-outs we demonstrated a significantly higher degree of inflammation within the Vim+/+ mice compared to Vim-/- mice while the integrity of the barrier was relatively similar after hyperoxic exposure. Additionally, we found a decreased amount of IL-6 and MCP-1 compared to wild-type mice using ELISA however TNFa levels were higher in Vim-/- mice than Vim+/+. In order to find the reasoning behind this discrepancy, we isolated and activated macrophage from both groups with LPS and found….(that there was a more than 2 fold decrease in IL-6 production in Vim-/- mice compared to vim+/+ mice)….These studies demonstrate that vimentin play an essential role in the secretion of IL-6 and perhaps other cytokines and thereby confers protection from hyperoxia-induced ALI due to an attenuated immune response.

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72 Effects of Invasive Plant Typha X Glauca on Wetland Denitrification and Emmision of Nitrous Oxide

Michal Olszewski, Loyola University Chicago
Field: Wetland Ecology Advisor: Nancy Tuchman, Ph.D.

Denitrification (DN), a critical wetland ecosystem function requires specific soil conditions: anoxia, and the availability of nitrate (NO3-) and organic carbon. The invasive plant Typha x glauca has been associated with increased soil NO3, organic matter and also with greater soil

aeration, which may result in incomplete reduction of NO3-to N2 and increased flux of N2O, a potent green house gas. To test these interactions, two experiments were conducted: 1) DN activity of soil cores collected along a gradient of Typha densities from Lake Michigan coastal wetlands was analyzed using acetylene inhibition and helium assays; and 2) 15NO3-was traced through the DN process in controlled microcosms with wetland soils at a range of redox levels. Results from the acetylene inhibition assay were inconclusive as to whether Typha affected DN quality, likely resulting from uneven distribution of site specific water levels. Helium assay samples are currently being analyzed. Results from the 15N study revealed a strong positive relationship between soil aeration and relative N2O emissions. This suggests, Typha mediated increases in soil aeration, may result in increased N2O emissions.

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73 **Allelic Imbalance at 8p21-22 and Prostate Cancer Risk**

Appledene Osbourne, University of Chicago
Field: Genetic Medicine Advisor: Rick Kittles, Ph.D.

Prostate cancer (PCa) is one of the most prevalent diseases affecting males over the age of fifty. In the United States, PCa disproportionately affects African Americans (AAs). We first identified 13 single nucleotide polymorphisms (SNPs) that span the 8p21-22 chromosomal region, which harbors the genes NKX3.1 and MSR1. Using these SNPs as markers, we then investigated allelic imbalance (AI) as a result of deletions by analyzing allelic ratios between tumor and normal paired tissue in 16 AAs and 11 European Americans (EAs). In general, we found AAs to me more polymorphic for these SNPs. For the MSR1 gene, 18% and 67% of EAs and AAs, respectively, exhibited moderate to high AI. Loss of heterozygosity (LOH) was observed only in 8% of AAs for MSR1. For NKX3.1, 36% and 40% of EAs and AAs, respectively, exhibited moderate to high AI. LOH was observed only in 13% of AAs for NKX3.1. Our results are consistent with previous research, which have found AI and LOH in NKX3.1 in PCa cases suggesting that NKX3.1 is a candidate tumor suppressor gene that is deleted in PCa. We also found AI and LOH in MSR1, which has not been previously shown. This finding warrants further investigation and confirmation by sequencing the regions of LOH. The 8p21-22 regions have been considered sites of frequent chromosomal deletions and this study supports this as it shows LOH in both the NKX3.1 and MSR1 genes. Furthermore, the alarming disproportionate in prevalence of PCa mortality among AAs merits further study. Looking at different populations allows the identification of potential differences in genetic susceptibility and such information can better our understanding of risk factors driving health disparities.

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74 **Effect of resin coating on the ultimate strength of glass ionomers**

Joshua Padovano, University of Illinois at Chicago
Field: Restorative Dentistry Advisor: Ana Bedran-Russo, Ph.D., DDS

Objectives: To evaluate the effect of resin coating on the ultimate tensile strength (UTS) of four glass ionomer cements subjected to erosive pH cycling.
Methods: Standardized hourglass-shaped specimens were obtained using addition silicone molds (n= 60 per group): (1) Fuji II LC (GC America); (2) Ketac Nano (3M ESPE); (3) Fuji IX Extra (GC America); and (4) Ketac Molar (3M ESPE). After first phase setting-time, the specimens were removed from the molds, polished and half of the samples were completely coated using G-Coat Plus (GC America) or Ketac Glaze (3M ESPE). Coated and uncoated samples were either stored in artificial saliva for 24 hours or subjected to erosive pH cycling (3x day immersion in a cola drink for 5 min for 7 days). After elapsed time, the samples were tested in tensile at a crosshead speed of 1mm/min. The data were analyzed by ANOVA and Fisher's PLSD test (a=0.05).

Results: The prolonged erosive pH cycling did not affect the UTS values; however the use of a coating material resulted in significantly higher UTS values for Fuji II LC and Fuji IX Extra when compared to their respective uncoated groups. Conclusion: Surface protection using resin coating enhanced the UTS values of Fuji II LC and Fuji IX Extra. The effect of resin coating is material-dependant.
Conclusion: Surface protection using resin coating enhanced the UTS values of all materials except Ketac Molar Aplicap. The effect of resin coating is material-dependent.

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75 **Soil legacies differentially influence native grass establishment in a prairie restoration**

Lisa Pahomov, Lake Forest College
Field: Soil Ecology Advisor: Louise Egerton-Warburton, Ph.D.

Understanding priority effects is an essential consideration in restoring native plant communities. Priority effects, i.e., when the growth of an earlier plant species affects the growth and survival of later plants, can lead to lasting differences in plant community composition. Such effects can be the outcome of competition or plant-induced changes ('legacies') in soil properties including alterations in nutrient availability and microbial communities, e.g., pathogens and mycorrhizal fungi (ubiquitous fungal- plant root symbioses). In this study, we examined how soil legacies on arbuscular mycorrhizal fungal (AMF) communities affected the restoration success of an AMF-dependent native grass, Andropogon gerardii. We evaluated soil nutrients in urban restoration sites conditioned by five or 15 years of growth by either native grasses or weedy grasses and forbs. Next, we conducted a greenhouse experiment in which seedlings of Andropogon were planted into soils from each restoration site, and measured plant growth, nutrient content, and AMF status. We found that Andropogon plants grown in soils conditioned by native grasses showed increasing biomass accumulation, nutrient status, and AMF colonization over time. Native grasses thus condition soils in a manner that enhances the growth of other native taxa. After 15 years of conditioning by weedy grasses, however, soil N and P fertility was elevated, and Andropogon plants demonstrated a significant increase in plant biomass, nutrient content, and root colonization by AMF than plants propagated in soils conditioned by native grasses. However, these plant –AMF relationships are unlikely to be beneficial owing to a reduced plant demand on AMF for nutrient acquisition. Overall, these results imply that weedy species may alter grassland restoration efforts by changing soil nutrient levels that, in turn, feedback to alter plant growth and AMF status. Since native grasslands are historically nutrient-limited, management strategies may need to be implemented to reduce soil nutrient levels.

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76 **The role of Vascular Endothelial Growth Factor in Spinocerebellar Ataxia Type 1**

Jay Patel, Northwestern University
Field: Neurology Advisor: Puneet Opal, M.D., Ph.D

Spinocerebellar Ataxia type 1 (SCA1) is a neurodegenerative disease caused by the expansions of a glutamine repeat track in ATXN1; it belongs to the family of polyglutamine disorders that also includes Huntington's and Kennedy's diseases. ATXN1 has been shown to play a role in gene regulation, a process that is altered in the cerebella of SCA1 knock in mice, the most precise animal model of SCA1. We have found that Vascular Endothelial Growth Factor (VEGF-a chemical signal released by cells that stimulates the growth of new vessels) mRNA is down regulated in the Purkinje neurons (cerebellar neurons that are most susceptible to SCA1) of SCA1 mice and that ATXN1 directly suppresses VEGF transcription by binding to the VEGF promoter. Furthermore over expressing VEGF improved the SCA1 phenotype. In order to explore the effect of reduced VEGF

levels on the vasculature in SCA1 mice, we quantified the capillary density in the cerebellum of SCA1 mice compared to their wild type littermates. Interestingly we have found that SCA1 mice have a decreased density of blood vessels in the cerebellum; however, replenishing VEGF significantly increased the density. These findings indicate there is an important role in communication between a degenerating nervous system and the vascular system around it that still has to be explored in more details. These findings also indicate future avenues of research to pursue, including finding a VEGF related biomarker to indicate the advancement of SCA1 in patients, as well as creating a therapeutic delivery mechanism to rescue VEGF in the brain in hopes of ameliorating the SCA1 phenotype.

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77 **The Effect of Genistein plus Estradiol on Apoptosis in MDA-MB-231 Breast Cancer Cells**

Kevin Peine, DePaul University
Field: Molecular Biology Advisor: Talitha T. Rajan, Ph.D.

Our previous results have shown that low concentrations of genistein, a soy component, inhibits the cell proliferation of ERb breast cancer cells in the presence of physiological concentrations of 17b-estradiol. These results are especially relevant in premenopausal women with breast cancer of the ERa-negative and ERb-positive type. The aim of the present study was to identify the mechanism by which genistein plus estradiol inhibit the cell proliferation of ERb breast cancer cells. For this purpose, the effect of low and high concentrations of genistein in the presence or absence of estradiol was studied on apoptosis and the expression of the cell signaling protein BAX, involved in apoptosis, in MDA-MB-231 breast cancer cells. Apoptosis was determined by the use of acridine orange and ethidium bromide dyes and the expression of BAX by western blotting and immunodetection. Our results show that 1μM genistein plus 10-9M estradiol increased apoptosis ($p<0.05$) as compared to the control (12.47% vs 5.87% respectively). In parallel, an increase in the expression of Bax (2.5 fold) was observed in cells treated with low concentrations of genistein plus 17b-estradiol as compared to the control cells. High concentrations of genistein (100 μM) in the presence or absence of 17b-estradiol also increased apoptosis and decreased cell proliferation; however these changes could not be correlated to the expression of Bax. In conclusion, our results show that low concentrations of genistein in the presence of 17b-estradiol probably inhibit cell proliferation through apoptosis via an increase in Bax expression. Our results also suggest that different concentrations of genistein elicit cell responses through different mechanisms.

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78 **Genetic diversity of Gasterosteus aculeatus in a freshwater drainage in Cook Inlet, Alaska.**

Amanda Peters, DePaul University
Field: Evolutionary Biology Advisor: Windsor Aguirre, Ph.D.

Gasterosteus aculeatus, commonly known as the threespine stickleback, is a small, ancestrally marine, cold-water fish. Stickleback have become adapted to freshwater with their invasion of post-glacial, near-costal lakes of the Northern Hemisphere. These stickleback systems have rapidly become adapted to their freshwater habitats by means of divergent natural selection acting on body shape, body size, and body armor. In the Fish Creek Drainage of Cook Inlet Alaska, this morphological diversification has been shown to occur in accordance with habitat type and is not correlated to geographic distances between habitats. This study investigates whether genetic diversity in this drainage also correlates to habitat type, or whether genetic diversity is a result of geographic distance. Genetic diversity was measured using three microsatellite markers, which are selectively neutral. Although body shape divergence is a result of adaptation to habitat type, we predict that, since decreased distance between habitats will tend to allow for increased gene flow, geographic distances between habitats will determine genetic diversity at these neutral markers in this drainage.

79 Empathy's effect on environmental attitudes

Aleksandr Pevtsov, DePaul University
Field: Environmental Behavior Advisor: Judith Bramble, Ph.D.

The question that motivated this study was "how can we get people more concerned about the environment?" We investigated whether evoking empathy would help promote more pro-environmental attitudes and behaviors in college students. An on-line survey was administered in which college students were shown photos of animals harmed by humans or animals harmed by natural phenomena. Half of these students received instructions to look at the photos objectively the other half were told to look at the photos with empathy. Prior research suggested that empathy can cause people to care more about the environment. Our study showed this to be the case, but only for students shown photos of animals harmed by natural phenomena. In our study, looking objectively at human caused environmental harm resulted in greater concerns about the environment than looking at the photos with empathy. In addition, our study showed the importance of childhood experience in filtering their response to environmental issues. This can tell us that increasing exposure with nature during childhood years can lead a person to grow up being more concerned about the environment as well as being more connected with nature and having a more realistic view when making decisions that effects the environment. There are many reasons why our results differed from a published study we built upon. One possible reason is that the other study was in Spain. This could represent a gap between American and European perspective on the environment. Another reason why we obtained different results could be that the other study only used freshman, while we only had 57% freshman. Our research underscores the importance of childhood experiences in nature and of looking objectively at the big picture to helping people develop pro-environmental behaviors and attitudes.

80 Addition of Biosolids to an Agricultural Soil Increases Nitrification and Produces Distinct Responses in Ammonia Oxidizing Archaea and Bacteria

Katherine Policht, Loyola University Chicago
Field: Microbial Ecology Advisor: John Kelly, Ph.D.

The recently discovered ammonia oxidizing archaea (AOA) have been found to be numerous in terrestrial soils and have been suggested as possible contributors to the first step of nitrification, a role that was previously assigned almost exclusively to ammonia oxidizing bacteria (AOB). The goal of the current study was to assess the responses of these two groups of ammonia oxidizers to the application of biosolids to an agricultural soil, which has become a popular disposal option for this nutrient rich byproduct. Anaerobically digested biosolids were applied annually for three consecutive years to a soil used for corn production. Addition of biosolids at a typical agronomic rate generally did not result in significant increases in total heavy metals in soil, and addition at double the agronomic rate resulted in modest increases in several metals that were well below the cumulative pollutant loading limits established by the U.S. Environmental Protection Agency. Both biosolids amendments resulted in increases in soil organic carbon, available phosphorous, and total inorganic nitrogen, and these nutrient increases enhanced soil fertility as demonstrated by increased corn yield. The biosolids amendments also resulted in increases in nitrification rates and in the numbers of AOA and AOB as shown by quantitative real-time PCR amplification of archaeal and bacterial amoA genes. However, only AOA responded to biosolids applied at the typical agronomic rate, and only archaeal amoA gene copy numbers showed strong correlations with both nitrification rates and levels of oxidized nitrogen compounds in the soil. These results suggest that AOA are linked to the increases in nitrification rates caused by addition of biosolids, which supports the theory that AOA may be significant contributors to nitrification in terrestrial soils.

81 **Quantitative phosphoproteomic analysis of MYCN-amplified neuroblastoma cell lines**

Kelly Regan, University of Chicago
Field: Oncology Advisor: Samuel Volchenboum, M.D., Ph.D.

The hallmark of neuroblastoma, the most common solid tumor in children, is its clinical heterogeneity. The most important biologic risk factor for aggressive disease is amplification of the MYCN oncogene. The biological pathways through which MYCN gene amplification effects aggressive disease is largely unknown. Using the Tet21N neuroblastoma cell line, in which MYCN is silenced under control of a tetracycline-inducible promoter, we have applied quantitative phosphoproteomic analysis and identified a panel of significantly differentially expressed proteins. Differential expression of a subset of these proteins has been validated in neuroblastoma cell lines using Western blotting, and we are currently validating their expression in patient tumor samples. We have corroborated a subset of our findings with gene expression analyses using Affymetrix GeneChip Human Exon 1.0 ST micorarrays. A possible mechanism by which MYCN amplification leads to tumorigenesis involves the ARF/MDM2/p53 activation pathway. NPM1, an antagonizer of ARF, was significantly differentially expressed in our proteomic analysis. We hypothesized that suppression of NPM by siRNA releases suppression of ARF, leading to down-regulation of MDM2 and subsequent release of p53 and resulting cellular death, but our initial findings in SKNBE2 cells do not support this. We are currently testing NPM suppression in cell lines that have an intact ARF/MDM2/p53 axis. Understanding how MYCN contributes to an aggressive phenotype will be essential to developing better methods for patient stratification, therapeutic measures of success, and better strategies for treatment.

82 **Evolutionary Selection for Pathogen-Host Nucleotide Sequence Correspondence**

Joseph Saelens, Loyola University Chicago
Field: Molecular Co-Evolution Advisor: Catherine Putonti, Ph.D.

Computational analysis of viral pathogen and host genomic sequences has revealed similarities in the preferred usage of particular codons. Since many of the smaller viral pathogens are entirely dependent upon host machinery, it has been postulated that they are under selection for a composition similar to that of their host. In a recent study by Coleman et al. (2008), a section of the capsid protein of poliovirus was altered to contain underrepresented codon pairs based on the codon bias of the human genome. The resulting viruses showed a decrease in translation rates and were consequently less virulent within the host suggesting its possible use as a vaccine. The results of this study prompted us to ask: To what degree would an engineered pathogen be under selection to return to a host-like composition?
Using the model system of the small viral bacteriophage φX174 and its host Escherichia coli C, a φX174 mutant was engineered in which a segment of the phage's capsid gene F was changed to include underrepresented codons of its host species. Three replicates of the mutant φX174 strain were propagated for many thousands of generations with its host E. coli C over 21 days. Sequencing of the strain was conducted throughout this time. The results of our sequencing revealed that many of the codons that were altered reverted back to the codon of the ancestor strain. The rate of reversion was found to correspond with the relative fitness of the phage. This suggests that codon usage not only corresponds with virulence but that the phage is in fact under strong selective pressure to utilize the host biases.

83 Characterization of Mesenchymal Stromal Cells and Axonal Growth for Studying Spinal Cord Injury

Jennifer Saluk, Northwestern University
Field: Neuroscience Advisor: Yang D. Teng, M.D., Ph.D.

Recent research suggests that multipotent mesenchymal stromal stem cells (MSCs) may have clinical applications in the nervous system. Primary MSCs are thought to lose their therapeutic capacity with prolonged culture, thus one aim of this study was to characterize human bone marrow-derived MSCs (hMSCs) and determine how long they retain their "stemness," i.e., differentiability. For successful application of hMSCs to central nervous system pathology such as spinal cord injury, it is also necessary to develop animal models of injury, implantation, and repair. To date, neurological stem cell research has primarily used neural stem cells (NSCs); models developed in these studies can likely also be applied to MSCs, which are more easily extracted from patients. Thus, the second purpose of this study was to generate an NSC model as a foundation for a future study applying hMSCs to the treatment of spinal cord injury. This experiment showed that MSCs maintain their viability and proliferation ability at higher passages, but differentiation ability does begin to decrease. Rubrospinal tracing served as a good measure of spinal cord repair after hNSC transplantation, and a similar experiment should be attempted with MSCs. This experiment showed that hMSCs have potential therapeutic uses in the nervous system and applications using NSCs may possibly be expanded to MSCs.

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84 Visualizing the Microbial Diversity within Soil

Richard Schmidt, Loyola University Chicago
Field: Bioinformatics Advisor: Catherine Putonti, Ph.D.

Due to advances in sequencing technologies, it is now possible to sequence the organisms present within individual ecological niches rapidly and cost effectively, providing not only a sense of the species present but also the complex interactions between these organisms. The sequencing of a community's genomic data, such as a complex soil sample, creates expansive data sets. In order to make any biological inference about a community, the billions of sequences must be assembled, stored, tagged, and analyzed, before they are of any use. Multiple software tools have been created to take both a biological and a statistical approach to comparing the data. A key challenge for such tools is introducing the data in a clear, concise manner. Herein we present an application to interface with metagenomic data in biologically meaningful ways. The primary objective has been to design a Graphical User Interface that is intuitive to the user and capable of extrapolating taxonomical and genic information from existing data repositories such as GenBank thus making it possible to assess the species and gene regions covered by the sequencing reads.

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85 Visualizing the Microbial Diversity within Soil

Caitlin Schulze, DePaul University
Field: Plant Physiology Advisor: Mark Potosnak, Ph.D.

Plants are known to emit isoprene, a biogenic volatile organic compound (BVOC). The addition of anthropogenic and biogenic VOCs with oxides of nitrogen from human sources leads to the production of ozone. Ozone is a harmful air pollutant that can damage to the respiratory system and vegetation. Ambient carbon dioxide levels were varied for cottonwood and northern red oak plants under drought stress conditions to investigate the biochemical controls on the creation of isoprene under global climate change conditions. Temperature was also varied in the plants and demonstrates at higher temperatures the substrate, dimenthylallyl diphosphate (DMAPP) is not

limiting, but at lower temperatures isoprene synthase is limited by the substrate. This signifies that the creation of isoprene by isoprene synthase could be affected further up stream in the mechanism presented by Rosentiel et al (2004).

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86 **Investigations into the Expression of Mitochondrial Genes in the Mosquito stages of Malaria Parasite Plasmodium**

Maheen Siddiqi, Loyola University
Field: Malaria Advisor: Stefan Kanzok, Ph.D.

The lifecycle of the Plasmodium parasite, the causative agent of Malaria, is complex, alternating between the vertebrate host and the mosquito vector. The environments of both the host and vector are drastically different, requiring Plasmodium to adapt gene and protein expression accordingly. While the mitochondrion of Plasmodium is small and underdeveloped in the human host it increases in size and complexity once the parasite enters the mosquito vector. Here we report on the regulation of genes comprising the ATP synthase complex of the Malaria parasite. We hereby focused on the early developmental stages of Plasmodium in the mosquito vector as well as in cultured mosquito stages. Our data show that these genes exhibit significant up-regulation at 12 hrs in mosquito as well as in culture samples indicating an increased activity of the parasites mitochondria. Interestingly, our observations of increased gene expression coincides with a motile stages of the parasite, the ookinete, which has the task to actively escape the blood meal in the mosquito midgut to establish vector infection.

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87 **Quorum Quenching Effects of PON1 on Pathogenic Bacterial Inhabitants of the Human Colon**

Lacy Simmons, Loyola University Chicago
Field: Biochemistry Advisor: Yvonne Harris, Ph.D.

Several species of bacteria have been linked to chronic infections of the colon and increased risk of colon cancer. Pathogenic bacteria use this environment to create disease-inducing biofilms, initiated through the use of acyl homoserine lactone (AHL) signaling molecules. Human PON1 enzymes exhibit high lactonase activity which can degrade AHL signaling proteins. Previous studies have shown that statins increase serum levels of the PON1 enzyme. In this study we are exploring whether statins can also induce PON1 expression and thereby increase biofilm inhibition. Once baseline levels of PON1 concentrations have been established colon cells (Caco-2) are treated with different doses of statins. The expression of PON1 following statin exposure is determined using an ELISA assay and Dot Blot. Cell culture supernatants are used to treat bacteria in a biofilm assay and the growth of the bacteria is measured to determine the effect that varied levels of PON1 had on growth.

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88 **Antagonistic Coevolution of ΦX174 with Two Hosts**

Ramunas Stanciauskas and Adam Hilterbrand, Loyola University Chicago
Field: Evolution Advisor: Catherine Putonti, Ph.D.

Antagonistic coevolution is a continuous cycle seen in most host-pathogen systems. In order to survive, a host must evolve a mechanism to prevent pathogen infection. If this happens, the pathogen must than evolve to overcome the resistance. In nature, this opposing coevolution is seen as a factor driving host-parasite infection, the evolution of sex, and genetic variability within populations. Despite its widespread implications on evolution, direct empirical data supporting the theory of antagonistic coevolution is largely unavailable. This is a result of limitations in laboratory

model systems that cannot mimic a natural population. Recently, the bacteria/bacteriophage system has been utilized to study the coevolution of a pathogen and its host. These studies have shown bacteria can confer resistance to bacteriophages but the bacteriophage rarely overcomes the resistance because of lack of genetic diversity within laboratory bacteriophage populations. While this result is common, this is not an accurate representation of a natural population.
In our study, we also utilize the bacteriophage system, specifically bacteriophage ΦX174 because of its well-characterized infection and open host range.ΦX174 is a generalist that is known to infect three bacterial hosts: Escherichia coli C, Salmonella typhimurium, and Pseudomonas syringae. We independently allowed replicates of both E. coli and P. syringae to confer resistance to ΦX174. We then created a genetically diverse phage population using chemical mutagenesis to simulate the diversity present in natural populations. The mutant phages were isolated and tested for growth on the resistant bacteria. Sequence analysis and fitness assays were performed on the successful phage isolates and the resistant bacterial strains to determine a possible mechanism of resistance and reinfection.

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89 **Impacts of Stream Characteristics on Denitrifying Biofilms**

Malachy Sullivan, Loyola University Chicago
Field: Microbiology Advisor: John Kelly, Ph.D.

Human-induced increases in the availability of fixed nitrogen to terrestrial and aquatic ecosystems have generated signification modifications to ecosystem function. In comparison with the pre-industrial age, nitrogen loading into the world's oceans has increased as much as 20-fold, resulting in decreases in water quality and the development of hypoxic zones. While streams and rivers transport much of this nitrogen into the oceans, there exist a number of processes within these systems that can either retain nitrogen or transform it. One such process is denitrification, the microbially mediated transformation of biologically available NO3- into biologically unavailable N2 gas. In order to investigate the effects that physical and chemical stream characteristics have on microbial consortia involved in denitrification, we placed ceramic tiles in two streams with differing physical and chemical characteristics. The tiles served as substrates for the formation of periphytic biofilms, and they were collected 1, 2, 3, and 4 weeks post-placement. Over the course of the study the streams differed significantly in depth, discharge, and the concentration of inorganic nutrients. Tiles from both streams showed the development of denitrifying biofilms, but molecular analysis of bacteria within the biofilms showed significant, site specific differences in the composition of the denitrifying communities.

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90 **Protein expression studies of Thioredoxin-1 and Thioredoxin(469) throughout the life cycle of the rodent model malaria parasite Plasmodium berghei**

James Tasch, Loyola University Chicago
Field: Parisitology Advisor: Stefan M. Kanzok, Ph.D.

The malaria parasite Plasmodium, the cause of 1-2 million deaths each year, is transmitted between humans by female Anopheles mosquitoes. Within the insect, there are many challenges the parasite is able to withstand to facilitate survival and transmission to the next human host. Cytotoxic reactive oxygen (ROS) and reactive nitrogen species (RNS) that are produced by the mosquito as an immune response against the invading parasite are among the threats the parasite encounters. We hypothesize that a defense against ROS and RNS is crucial for the survival of the parasite within the mosquito and, by extension, for malaria transmission. Here we present our investigation into the protein expression of two putative antioxidant genes on the rodent malaria model organism Plasmodium berghei. Using immunofluorescence and confocal microscopy we show the expression

pattern and the subcellular localization of these candidate genes throughout the complex life cycle of this parasite. Their potential role in parasite survival in the mosquito will be discussed.

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91 **Urinary Bladder Regeneration Utilizing Mesenchymal Stem Cells Seeded onto Elastomeric Thin Films**

Hatim Thaker, Northwestern University
Field: Tissue Engineering Advisor: Arun K. Sharma, Ph.D.

Acquired or developmental disorders affecting urinary bladder function leads to a myriad of pathological conditions, even with advances in surgical intervention. Previous studies have yielded inconclusive results due to inappropriate cell types and primitive scaffold design. An alternative using bone marrow derived mesenchymal stem cells (MSCs) addresses this shortcoming: MSCs may be transdifferentiated into bladder wall components, suitable for bladder regeneration studies, when combined with poly(1,8-octanediol-co-citrate) thin films (POCf). Initial studies have confirmed the candidacy of MSCs for bladder regeneration since they express contractile proteins and even show contraction in an undifferentiated state. POCf is a highly reproducible elastomeric material capable of being used as a synthetic scaffold. Human MSCs/Urotsa (an immortalized urothelial cell line), and bladder smooth muscle cells (bSMCs)/Urotsa were seeded on opposing sides of POCfs at 15K cells/cm2, cultured for 1 week. Cell viability was determined in vitro up to 21 days post-seeding. A 30% bladder cystectomy was created in a nude rat bladder augmention model and repaired with the aforementioned cell seeded POCfs or unseeded POCfs enveloped with an omentum. Rats were sacrificed 4 weeks post-implantation and augmented bladders were paraffin embedded for Masson's Trichrome and anti-human g-tubulin staining. in vitro MSC viability at day 1 and 21 post-seeding was >98% on POCfs. Rat bladders augmented with an MSC/Urotsa seeded POCf grew to thickness levels greater than a comparably seeded cSMC/Urotsa POCf. Collagen to muscle ratio was also comparable between MSC and SMC groups. g-tubulin staining of the MSC/Urotsa POCfs indicated that cell outgrowth was of human origin as also seen with directly labeled cSMCs. Data gathered from this study demonstrate that MSCs, paired with synthetic POCfs, support the regeneration of bladder tissue in vivo.

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92 **Macrophage Influence on Pre-pubertal Follicle Development in Mice**

Cristina Thomas, Northwestern University
Field: Reproductive Biology Advisor: Teresa K. Woodruff, Ph.D.

Macrophages secrete over 100 different molecules, including growth factors and cytokines that have been proposed to be involved in several ovarian processes, including follicular development, ovulation, and corpus luteum involution, but the interplay of the known cytokines and their roles in the pre-pubertal ovary has not been well-studied. To examine the role of macrophages on pre-pubertal follicle development, we examined both the localization of these cells in relation to different subclasses of follicles and the effect of co-culturing macrophages and follicles in our established in vitro culture system. Sections from dpn 2, 6, 10, 19, and 26 aged ovaries were probed with a–F480 antibody and counterstained with hematoxylin. Macrophages were counted in every 10th section as being associated with a particular follicle subclass. Follicle counts were also performed in pre-pubertal animal ovarian sections. For co-culturing experiments, ovarian macrophages from dpn 22 ovaries were isolated in wells of a 96-well plate by plastic adherence. Secondary follicles were cultured in the same wells using typical follicle media, with either no FSH or half the regular FSH added. Follicle diameter and survival were measured every other day for a 10-day culture period. Localization demonstrates an increasing number of macrophages present in the ovary over the

pre-pubertal period, with no significant association with a particular follicle class on day 2, a strong association with primordial/primary follicles on day 6 which changes to a more significant association with secondary/antral follicles on days 10 and 19, and a re-association with primordial/primary follicles on day 26. Co-culturing experiments demonstrate that a feeder layer of macrophages cause an increase in follicular growth and survival in low or no FSH media. Together, these data suggest a model in which macrophages are in close association with growing follicles in vivo and secrete molecules that directly aid in follicle growth.

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93 **Chromosome Segregation During Female Meiosis in Drosophila melanogaster.**

Maria Uhler, DePaul University
Field: Genetics Advisor: William Gilliland, Ph.D.

Studying how chromosomes separate is important because of how it applies to humans. When chromosomes do not separate correctly it is called non disjunction and causes the wrong number of chromosomes to be put into the sex cells during meiosis. One human condition where this occurs is called Down syndrome. This occurs when chromosome 21 does not separate properly during meiosis; it causes three copies of this chromosome to be present within the progeny. As a result, this causes a series of significant abnormalities including lower learning capacity and mental disabilities. While Down syndrome is the most common human birth defect it is actually one of the milder outcomes of non disjunction, as most abnormalities in the number of chromosomes are lethal. Therefore, it is important to learn how non-disjunction is occurring.
What we know from studying D.melanogaster previously is that mutations in genes required for meiosis can cause non disjunction, but the mechanism that causes non disjunction is still unknown. Through previous research done by professor Gilliland, we have found that chromosomes during female meiosis in D.melanogaster congress into a compact "lemon" shaped mass when the egg completes its development prior to fertilization. Our hypothesis is that mutant D.melanogaster, the "lemon" is built incorrectly, with the chromosomes oriented incorrectly. Then, when the cell is fertilized, the chromosomes fail to separate. To test our hypothesis, we will examine a collection of genetic mutants and the amount of non disjunction that occurs in each line. Then oocytes from each line will be looked at cytologically using chromosome specific probes in a technique called FISH (fluorescent in situ hybridization) to see if the chromosomes are misaligned. If our hypothesis is correct, then the role of mal orientation shown by FISH will correlate to the late of error we saw genetically.

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94 **Effects of an Experimental Flood on the Diets of Invertebrates in the Grand Canyon**

Tyler White, Loyola University Chicago
Field: Aquatic Ecology Advisor: Chris Peterson, Ph.D.

Glen Canyon Dam, completed in 1963, has substantially altered the downstream ecosystem of the Colorado River. Having terminated the seasonal floods to which the native community had become adapted, it greatly affected the biodiversity and species interactions downstream. Three native fishes have been locally extirpated from the river, and the humpback chub, Gila cypha, is currently listed as endangered.
This project investigates the effects of the March, 2008 Beach Habitat Building Flow (BHBF, experimental flood) on invertebrate resource consumption and the taxonomic composition of diatoms in their diets. It contributes to a better understanding of how dam operations affect invertebrate and ultimately fish populations to promote proper river maintenance in the future. Using samples collected during the March, 2008 BHBF by Dr. Rosi-Marshall and colleagues, the gut contents of four invertebrate species were dissected and drawn onto slides. Particulate matter was

indentified for each slide using imaging analysis software attached to a compound microscope. Diatoms from samples collected from rock-based biofilms of the same time period were identified to the species level.
When comparing samples before and after the flood, I observe no significant alterations in the gut content composition. There is also no apparent significant difference in the diatom species composition present in the epilithon. My results indicate that the experimental flood did not have a detrimental impact on the availability of food resources for aquatic invertebrates. This implies further research is necessary to elucidate the importance of seasonal floods for the Colorado River system, and that more frequent BHBFs may be necessary to help restore the ecosystem to pre-dam conditions. My project, in conjunction with the overall flood project, serves as a reference for dammed stream ecosystems.

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95 **Nucleoside reverse transcriptase inhibitors of all subclasses induce endothelial dysfunction and compromise mitochondrial function**

Stephen Xue, University of Chicago
Field: Pharmacology Advisor: Tammy Dugas, Ph.D.

Nucleoside reverse transcriptase inhibitors (NRTI) are a critical component of highly active antiretroviral therapy for HIV patients. Despite their effectiveness, however, long-term use of NRTIs leads to cardiovascular complications likely resulting from drug-induced mitochondrial toxicity. Our prior in vitro studies demonstrated that NRTIs impair endothelial function in the vasculature, likely via an increase production of mitochondria-derived reactive oxygen species. In this study, we investigated the effects of three subclasses of NRTIs: thymidine analogues like zidovudine (AZT) and stavudine (d4T); cytidine analogues, such as lamivudine (3TC); and adenosine analogues like didanosine (ddI). In mice orally administered pharmacologically relevant doses of NRTI for 4-6 weeks, endothelium-dependent vasorelaxation following acetylcholine administration and endothelium-independent relaxation by sodium nitroprusside were assessed. In addition, we determined the mitochondrial locus of injury by measuring the activity of mitochondrial electron transport chain complexes in human umbilical vein endothelial cells (HUVEC) treated with equimolar doses of NRTI. Our in vivo data suggests that all three subclasses of NRTIs impaired endothelium-dependent vasodilation, with the cytidine analog lamivudine having the most profound effect. The in vitro experiments showed direct inhibition for one or more mitochondrial complexes, and this effect was observed across all NRTI subclasses. Ongoing studies are aimed at determining the mechanism by which NRTI mediate mitochondrial electron transport.

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96 **Expression analysis of oxidative defense genes in the mosquito stages of the malaria parasite Plasmodium**

Angelika Zalewski, Loyola University Chicago
Field: Malarial Biology Advisor: Stefan Konzok, Ph.D.

Malaria, a disease caused by a single-celled protozoan parasite of the genus Plasmodium, is transmitted between humans by way of Anopheles mosquitoes. To accomplish proper development within the mosquito and continue transmission to the next human host, the parasite undergoes several transformations. During development, the change from zygote to motile ookinete in the mosquito midgut is crucial. The role of the ookinete is to travel to and traverse the midgut epithelium which serves as the prerequisite of infection using the insect vector. However, cytotoxic reactive oxygen and reactive nitrogen species originating from the digesting blood meal of the midgut, the mosquito's immune response, and the parasite's own metabolism present stresses with which Plasmodium must cope. We hypothesize that the parasite's antioxidant and antinitrosative

defense mechanisms play pivotal roles in parasite survival and passage through the mosquito and are, therefore, critical for parasite transmission. Here we show that the malaria parasite significantly modulates the expression of antioxidant genes during its development in the mosquito (in vivo). We also see differential gene expression in cultured mosquito stage parasites (in vitro). As a result, we have an indication that abundance differs or candidate genes. In a different experimental approach, we detected that candidate gene expression profiles change in peroxiredoxin knockout parasites and therefore show compensatory expression of genes with related functions. Implications for parasite survival will be discussed.

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97 **Ammonification of Microbial Cave Isolates**

Conrad Ziembinski, Loyola University Chicago
Field: Microbiology Advisor: Domenic Castignetti, Ph.D.

Nitrogen cycling is crucial to life. Nitrogen, in a number of forms, passes from plants to herbivores to carnivores. When either the plants or animals die, the N compounds they contain are potentially broken down into ammonia (NH3) which is then converted to nitrate (NO3-) by bacteria. This latter process is called nitrification. Nitrate is converted to N2 by the process of denitrification and released into the atmosphere as N2. Denitrification is another important step in nitrogen cycling and is as follows:

NO3-	→	NO2-	→	NO	→	N2O	→	N2
(nitrate)		(nitrite)		(nitric oxide)		(nitrous oxide)		(nitrogen gas)

Nitrogen fixation is the process by which N2 becomes "fixed" by bacteria back into ammonia and then incorporated into the amino acids and nucleic acids needed by all organisms for growth and reproduction. Ammonification is the conversion of oxidized forms of nitrogen (for example, forms such as nitrate and nitrite) to ammonium ion (NH4+). As the entire process is a cycle, each component is crucial if N is to continuously cycle in the biosphere.

Data from past research indicates that nitrogen cycling can be performed by the bacteria present in an oligotrophic cave. Dr. Hazel Barton, from the University of Northern Kentucky, is providing us with a set of about 50 isolates from an oligotrophic cave in Venezuela. We are studying whether microbes from the cave can denitrify and, if so, whether their denitrification is similar to that of common terrestrial bacteria. The isolates are also being examined for the ability to ammonify. Understanding if these isolates denitrify and ammonify helps to define how nitrogen is metabolized and used in these cave environments.

The current study is examining the ammonification capacities of the Venezuelan bacteria. We have cultured these organisms in media containing nitrate, which will yield nitrite and ultimately ammonia if ammonification is occurring. Using a chemical assay specific for NH3 (NH4+) detection, we have determined that a number of the Venezuelan microbes are capable of ammonification. As evidence of ammonia pitting of the cave's rocks has been observed, the ability of these microbes to synthesize ammonia may be playing a role in the cave from which they were isolated.

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98 **Preliminary study of the skeletal anatomy of the enigmatic deep-water lamniform shark, Odontaspis noronai**

Sara Zufan and Sonia Chavez, DePaul University
Field: Skeletal Morphology Advisor: Kenshu Shimada, Ph.D.

The bigeye sandtiger, Odontaspis noronai, is a deep-water lamniform shark known from less than 15 individuals reported from Atlantic, Pacific, and Indian Oceans. Because of its exceptional occurrences, very little is known about the biology of this shark, including its basic skeletal anatomy and exact systematic position within the order Lamniformes. HUMZ 110959 housed in the Museumof Zoology at the Hokkaido University in Japan, is a 216.8 cm TL male caught off the coast of Hawaii, USA, that represents one of only three complete preserved specimens in the world. We examined its skeletal anatomy through direct palpation as well as by using a computer tomographic (CT) scanner. The CT images revealed that the skeleton of O. noronhai is poorly calcified overall, but some anatomical data were obtained through our study. Like other lamniform taxa, the skull posseses a tripodal rostrum and pronounced pre- and postorbital processes. The structural pattern of vertebrae in transverse cross-sections is of the 'lamnoid'-type, confirming that O. noronhai belongs to Lamniformes. The vertebral column consists of approximately 56 precaudal vertebrae and 58 caudal vertebrae, giving the total vertebral count of about 114 that represents a unique number among 16 known species of extant lamniforms. This study represents the first skeletal analysis of O. noronhai that is anticipated to help determining its systematic relationships with other lamniforms.

Social Sciences/ Psychology

99 **Forward and Backward Causal Relations in Narrative Text**

Lindsay Anderson, DePaul University
Field: Cognitive Psychology Advisor: Sandra Virtue, Ph.D.

During story comprehension, readers often make connections between different events in a text. For example, readers make inferences about the causes and effects that occur in a story (e.g., Trabasso & Wiley, 2005). In narrative text, the cause is typically described before the effect (i.e., a forward cause). However, a cause may be described after the effect in a text (i.e., a backward cause). Because comprehension is often disrupted when events are presented out of chronological order (Fleishman, 1990), readers should respond differently to forward and backward causes in a text. Therefore, in the current study, we investigated how readers process text containing forward and backward causes. Participants read sixty-four sets of narrative text containing: a forward cause, a backward cause, a forward control, or a backward control condition. In the forward causal condition, the events in the second sentence caused those in the first sentence (i.e., I dropped the cup. It lay in pieces). In the backward causal condition, events in the second sentence caused the events in the first sentence (i.e., The cup lay in pieces. I dropped it). In the control condition, there was no causal relation between the events. After reading each text, participants were presented with related targets and indicated whether each target was a word or nonword (i.e., a lexical decision task). The current results showed faster response times to targets in the forward cause condition than in the forward control condition, and faster response times in the backward cause condition than in the backward control condition. Importantly, response times were faster for targets in the forward cause than in the backward cause condition. These findings suggest that readers generate both forward and backward causal inferences, although additional cognitive effort may be needed during the processing of backward causes in a text.

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100 **Parenting Attitudes and Child Externalizing Behaviors in Elementary School-Aged Children**

Cordelia Benedict, DePaul University
Field: Clinical Child Psychology Advisor: Karen Budd, Ph.D.

Externalizing behavior problems in children are correlated to parenting behaviors. These parenting behaviors are related to parenting attitudes, which have also been correlated with child externalizing behavior problems. This relationship between parenting attitudes and child externalizing behaviors is not clearly defined and needs to be further examined to identify potential impacts of parenting attitudes on child behavior and vice versa. This study will use the Parenting Questionnaire, a newly developed measure that assesses parenting attitudes toward various childrearing practices, and a standardized child behavior inventory to examine parenting attitudes and child externalizing behaviors in a sample of elementary school-aged children. Researchers will recruit parents from local after-school programs to participate. It is hypothesized that child externalizing behaviors will be positively correlated with parent attitudes toward physical discipline and aversive control, but negatively correlated with responsive communication. This study will also examine whether the age of the child is a moderating factor in this relationship by comparing our sample with a previously collected sample of parents of preschoolers. This study will help clarify the relationship between parenting attitudes and externalizing behavior and help to identify risk factors.

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101 **Collection and Distribution of Material Needs for Newly Arrived Refugees**

Evan Brown and Caitlin Donato, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

Refugees often come to America with limited financial resources and personal possessions. Unexpected living conditions, such as harsh Chicago winters, create further difficulties in acquiring necessities. Material resource needs are substantial but in our experience, the most successful goals for campus organizations involved in refugee resettlement are focused on providing clothing, small children's furniture and toys, and toiletries. Our material procurement efforts have included clothing drives, accepting toiletry donations at bake sales, and use of holiday giving trees. The most challenging aspect of this work is establishing effective networks for material donation and egalitarian structures for material distribution. For example, refugees are invited for "free market shopping" events on campus to help accomplish these goals of fair distribution. The ethical approaches of this charity extended to refugees are founded on the issues of fairness, sharing, and establishing transcendent personal relationships.

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102 **Power and Dependency: Interactions Between Informal Caretakers and Patients with Mental Illness in Uganda**

Dara Carroll, Northwestern University
Field: Medical Anthropology Advisor: Rebecca Seligman, Ph.D.

This research examines the role of informal caretakers, such as family members and friends, in caring for individuals with mental illness in Uganda. Previous studies describe the role of informal caretakers of the mentally ill in Western countries, and the research on mental health in sub-Saharan Africa is growing. This paper builds on such previous work by exploring the effects of informal care in a context which has yet to be studied. In Uganda, individuals with mental illness typically hold a devalued place in society. As a result, when adults suffering from mental illness are placed under the care of an older relative (usually female), they are often treated like children. Rather than being given the opportunity to perform the normative adult social roles existing in Uganda, patients rarely live independently or hold jobs while under the care of a family member. The dynamics of power and dependency between caretaker and patient may have negative effects on treatment outcomes and the well-being of the patients. Although social support is often heralded as a positive force in the African context, I argue that this assumption needs to be examined critically. In the case of mental illness in Uganda, clients could benefit from a reordering of the relationship with caretakers and changes to societal perceptions that allow clients to interact with others on a more equal basis.

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103 **Home Gardens, Migration, and South Asian Immigrant Women in a Chicago Neighborhood**

Alice Cherry, Northwestern University
Field: Anthropology Advisor: Micaela di Leonardo, Ph.D.

Home gardens are small enclosures in which people from many societies grow plants for food, medicine, and ornament. In the developing world, home gardening is a traditional practice, and women commonly keep home gardens in both rural and urban areas. While migrants to developing countries often continue to maintain home gardens, many migrants to developed countries give up gardening—a phenomenon that has received little attention in scholarly literature. In this study, I interview 25 South Asian immigrant women at a community center in Chicago's Rogers Park, each of whom kept a home garden in India but does not keep one in Chicago (or has not always kept one). I ask how they valued home gardening in India and whether they intentionally chose to avoid it after migration. The results demonstrate that nearly all of the women found home gardening highly

satisfying for a variety of reasons; lament the loss of this activity; and take creative steps to cope with the loss of their gardens, find substitutes for them, or even recreate them when circumstances allow. Additionally, a small sample of women who have worked in Chicago for several years uniformly stated that they would prefer gardening full-time to working full-time at their current jobs, if given a choice. Nonetheless, many interviewees emphasized that their efforts to adapt to new circumstances in the U.S.—especially downward economic mobility—take precedence over gardening. I make two arguments: First, home gardens are important not just as biological or economic systems of production, but as arenas in which women exercise agency. Second, in this study women's choices to garden or not garden do not merely reproduce or resist dominant cultural constructions (e.g., of gender relations and homemaking), but instead interact in complex ways with circumstances such as migration and economic environment.

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104 **Hospitalized patients' preferences about medical decision making: a single-center study**

Grace Chung, University of Chicago
Field: Bioethics Advisor: Farr Curlin, Ph.D.

Background. Patients often want to be involved in medical decisions, but hesitate to make final treatment decisions. Physicians too place variable emphasis on patients' wishes. Studies to date have not characterized how religious commitments, demographic variables, and patient health status influence patients' preferences for participation in decisions. *Methods.* We examined data from the University of Chicago Hospitalist Study, a single center survey of medicine inpatients. Primary criterion measures were agreement with two statements: "I prefer that my doctor offers me choices and asks my opinion" and "I prefer to leave decisions about my medical care up to my doctor." Predictors were religious service attendance, the importance of religion, self-rated spirituality, Charlson Comorbidity index, self-reported health, vulnerable elder score, and several demographic characteristics. *Results.* Data was collected from 8,308 of 11,620 possible participants. Ninety-seven percent of respondents wanted physicians to offer them choices and to consider their opinions. However, the majority (67%) preferred to leave medical decisions up to the doctor. Patients who frequently attend religious services were more likely to prefer leaving decisions up to the doctor (66% vs. 65%, OR 1.5, 95%CI 1.1-2.1). Patients were less likely to prefer leaving medical decisions up to the doctor if they were female (66% vs. 69%, OR 0.6, 95%CI 0.5-0.8), university educated (57% vs. 75%, OR 0.6, 95%CI 0.4-0.9), or less healthy (63% vs. 71%, OR 0.6, 95%CI 0.3-0.9). *Conclusions.* While medicine often focuses on autonomy and nondirective clinical counseling, many patients prefer that physicians play a significant role in decision making.

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105 **Campus Fundraising Efforts in Support of Refugee Resettlement**

Kathryn Condic, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

Because the need for obtaining resources is so severe, fundraising is a critical aspect of our refugee resettlement efforts. In particular, any success in fundraising is directly tied to our abilities to support transportation assistance, critical material needs, and cultural awareness and community social events. We have experimented with several different fundraising strategies and find variation in their success at raising money and raising public attention. In addition to raising funds for purchasing items needed to support the immediate concerns of the refugee resettlement program, we have started a pilot study of micro-grant funding for developing small home businesses relying on self-employment. The fundraising aspect of our campus program also provides practical experience in the development and operation of a small, not-for-profit, service organization. Using this framework, our fundraising program is considered to be under constant evaluation and refinement.

106 **Spatial and Verbal Working Memory Networks with Large and Small Reward and Large Delayed Reward in Typically Developing Children**

Sarah Corbridge, Northwestern University
Field: Cognitive Neuroscience Advisor: James Booth, Ph.D.

This study aims to investigate spatial and verbal working memory in typically developing children and the role that reward processing plays in their working memory performance. Reward processing is important to look at in order to obtain a better understanding of the functions that are affected by reward, such as working memory. Three levels of reward have been examined in this study to assess the effects of reward size and reward delay; large delayed reward, large immediate reward, and small immediate reward. The paradigm that was used in this experiment was the "n-back" task in which subjects decided for each stimulus in a series whether it matched the one presented n-times back in the series (Owen et al., 2005). The subjects were instructed to remember either the identity or the location of a letter stimulus during small and large immediate, and large delayed reward conditions. Variations in task difficulty were accomplished by alternating the load of the task from one to two items. Pilot results using multivariate ANOVA indicate that significant effects were found in task [F (1,19) = 40.801, p <. 001], reward [F (2, 38) = 6.652, p <. 01], load [F (1, 19) = 55.693, p<. 001,] and significant interactions between task and reward [F (2,38) = 5.389, p<. 01], and between task and load [F (1, 19) = 14.278, p<. 01]. There was a significant difference found between verbal and spatial tasks, where the participants performed worse on the spatial tasks, particularly at the 2-back level. Reward was found to have a differential effect on verbal and spatial tasks, where participants performed better on the verbal task in the large delayed condition, but better on the spatial task in the large immediate condition. Therefore, the spatial tasks appear to benefit from immediate feedback whereas the verbal tasks appear to benefit from delayed feedback. These pilot results clearly show that there is an effect of reward on accuracy scores.

107 **Medication Adherence and Health-related Quality of Life in Type 2 Diabetes Patients**

Alexandra De la Rosa, Loyola University Chicago
Field: Public Health Advisor: Wen-Chih Hank Wu, M.D.

In the United States, 65% of type 2 diabetes mellitus (DM) patients will die of its cardiovascular complications. Thus, the treatment regimen for DM patients commonly includes oral hypoglycemic agents and/or insulin therapy, as well as antihypertensive and antidyslipidemic medications for cardiac risk factor management. It should be questioned whether the demands of such a complex regimen impacts patients' health-related quality of life (QOL). Considering the glycemic and cardiovascular treatment components of DM patients, this study seeks to find a correlation between medication adherence behavior and QOL. A cross-sectional analysis was conducted on data collected over six months of 100 veterans with type 2 DM and concurrent hypertension and dyslipidemia at the Providence Veterans Affairs Medical Center. QOL scores were assessed with the Veterans Affair version of the Medical Outcomes Study Short Form (SF-36V) questionnaire. Medication possession ratio (MPR) of all insulin, oral hypoglycemic, antihypertensive, and antidyslipidemic prescriptions was calculated for all patients and further stratified by insulin and non-insulin users, over six months as an estimate of medication adherence. We found no significant correlations between general QOL scores and MPR of all prescriptions. Although adherence to medications including insulin therapy did not result in short term gain in QOL, it did not worsen it. When stratified by subgroups, there was significant positive correlation between MPR scores of ACE Inhibitor and ARB antihypertensive medications and Physical Functioning of non-insulin users, in contrast with significant negative correlations of these antihypertensive medications and Energy/ Vitality scores of insulin users. Further longitudinal analysis is necessary to clarify the possible effects of ACE and ARB agents on QOL of DM patients.

108 **Development of ELL Resources for Refugees and Student Volunteers**

Lauren Del Carlo and Margaret Paulson, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

Under current policies in the United States, refugees are expected to gain employment and become economically self-sufficient within three months. Learning English as quickly as possible is crucial to interview successfully, get a job, and to navigate American social systems. ELL programs need to confront the language barrier not only to help refugees learn English but also to provide a foundation for further education and to assist in cultural adjustment. Effective programs should not just focus on simple grammar and vocabulary exercises, but include applications of the English language in different cultural settings. Our efforts focused on developing lesson plans and instructional materials specifically tailored for use by student volunteers engaged in ELL efforts with this population.

109 **Idiom Processing in the Right and Left Cerebral Hemispheres**

Madeline Garza, DePaul University
Field: Neuro Psychology Advisor: Sandra Virtue, Ph.D.

Currently, it is unclear about the specific roles of the left and right cerebral hemispheres during language processing. Research has shown that the right hemisphere may be important during the processing of figurative language (e.g., Shami & Stuss, 1999). Specifically, research shows the left hemisphere may have an advantage when readers process highly familiar metaphors, whereas the right hemisphere may have an advantage when readers process unfamiliar metaphors (Faust & Mashal, 2007; Mashal, Faust, & Hendler, 2005). However, it is currently unclear how the left and right hemispheres process familiar and less familiar idioms. Based on previous research, the left hemisphere should have an advantage for high familiarity idioms, whereas the right hemisphere should have an advantage for low familiarity idioms. Therefore, in the current divided visual field study we investigated the hemispheric processing of idioms that vary on the level of familiarity. Participants read 48 sets of text. Each text contained either a high familiarity idiom (e.g., to kick the bucket), a low familiarity idiom (e.g., to have a lark) or a neutral condition that did not contain an idiom. After participants read each text, related target words or nonwords were presented to either the left visual field-right hemisphere or the right visual field-left hemisphere. Participants indicated whether the target was a word or a nonword (i.e., a lexical decision task). Facilitation scores were calculated by subtracting participant's response time for target words in the neutral condition from their response time for target words in the high and low familiarity idiom conditions. Facilitation was found to be greater in the left hemisphere than in the right hemisphere for both the high and low familiarity idioms. The results from this study suggest that the left hemisphere may have an advantage when readers process both familiar and less familiar idioms.

110 **Numerosity Effect: the influence of financial literacy on share price estimates**

Bernadett Guy, Loyola University Chicago
Field: Behavioral Finance Advisor: Raymond Dye, Jr., Ph.D.

Money illusion, or the numerosity effect, has been the focus of recent research in behavioral finance. The term refers to individuals' tendency to make value judgments based on the numerosity of a certain currency, rather than its actual value within the financial markets. This study seeks to evaluate the influence of experience on money illusion, specifically if increased experience will diminish the magnitude of over and underestimates of stock prices based on numerosities. While there is research

to suggest that experience does influence monetary decisions, this study found no significant differences in money illusion between the expert and inexperienced groups. However, it was evident that individuals with financial knowledge consistently picked smaller changes in stock prices than other participants, indicating that experienced individuals believe the markets to be less volatile, especially during earnings reports publications.

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111 **Stressors, Coping Strategies, and Internalizing Symptoms in Urban African American Youth: A Comparison of Youth in Single-Parent Families and Two-Parent Families**

Aubrey Harrison, Loyola University Chicago
Field: Psychology Advisor: Noni Gaylord-Harden, Ph.D.

Approximately 51% of African American children were living in a single, mother-headed household (U.S. Census Bureau, 2001). Youth in single-parent families tend to demonstrate more maladjustment, including academic problems, depression, anxiety, and substance abuse, than youth in two-parent families (Carlson & Corcoran, 2001). Thus, African American youth are at higher risk for negative outcomes associated with single-parent family status due to higher within-group rates of single-parent families. Several studies address the psychosocial behavior of youth as a function of family status, but few actually compare youth from single-parent and two-parent families on stressors and coping behaviors. Due to associations between stressors, coping and behavior problems (Grant et al., 2004), group differences in stress exposure and how youth cope with stress may account for group differences in maladjustment (Carlson & Corcoran, 2001). The purpose of this current study was to compare the level of stress, coping strategies and behavior problems experienced by African American youth from single-parent families and those from two-parent families. It was predicted that youth in single-parent families would show more behavior problems, higher levels of stressors, and more maladaptive coping than youth in two-parent families. Participants were 246 African American youth (mean age = 12.89; 56% female; 49% single-parent families). Participants reported on stressors, coping and internalizing symptoms. Consistent with predictions, youth in single-parent families showed higher internalizing symptoms than youth in two-parent families. Contrary to predictions, the two groups did not differ on stressors. Consistent with predictions, there was a trend for youth in single-parent families to use more maladaptive coping strategies (distraction and avoidant coping) than youth in two-parent families. These findings provide evidence of group differences on determinants of maladjustment that may help to explain higher rates of psychological symptoms in youth from single-parent families. The implications of the findings will be discussed.

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112 **Assisting Refugee Preparation and Opportunities for Employment**

Kelsey Horton and Paige McPhail, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

With the primary goal of US refugee resettlement policy focused on rapid acquisition of economic self-sufficiency, we have initiated programs to assist the Ethiopian Cultural Association of Chicago (ECAC) in that effort. As part of our research, we worked with the Employment Program Manager and Job Developer at the ECAC to align our efforts with the needs of their refugee clients, we investigated the forms of support from local organizations and governmental offices who are involved in refugee and immigrant employment and rights, and we sought out job opportunities on campus. Specific outcomes included developing instructional packets for resume creation, completing employment applications, and navigating the job interviewing process. Interview training and financial literacy programs have emerged as the focal points of these efforts.

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113 Siblings of children with autism: Predictors of sibling adjustment

Tessa Hesse, DePaul University
Field: Psychology Advisor: Karen Budd, Ph.D.

Autism is a complex developmental disorder that is part of a wide range of disorders known as Autism Spectrum Disorders. The most recent prevalence estimate of autism is 1 in every 110 children, which is an increase from previous years. The previous research findings on the effects of autism on sibling adjustment are mixed; siblings have shown to be affected both positively and negatively by their having a brother or sister with autism. Parenting stress has been shown to be a strong predictor of sibling adjustment. Parental self-efficacy, or how competent the parent feels in his or her role as a parent, and parenting satisfaction have been associated with internalizing and externalizing child behavior problems. In addition, high levels of parent involvement have been associated with positive adjustment. This study will seek to measure the adjustment of siblings of children with autism and identify possible predictors, specifically parental stress, parental self-efficacy, and levels of parental involvement in the education of the child with autism. The hypothesis of the study is that low parental stress, high parental self-efficacy and high parental involvement in education will predict the positive adjustment of the siblings. Participants will be caregivers of 4-10 year old children with autism who have at least one sibling. They will fill out questionnaires to assess sibling adjustment and possible predictors. If predictors of sibling adjustment can be identified, proactive measures may be taken to counteract adjustment difficulties in the siblings of children with autism.

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114 Healthcare Issues in Refugee Resettlement

Vincent Jessen and Paige McPhail, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

Refugees in Chicago face many healthcare issues. Current Illinois policy allows Medicaid insurance for nine months after arrival, but existing government programs and agencies have limited resources to assist refugees with their needs. With guidance from the Healthcare Director of the Ethiopian Cultural Association of Chicago, we have implemented preventive health measures through presentations explaining nutrition, sanitation, and chronic disease issues. Through an electronic map, we have provided direction to healthcare professionals in the Chicago-land area that accept patients on Medicaid insurance or who charge on a "sliding scale" based on income. Grant funding from Loyola Student Activities Fund allowed us to develop undergraduate involvement in assembling First Aid/Hygiene kits while educating Loyola students on refugees. These projects helped extend the limited healthcare resources available to resettled refugees, while providing important insights into the healthcare experiences and challenges refugees face in America.

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115 Local Variation of Environmental Attitudes

Tyler Kerr, University of Chicago
Field: Environmental Studies Advisor: Angela Gugliotta, Ph.D.

Chicago's role in American industrialization and development has yielded environmental costs and economic benefits; however, the distribution of these effects has varied greatly between individuals and different segments of society, adding other dimensions to the city's diversity besides ethnic, religious and social factors. The cultural mosaic that distinguishes Chicago from other cities, often serving as a source of pride, may interfere with efforts to recognize and mitigate environmental problems. The divisions between different areas of the city have the potential to keep many residents ignorant of salient environmental hazards or neighborhood-level activism; where awareness exists, on the other hand, issues that receive attention in some places may not be considered

relevant in others. To assess the significance of this potential obstacle, residents of various Chicago neighborhoods were surveyed regarding their attitudes toward environmental problems and responses to them. The data collected have clear applications for environmental education and engagement with the public, such as making residents aware of both locally and globally significant issues, and the relation of environmental risks to other sources of concern, such as economic and physical security. Some of the survey results may also be useful in informing citywide environmental policy, or encouraging closer cooperation between activist groups and social institutions; if changing conditions are taken into consideration, they could aid understanding of environmental attitudes in other cities or regions as well.

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116 **The Profitability of Children: Capitalism and its Relationship to Children's Television**

Alexandra Knepler, DePaul University
Field: International Studies Advisor: Heidi Nast, Ph.D.

Capitalism's vast influence on society has far reaching effects, including ones in arenas that might not immediately come to mind. The purpose of my research was to discover what kind of relationship capitalism had with children's television, and how that relationship might impact children and society itself. Scholarly articles and books on the matter were researched in order to come to my conclusion on the subject. First, a brief history of television itself was explored in order to better understand the capitalist motivations that drive the children's television industry throughout the United States and the world. Upon researching a number of pieces of written work, four trends were discovered: that a dilemma exists within the industry on whether programs should educate or entertain, a decision which could determine a program's survival; that the deregulation of television under the Reagan administration allowed for more blatant use of advertising strategies in children's television and advertisements; that advertisement in children's television and commercials teaches children 'truths' about themselves in the form of what is marketed to them based upon assumptions the producers make; and finally, that US hegemony provides a challenge to producers of children's programs worldwide in preserving and promoting their own cultures, a task that is made ever more difficult with US values that are promoted through their widely available programs. All of these findings lead to a conclusion that the overall theme regarding children's television is that it is motivated, driven, and succeeds because of capitalism. The capitalistic desire for profits is the number one motivation behind children's programming. The consumer, in this case, children, are not aware of the manipulation they are subject to, and eagerly consume both the programs aired and the products in the advertisements they see, while being exposed to values driven by market bottom-lines.

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117 **Internet Safety: The Relationship to Victimization**

Sylvie Kocjan, DePaul University
Field: Life Span Developmental Psychology Advisor: Yan Li, Ph.D.

In this study, we examined risk factors that compromise internet safety for college students including password sharing and meeting online strangers in real-life. Both risk factors were of interest because numerous sources urge users to protect their privacy online (Tynes, 2007). Sharing passwords could put one's internet accounts at risk, while meeting online strangers in person could result in harm in both real-life and online. However, these risky behaviors could be associated with other online consequences such as online victimization. We hypothesized that both risky behaviors would be associated with online victimization. Our participants (N=493) were recruited through the psychology subject pool. Measures were completed online, which included a demographic questionnaire (e.g., age, gender), internet usage questionnaire, and Cyber Experience Questionnaire (CEQ). The internet usage questionnaire included questions regarding password sharing and meeting online strangers

in real-life. The CEQ asked participants how often they were victimized online, which included being a victim of rumor spreading, gossip, teasing, insults, receiving mean messages, and having mean messages posted about them. More severe victimization behaviors were also examined including being a victim of hacking that resulted in the hacker posting mean messages and/or sending mean messages to the person's friends using their identity. Bivariate correlations revealed that sharing passwords ($t(342) = .12$, $p = .03$) and meeting an online stranger in real-life ($t(342) = .11$, $p < .05$) were positively related to online victimization. Being a victim of severe victimization was related to sharing passwords ($t(342) = .13$, $p = .02$), but not meeting an online stranger in real-life. These results indicate a need for increased internet safety education and awareness among college students.

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118 **Coping with Relational Aggression among Chinese Adolescents: Associations with Inter-parental Conflict Strategies**

Krysta Kurzynski, DePaul University
Field: Child Development Psychology Advisor: Yan Li, Ph.D.

Childhood relational aggression (RA) has been studied greatly across cultures and children of varying ages (Tomada & Schnieder, 1997). Researchers have identified specific strategies that children use to cope with peer RA (e.g. blaming themselves, avoidance, seeking social support). According to the social learning theory (Bandura, 1977), children may directly learn conflict resolution strategies from their parents and apply them to social conflicts in the peer context. Research has shown that child adjustment relates to inter-parental conflict within the United States (Toussaint & Jorgensen, 2008). However, there is little understanding of this relationship among families of collectivist cultures, such as the Chinese culture. Further investigation of this research is important in understanding family dynamics and child adjustment across cultural contexts. This study investigated the relationship between children's strategies for coping with RA and inter-parental conflict resolution strategies. It was hypothesized that negative conflict strategies used in inter-parental conflicts would be positively correlated to the child's use of negative coping strategies. The participants were 345 adolescents in China who were asked questions regarding how they responded as victims of relational aggression. Their responses to the open-ended questions were coded into categories by two coders. Additionally, 230 mothers reported their use of various conflict strategies through the Conflicts and Problem-Solving Scale (Kerig, 1996). Significant correlations were found to support the hypothesis. For example, maternal use of involving the child in inter-parental conflict (e.g., becoming angry at the child when really angry with partner) was significantly correlated with the child's use of self-blaming in coping with relational aggression ($r=.14$, $p< .05$). Further examination of the relationships between other conflict strategies and child coping strategies will follow. This study, using the multiple-informant approach (child and parent), demonstrated an important link between parent conflict strategies and child coping strategies.

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119 **Population Factors Associated With Low Birthweight**

Lucy Li, University of Chicago
Field: Epidemiology Advisor: Jeffrey Grynaviski, Ph.D.

This study attempted to identify the risk factors associated with low birthweight in county-level populations. Data on maternal age, incidence of prenatal care, race, and method of delivery (c-section or vaginal) was drawn from the 2006 BRFSS carried out by the Centers for Disease Control and Prevention. The median air quality index for each county was drawn from EPA data. Low birthweight was subdivided into two categories, <1500g and <2500g. A multiple regression analysis found a strong correlation between the percentages of younger and black mothers, deliveries via c-section, lack of prenatal care, and the incidence of babies with low birthweight. Air quality

had no or minimal effect. The correlation coefficients were consistently stronger when the <2500g subcategory was used. These results suggest that younger mothers are more at risk for having babies with low birthweight and that areas with a higher percentage of black mothers are also areas where the incidence of low birthweight is highest.

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120 **Establishing Refugee Awareness through Inter-Cultural Dialogue**

Rob Liss, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

This campus program addresses the ability of undergraduate students to serve as facilitators of cultural dialogue, not only between the refugees and the American culture surrounding them, but also between different groups of refugees. We concentrate on engaging the practical implications of the mission of Loyola University of Chicago, to serve as "Persons for Others", through both scholarship and service. Our efforts mainly seek to improve campus understanding on a broad spectrum of refugee issues and to make the Loyola community aware of the presence of a large population of resettled refugees living in our immediate neighborhood. Cultural programming and community building have been created through holiday parties on campus for Loyola students and refugee families, and campus film screenings and panel discussions that highlight refugee issues. The overall goals of these programs are to reduce the marginalization of refugees and for the practical aspect of promoting student-led civic organizations.

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121 **Sexuality and Self Esteem in the New Generation**

Timothy McAlister, Loyola University Chicago
Field: Psychology Advisor: Anthony Burrow, Ph.D.

Our understanding of homosexual life has changed since it was first studied in the 1970s. Hooberman (1979) reported that homosexual and heterosexual men received equivalent scores on masculine traits on sex role inventories. Similarly, Crocker & Major (1989) found that levels of self-esteem among men did not differ as a function of their sexuality. However, more recent evidence may call into question the validity of these earlier findings. Specifically, Rubinstein (2010) found higher levels of self-esteem reported by heterosexual men compared to their homosexual counterparts. In addition, Lippa (2008) found evidence of greater gender non- conformity among homosexual compared to heterosexual men - with homosexuals endorsing greater feminine traits. While the significant discrepancies in findings between these two generations of studies are difficult to reconcile, one plausible explanation is that both have ignored within-group variability in the constructs examined. That is, research, to date, has not established a means of accounting for unique profiles of homosexual individuals that may differ by their gender identity. The purpose of the current study is addressing this limitation by moving behind the homosexual/heterosexual dichotomy and investigating within-group differences that may shape adjustment. Specifically, the goal of this project is to establish distinct profiles of self- esteem by individuals' reported sexuality and gender identification. The two testable hypotheses of this study are: First, that four unique profiles will emerge - (a) feminine-identifying homosexuals, (b) masculine-identifying homosexuals, (c) feminine-identifying heterosexuals, and (d) masculine-identifying heterosexuals. Second, self-esteem will be highest among masculine-identifying heterosexuals and lowest among feminine-identifying homosexuals.

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122 The Roles of Collective Guilt and Infrahumanization in the Stigmatization of Arab Americans

Yara Mekawi, University of Chicago
Field: Social Psychology Advisor: Mary Murphy, Ph.D.

Experiencing the self in relation to one's group membership can allow an individual to transcend the realms of personal emotionality and consequently live vicariously through actions committed by one's group. In the same way that we can bask in the glory of an ingroup's brilliant endeavor and consequently feel vicarious pride, we can also suffer in the realization of an ingroup's negative history, and consequently feel vicarious guilt. In studying this guilt, known as "collective guilt," a substantial amount of research has focused on the emotional processes driving it (Lickel, Schmader, Curtis, Scarnier & Ames, 2005), as well as its relationship to national and ethnic identity (Roccas, Klar & Liviatan, 2006; Zebel, Doosje, & Spears, 2009). In understanding the behaviorial repercussions of experiencing collective guilt, considerable research has shown that across the globe, collective guilt plays a large role in individuals' support for reparation policies as well as a need for public apologies for harm done by ingroups to outgroups (Zebel, Zimmermann, Viki, & Doosje, 2008). In certain situations, it has even been found that collective guilt negatively correlates with infrahumanization, known as the tendency to view others as being less than human (Zebel et al., 2008). In this proposal, we focus on understanding the potential roles of collective guilt and infrahumanization in the stigmatization of one outgroup in America, Arab-Americans. When presented with collective guilt-inducing stimuli, we predict that Arab-Americans will inordinately experience collective guilt compared to Caucasian Americans. Secondly, we predict that due to society's negative media representations of Arabs, Caucasian Americans will infrahumanize the outgroup at a greater degree than Arab-Americans.

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123 The Generation of Predictive Inferences in the Hemispheres: The Influence of Reader Goals

Alyssa Nudo, DePaul University
Field: Cognitive Neuropsychology Advisor: Sandra Virtue, Ph.D.

During reading, individuals often generate expectations about what will occur next in a text, or make predictive inferences. When a text strongly points to a particular event (i.e., is strongly constrained), research shows that both hemispheres are involved in predictive inference generation. In contrast, when a text weakly suggests a particular event (i.e., is weakly constrained), the right hemisphere is highly involved during predictive inference generation (Virtue, van den Broek, & Linderholm, 2006). However, it is currently unclear how an individual's reason for reading, or a reading goal, influences predictive inference generation in the hemispheres. Behavioral studies show that when individuals read for study purposes, they make more inferences than when they read for entertainment purposes (Linderholm & van den Broek, 2002). Therefore, it is likely that different cognitive processes, and different hemispheres, are involved when readers adopt different goals during reading. In the current divided visual field study, participants read texts that were either strongly or weakly constrained toward a predictive inference. Before reading, they were instructed to read as if they were preparing for an upcoming exam (i.e., the study goal condition) or they were not given any specific instructions (i.e., the control condition). Next, participants made word/ nonword decisions (i.e., a lexical decision task) to inference-related target words in the right hemisphere or the left hemisphere. In the current results, the left hemisphere showed greater facilitation for strongly constrained than weakly constrained inferences in both the study goal and control condition. In contrast, the right hemisphere showed greater facilitation for strongly constrained than weakly constrained inferences in the study goal condition, whereas no difference was evident between strongly and weakly constrained inferences in the control condition. These findings suggest that an individual's goal during reading influences the pattern of predictive inference generation in the right hemisphere.

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124 **The Effect of Perceived Stress on Academic Outcomes of First Generation College Students**

Koonal Patel, Loyola University Chicago
Field: Clinical Psychology Advisor: Colleen Conley, Ph.D.

Previous research has shown different academic experiences for first generation college students (FGCSs) and non-first generation college students (NFGCSs). In particular, studies have found attrition rates of FGCSs to be higher than those of NFGCSs. Additionally, research findings have demonstrated a relationship between attrition rates, negative academic outcomes, and FGCSs. Past research has also indicated that FGCSs face greater perceived stress than NFGCSs. The present study examined the relationship between perceived stress, generational status, and academic outcomes. Four hundred and six first year college students, including 44 FGCSs, completed the perceived stress scale. Data on grade point average (GPA) was taken from institutional research, while student generational status was determined from self-report measures. The author predicted that perceived stress would moderate the relationship between student generational differences and GPA. The results of a hierarchical regression analysis suggest that perceived stress may moderate the relationship between FGCSs and GPA. These findings suggest that universities could specifically target effective stress management skills when dealing with the FGCS population. Fostering improvements in the amount of perceived stress experienced by FGCSs may in turn bolster academic outcomes, which in turn may affect attrition rates.

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125 **Gender Differences in the Effects of Social Support and Self Efficacy on Perceived Stress**

Kelly Patterson, Loyola University Chicago
Field: Clinical Psychology Advisor: Colleen Conley, Ph.D.

Previous research on college students has shown a significant negative relationship between social support and perceived stress. Specifically, students who report having higher levels of social support tend to exhibit significantly less perceived stress than those with lower levels of social support. Research shows that women tend to have higher levels of social support and perceived stress than men, suggesting a significant gender difference. Lower levels of self efficacy have also been associated with greater levels of perceived stress among college students. The present study examined gender differences in the relationship between social support and self efficacy on perceived stress. Nine hundred six first-year college students (620 females; 285 males) completed the Self Efficacy Scale, Social Support Appraisal Scale and Perceived Stress Scale. The researchers predicted that social support would buffer the effects of low self efficacy on perceived stress. It was also predicted that this relationship would be different for men and women. The results of hierarchical regression analysis show that both self-efficacy and social support predict lower perceived stress for both men and women. It was found that social support moderates the relationship between self efficacy and perceived stress. The interaction was marginally significant for males ($p = .56$), but was not significant for females. These findings suggest the important role of social support in the relationship between self-efficacy and perceived stress for males, specifically in the college student population. Future research should continue to examine other predictors of perceived stress among men and women as well as in more diverse populations.

126 Classroom Management Training: The Impact on Schools and Academic Achievement

Elizabeth Polk, DePaul University
Field: Community Psychology Advisor: Christopher Keys, Ph.D. and Susan McMahon, Ph.D.

Behavioral issues are the most common complaint of teachers (Goldstein, 1995). Effective classroom management can lead to fewer behavioral problems in students, as well as positively influence school settings and academic achievement (Marzano, 2003). This study utilized an ecological approach to understand the role of classroom management at the school and classroom levels for teachers. We evaluated classroom management training seminars organized by a large Midwestern urban school district. Two hundred and forty-five teachers were surveyed immediately prior to and following classroom management training. It was hypothesized that knowledge and perceived effectiveness of classroom management would increase as a result of the trainings. Additionally, it was expected that greater pre-training knowledge and effectiveness of classroom management would predict more positive school climate. It was also hypothesized that positive school staff relations will predict fewer school problems and a more positive school climate. Results revealed that both knowledge and effectiveness of classroom management were significantly higher after training, suggesting the training was effective. It was also found that higher pre-training scores of knowledge and effectiveness did predict a more positive school climate. Results also showed that positive staff relations predicted fewer school problems and a more positive school climate. Additionally, a structural regression model was developed to demonstrate the direct and indirect influences of school problems, school climate, and school staff relations on academic achievement. The results have implications for school policies regarding innovative ways to improve school climate and give evidence for the success of classroom management training seminars. This study is important because evaluation of these training programs is crucial to determining whether they have achieved their goals of increasing knowledge and effectiveness of classroom management to ultimately improve student behavior, academic performance and school climate.

127 The Influence of Geographical Software on Education and Spatial Ability

Maria Ptouchkina, Northwestern University
Field: Cognitive Psychology Advisor: David Uttal, Ph.D.

Spatial thinking involves the representation and transformation of the locations of objects and figures. The present study investigated the relations between GIS learning and children's spatial ability by analyzing performance on spatial-related skills tests, and the role of spontaneous gesture in spatial cognition and communication. Participants completed spatial- and content-related tests, a learning phase, and a verbal interview. Ten students were randomly assigned to the experimental condition, in which they used a GIS system, My World; the other ten students were in the control condition and used traditional tables and figures. Students who received GIS training improved more on the post-test than those who received paper and pencil training. Correlation test revealed a positive relationship between amount of spontaneous gesturing and prior knowledge, which can be indicative of the fact that children who have a better understanding of the topic have better mental representations of the spatial concepts, and thus gesture more. Gesture might play a more direct role in the learning process by allowing to explore - perhaps with less effort - ideas that may be difficult or inappropriate to think through in a verbal format (Goldin-Meadow, 2000). Malleability of spatial cognition suggests that spatial learning can be fostered by technology and education (Uttal et al, under review). Classroom implementation of GIS learning has a great potential to completely restructure the way science is taught in the classroom.

128 **Undergraduate Participation in PCIT Research**

Catherine Ranieri, Menatalla Ads, Dani Galladora, Nicole Debnar, Colleen Finegan, and Kate Zelic, DePaul University
Field: Clinical Psychology Advisor: Daren Budd, Ph.D.

Parent-Child Interaction Therapy (PCIT) focuses on children with behavioral issues between the ages of 2 and 7. Their parents seek treatment in order to improve their relationship with their child. In order to analyze results of therapy, undergraduate research assistants must learn to utilize the Dyadic Parent-Child Interaction Coding System (DPICS). DPICS is a behavioral observation system designed to assess the quality of parent-child social interactions. DPICS requires the preliminary steps of transcribing a five-minute segment of a parent-child interaction. Following transcription finalization, research assistants begin coding the same segment according to DPICS methods previously learned. Through a newly established lab mentoring program, previously trained assistants are expected to help in the training of new transcribers and coders. Amongst the lab team, there is an emphasis on collaboration that manifests during weekly lab meetings and discrepancy discussions. The lab initially focuses on PCIT research with a secondary focus on providing undergraduates with hands-on research experience. The PCIT team has learned that a systematic mentoring program and group collaborations are necessary to analyze the data accurately. The team's goal is to learn from previous teaching techniques in order to improve future lab procedures.

129 **It's all about how you use it: The Relationship between Directive Memory Function and Life Satisfaction**

Tasha Richardson, Northwestern University
Field: Psychology and Cognitive Science Advisor: Dan McAdams, Ph.D.

This study examined whether there was a relationship between directive memory function, emotional valence of memories, and life satisfaction. Previous autobiographical memory research has found that people generally use their memories in three ways. These include self, social, and directive functions. When people use the self-function, they tell memories primarily for identity management. When they use the social function, they wish to facilitate social connections. Finally, when they use the directive function, they hope to learn from their pasts in order to make future actions. In this study, 65 participants provided vivid single-event memories of a high point, low point, childhood, adolescent, adult, and virtue scene (a time when someone taught them a lesson) via an online survey. For each memory, these participants gave a six-point rating designed to measure the principal ways they used their memories. After conducting statistical analyses, the most important findings were that there was a significant correlation between directive memory function and life satisfaction, and that people generally use the memory scenes that are most relevant and recent to their lives. In the case of this study, the more people used directive functioning, the higher they rated their evaluation of their lives, and the memories that they drew from were the adult scenes as reflected by their high, low, adult, and virtue scenes. Memory valence was important only if the particular memory scene was positive. Therefore, people who used directive functioning when discussing their high point scenes were more satisfied with their lives. This finding was counterintuitive because previous research indicated that mostly negative memories are directive. This should have led to their being a greater relationship between negative memories and directive function. These findings are significant because they add more depth to the under researched areas of autobiographical memory function and life satisfaction.

130 Iranian Political Behavior in the 2009 Presidential Elections

Mohammad Sagha, DePaul University
Field: Political Science Advisor: Khalil Marrar, Ph.D.

Shortly after Iran's 2009 presidential election, mass protests contesting the results rocked the nation's capital and sent tremors throughout the country. This paper strives to better understand these events and their implications and explain the range of factors contributing to the unrest. An integral part of this research was my own personal on-the-ground experiences inside Iran before and after the presidential election. One of the primary methodological approaches of this research was journalistic in nature; I am fluent in both Farsi and English, was granted press credentials, open access to polling locations, and interviewed local campaign managers for all four candidates on Election Day. Conversations with top officials, students, grassroots activists and regular citizens provided additional insights. However, serious academic analysis is a major underpinning of this work and argues, among other things, that political fragmentation, questions of legitimacy and an airing of existing grievances sparked hidden yet substantive civil discontent. Further, I examine the political and social positions of the Green movement and their inherent conflicts with the Iranian establishment. This paper combines political perceptions and discourse on the ground with polling, political history, and academic findings regarding Iran's body politic. This paper also takes into consideration the effects on turnout and fragmentation that Iran's first live televised presidential debates had. These findings show, among other things, that Iran's opposition movement is a highly politicized faction of the population; they were further mobilized and activated during the pre-election campaign freedoms, and had existing deep mistrust of the Iranian electoral system. This combination of factors, in addition to Iran's young population demanding a greater political voice in domestic and foreign affairs, set the ground for confrontation.

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131 Shyness-Eliciting Events

Lauren Schliesleder and Cheryl Franzen, DePaul University
Field: Personality and Social Psychology Advisor: Nicholas Herrera, Ph.D.

Shyness is the common experience of discomfort and inhibition in social situations. It is frequently described as a personality trait or a reaction consisting of affective, behavioral, and cognitive components. However, the experience of shyness is triggered by particular events or situations. Previous studies (e.g., Zimbardo, 1977; Russell, Cultrona, & Jones, 1986; Watson & Cheek, 1986) have described some shyness-eliciting events, including interactions with strangers or people in positions of authority, situations requiring assertive behavior, and evaluative settings (Cheek & Krasnoperova, 1995). In the present study, 239 undergraduates (175 females and 65 males) at DePaul University described several situations in which they "felt shy and behaved in a shy manner." We found that shyness-eliciting events can be grouped into several distinct categories. We examined sex differences in the events that were described, and also looked at the order in which they were described. It is important to understand both dispositional and situational factors that affect the experience of shyness. Most shy people do not like being shy and consider it to be a personal problem (Cheek & Krasnoperova, 1999). Despite that fact, in recent years, the prevalence of chronic shyness has increased, (from about 40% in the early 1970s to about 50% in the 1990s; Henderson & Zimbardo, 1998). A better understanding of shyness-eliciting events and situations could help shy people better anticipate and cope with the experience of shyness.

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132 **Age Effects on Social Motivation in Children with Autism**
Christie Stiehl, Northwestern University
Field: Atypical Development Advisor: Amy Booth, Ph.D.

The current study examined whether children with autism prefer to interact with adults or children and compared this preference to their typically developing (TD) peers. The mixed-design study required ten children with autism and ten age-matched typically developing peers to complete a task where pushing either of the two available buttons disbursed a treat under each of the following conditions: adult vs. child, adult vs. gumball machine, and child vs. gumball machine. We analyzed the proportion of adult pushes over total social pushes (adult + child) and the proportion of child pushes over total social pushes. We hypothesized that the children with Autism Spectrum Disorder (ASD) would demonstrate less motivation overall, prefer the machine to adults or children, and display significantly less social motivation to interact with children than adults (machine > adult > peer). At this time, we have run the ten experimental subjects and will be running the control subjects later this month. The results from this study yield important implications for autism remediation given the current emphasis on peer-mediated intervention. In addition, the results further support the advances seen in children with autism using structured venues such as music and simple technology.

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133 **Hidden Transmission: Race and Class in Childrearing Practices of White and Minority Families**
Alexandra Tate, Northwestern University
Field: Sociology Advisor: Monica Prasad, Ph.D.

It is well understood that family life is the central part of a child's development, and that parents pass on advantage and disadvantage to their children through mechanisms of childrearing. However, the current research examining childrearing practices specifically has not examined an older population of children, leaving a realm of sociological inquiry unanswered. This ethnographic exploration into the childrearing practices of lower and middle class parents of adolescent children seeks to provide a discourse on variables at play in the transmission of advantage to adolescent children, and the implications for such variables in the larger world of social inequality. Middle class white children receive tools to make autonomous but guided decisions, and have received a comprehensive education on race from an empathic standpoint. Middle class black children receive these same tools from their parents, yet diverge in the treatment of race by their parents. Lower class minority children receive a hybrid of concerted cultivation and natural growth, and are not given much agency in their decision-making. Issues of racial marginlization are intentionally ignored.

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134 **Happiness and the disclosure of one's sexual orientation**
Laura Thomas, DePaul University
Field: Positive Psychology and LGBT Individuals Advisor: Midge Wilson, Ph.D.

After nearly a century spent investigating mostly negative aspects of human behavior (e.g., depression, suicide, mental illnesses, etc.), psychologists finally turned their attention to happiness as a legitimate subject of inquiry. The current research contributes to that growing literature by looking at whether happiness is enhanced in gay and lesbians by disclosure of their sexual orientation. Multiple risks are associated with coming out, such as being deemed an abomination in the eyes of God, abandonment by family and friends, or even a declaration of mental illness. But despite these risks, potential benefits may also result in coming out to close associates. An online survey was developed to address this question by assessing the emotional consequences of a sexual orientation disclosure to someone from three primary social groups, a family member, a friend, and a co-worker

or classmate. Fifty lesbian and gay men will be recruited from flyers posted at LGBT community organizations, and online announcements at gay and lesbian websites. The survey was comprised of 40 items with questions pertaining to a disclosure (or a non disclosure) of their sexual orientation to one individual from each of the three social groups, and items evaluating their own happiness or possible regret stemming from their disclosure. Perceived responses from "the other" to that disclosure also will be collected. The survey further includes questions about the participant's current level of happiness, and demographics. It is hypothesized that gay men and lesbians who have come out will be happier than those who have remained closeted. More specifically, the study's central hypothesis is that the more social groups that a person discloses his or her sexual orientation to the happier he or she will be.

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135 **Online Aggression and the Adjustment of Emerging Adults**

Jessica Twardowski and Clare Kennedy, DePaul University
Field: Social/Cyber Psychology Advisor: Yan Li, Ph.D.

The purpose of the study was to investigate how online aggression and victimization related to the adjustment (i.e., depression and social anxiety) of emerging adults. We examined three forms of online aggression and victimization, including relational (e.g., rumor spreading), verbal (e.g., insulting), and severe forms of aggressive behaviors (e.g., logging into someone's account without permission). We hypothesized that victims of online verbal and relational aggression would experience both depression and social anxiety. Victims who experienced severe behaviors online should exhibit symptoms of social anxiety only. Online aggressors are hypothesized to report symptoms of social anxiety and depression for all forms of online aggression. The participants (N =470) were recruited from a Midwestern university psychology subject pool and fell into the 18-25 year old age range of emerging adulthood. Participants completed two questionnaires. The Cyber Experience Questionnaire (CEQ) is a self-report measure assessing how often participants inflict through, and are victimized by, online relational, verbal and severe aggressive behaviors. Following the CEQ, the participants completed the Inventory of Depression and Anxiety Symptoms (IDAS) which examined levels of depression and anxiety among the participants during the past two weeks. Our correlation results showed that all forms of aggression and victimization were positively correlated with adjustment issues. The multiple regressions showed that aggressors and victims of both verbal and severe aggression exhibited signs of depression. Aggressors and victims of severe aggression displayed social anxiety. The only significant result for relational aggressors was that they experienced social anxiety. Our study was a step towards bridging the gaps found regarding online aggression and emerging adults. We examined both aggression and victimization using three specific subtypes of online aggression, which had previously been overlooked. Our data will provide useful information for future studies on prevention pertaining to online aggression.

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136 **Changing Environmental Attitudes and Behaviors of College Dormitory Residents**

Marian Vernon, DePaul University
Field: Environmental Science Advisor: Mark Potosnak, Ph.D.

One of the most important and recognizable issues of today's world is the issue of environmental conservation and global warming due to resource consumption. Many college students express interest in environmental issues, yet lack incentives to change their lifestyle practices. Using research gathered from a variety of different sources aimed at exploring the success of different techniques in changing environmental behaviors, I have designed and implemented a weeklong energy-saving competition among the residents of DePaul's University Hall dormitory. Many researchers disagree on the most successful methods for changing environmental attitudes,

which I took into account when planning how I would like to market and run the competition. The research methods I studied included the use of feedback and incentives to reduce consumption, educating people about environmental issues, and using complementary injunctive and descriptive norms to influence people's environmental perceptions, behaviors, and attitudes. Two of the four floors were exposed to environmental education messages, which described some environmental issues in the Chicagoland area, and the other two floors were exposed to complementary injunctive and descriptive normative messages, which emphasized that the majority of people participate in environmental conservation behaviors and is therefore a socially popular practice. I found that environmental education was more successful in changing environmental behaviors among college dormitory residents, and concluded that normative messages are not successful when presented to groups of individuals that have strong friendships and interact with one another on a daily basis.

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137 **Transportation Assistance: The Ride to Success in Refugee Resettlement**

Alicia Walter and Brendan Fitzgerald, Loyola University Chicago
Field: Anthropology Advisor: Daniel Amick, Ph.D.

Refugees new to America face an upward battle – we expect them to find employment, pay rent, and feed the family on their own dime within a few months of their arrival. But how can they achieve anything without a thorough understanding of their new home's geography and the basics of local transportation? Recognition of these challenges has led us to develop assistance that supports critical transportation needs. We purchased CTA passes for distribution to refugee clients by the resettlement agency, worked on procuring recycled bikes for refugee families, and made neighbor maps that include the locations of essential community resources relevant to refugee newcomers. The issue of refugee transportation is a constant one, and we have realized that the sooner we are able to teach refugees how to get where they need to go, the sooner they will be able to begin learning how to navigate Chicago on their own.

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138 **Expecting the Unexpected: Examining Social Perception Strategies Amongst Assigned College Roommates Using Parent Attachment**

Lauren Winczewski, DePaul University
Field: Social Psychology Advisor; Christine Reyna, Ph.D.

A considerable body of research suggests that social perception amongst strangers is a multifarious process depending on the nature of the relationship. Psychologists have studied and categorized certain types of interpersonal relationships as more highly influenced by social perception processes than others. These types of special relationships are known as "outcome dependent" ones; that is, the social perceivers have underlying goals about the extent of accurately perceiving the stranger's personality, given the potential trajectory and type of relationship they are to have. The present study extends this type of attribution analysis to one particularly novel type of relationship: randomly-assigned freshmen roommates. Previous research has shown that roommates living in campus residence halls not only play a critical role in the transition to college, but they are also faced with the sometimes burdensome experience of developing expectations about the new roommate that may or may not match the impressions they later form about one another. To further compound these complex psychological mechanisms, Bowlby's original theory on attachment to parents shows that individual attachment styles (i.e. secure, anxious/avoidant, dismissing) significantly contribute to the ways in which people approach novel situations (college) and relationships (e.g. a new roommate). Given that freshmen roommates were assigned to live with one another, researchers predict that Bowlby's theory on parent attachment will act as a viable model for understanding the underpinnings of such a unique relationship. Using Armsden & Greenberg's (1987) Inventory of Parent

and Peer Attachment as well as author-generated items assessing the student's expectancies about the relationship, we hypothesize that the students' respective attachment style will inform the type of expectations (positive or negative) that the randomly-assigned students develop about one another within the context of a stressful transition to college.

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139 **Testing Evolutionary Brain Size Change in Bats**

Lu Yao, Northwestern University
Field: Physical Anthropology Advisor: Robert Martin, Ph.D.

On an evolutionary scale, presumably due to new adaptations and generally beneficial characteristics, mammal brain size usually increases. This interpretation was challenged by Safi et al. (2005) with respect to bats. These authors proposed that evolution of the brain in different bat lineages had involved reduction as well as enlargement in brain size. However, that conclusion was based on a theoretical analysis of brain size in living bats and made no mention of the need to test it with reference to the fossil record. Furthermore, the software and test, CONTINUOUS, used to draw the conclusion was incorrectly applied to this situation. Thus, to determine whether there truly is a reduction, enlargement, or no change in the evolution of bat brains, a two-pronged approach was implemented. First, anthropometric measurements on the skulls of 44 randomly selected species of modern bats were measured in order to establish an empirical formula as a reliable means of estimating body size in fossil bats. Second, 3-dimensional images of the braincase volume in six fossil bats were generated from synchrotron scans to calculate the size of the reconstructed brains. Statistical analyses indicate bat brain sizes in the family Rhinolophidae have increased, not decreased, in size over time.

MENTOR RECOGNITIONS

Chicago area undergraduates are fortunate to have excellent support and mentorship from professors, postdoctoral fellows, graduate students, and peers. Students were invited to send in messages to express their gratitude for the guidance they have received in their research careers.

"Thank you, Dr.Brey, for your help and guidance over the past few years. I really admire the diligence, level-headedness and general awesomeness with which you approach doing research, all of which I hope to someday emulate."
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Poster Presentations: Session I

11:45am - 1:00pm

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