2012 SYMPOSIUM PROGRAM

CHICAGO AREA
Undergraduate Research Symposium

March 03, 2012

Holiday Inn Mart Plaza Chicago Hotel
Chicago, Illinois

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

CHICAGO AREA UNDERGRADUATE RESEARCH SYMPOSIUM

March 3, 2012

9:30 a.m.	**Opening Address** *Wolf Point Ballroom, 15th Floor* *Samuel Attoh, Ph.D., Dean & Associate Provost* *Loyola University Chicago*
10:00 a.m.-12:30 a.m.	**Morning Oral Presentations** *Shakespeare House and Lake House Rooms, 14th Floor*
10:00 a.m.- 11:00 a.m.	**Morning Poster Session I**
11:00 a.m.-11:30 a.m.	**Break/Poster-Viewing Session (No Judging)**
11:30 a.m.- 12:30 p.m.	**Morning Poster Session II** *Sauganash Ballroom, 14th Floor*
12:30 p.m. - 1:30 p.m.	**Lunch** *Wolf Point Ballroom, 15th Floor*
1:30 p.m.-2:30 p.m.	**Roundtable Discussions and Networking Session** *Wolf Point Ballroom, 15th Floor*
2:30 p.m.-5:00 p.m.	**Afternoon Oral Presentations** *Shakespeare House and Lake House Rooms, 14th Floor*
2:30 p.m.-3:30 p.m.	**Afternoon Poster Session I** *Sauganash Ballroom, 14th Floor*
3:30 p.m.-4:00 p.m.	**Break/Poster-Viewing Session (No Judging)**
4:00 p.m.-5:00 p.m.	**Afternoon Poster Session II** *Sauganash Ballroom, 14th Floor*
5:30 p.m.	**Keynote Address, Dinner, and Awards Ceremony** *Wolf Point Ballroom, 15th Floor* *Dr. Robert Morrison, PhD.* *Loyola University Chicago*

Contents

CAURS Presenters, Judges, and Guests,

On behalf of the entire Inter-School Board and the CAURS faculty advisors, the 2012 Symposium Directors would like to welcome you to the eighth annual Chicago Area Undergraduate Research Symposium. Both of us, having had the privilege of being involved with CAURS for 4 years now, have had the great fortune of watching the Symposium grow each year and witnessing the impacts that CAURS has had on the students who attend. It is truly incredible to see how well former CAURS attendees do and how successful they become; dozens of CAURS students have gone on to win prestigious scholarships and fellowships, and nearly all continue on to graduate and/or professional school. Indeed, the skills and knowledge that students gain at the Symposium prove to be critical for whatever endeavors they end up pursuing.

We take note each year that the present Symposium is the largest ever, and indeed the trend has continued this year. Not only were we impressed by the volume of project submissions we received, but we were also awed by the quality and diversity of those projects; we encourage you to explore the wide breadth and depth of the research presented at the Symposium to witness for yourselves how truly incredible this event is. Moreover, this year was marked by the implementation of a number of changes, from our new website to significant organizational and logistical overhauls. It is our hope that you find the Symposium to be both more effectively run and more enjoyable as a result.

Finally, we'd like to take a moment to express our utmost gratitude to all who have made CAURS as it is today possible. For nearly 12 months, a dedicated group of students on the Inter-School Board have devoted countless hours of their time to ensure that every aspect of the Symposium runs smoothly. In addition, our faculty advisors have been absolutely invaluable in providing experience, insight, and logistical support to the Board. Finally, we are grateful to all of our sponsors, from our 6 affiliated institutions to all of our corporate and academic sponsors — without the generous support from these organizations, we would not be able to hold this event.

We hope that you enjoy the Symposium as much as we have enjoyed planning, organizing, and orchestrating it. We earnestly hope that our student attendees walk away today not only with a greater understanding of and appreciation for the work of their peers, but also with new friendships, professional contacts, and memories of an experience that we hope will shape their futures, whether it be in academia, industry, service, or whatever careers they decide to pursue.

Faraz Khan and Stephen Xue
Directors, Chicago Area Undergraduate Research Symposium 2012
University of Chicago

DEPAUL
UNIVERSITY

Office of the President
1 East Jackson Boulevard
Chicago, Illinois 60604-2287
312/362-8890
FAX: 312/362-7577

March 3, 2012

Dear CAURS Students, Faculty and Guests,

Welcome to the 8th Annual Chicago Area Undergraduate Research Symposium (CAURS). I am delighted DePaul University has again joined the Illinois Institute of Technology, Loyola University, Northwestern University, the University of Illinois at Chicago and the University of Chicago to sponsor this showcase of outstanding student scholarship in a wide range of fields.

Research entails not only the discovery and dissemination of new knowledge, but also the development of methodologies of inquiry, instruction and professional practice. Presenting and discussing your research in a professional environment is fundamental to this process. 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 benefits that can be derived from collaborating with colleagues.

On behalf of DePaul, I would like to thank the student organizers whose time and dedication made today possible. I congratulate everyone selected to participate today in today's symposium and wish you continued success in your scholarship.

Sincerely,

Rev. Dennis H. Holtschneider, CM

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

ILLINOIS INSTITUTE OF TECHNOLOGY

John L. Anderson
President

February 17, 2012

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.

IIT is honored to be a part of this growing tradition for our students.

Sincerely,

John L Anderson

10 West 35th Street | Suite 1900 | Chicago, IL 60616 | 312.567.5198 • Fax 312.567.3110 | johno@iit.edu | iit.edu

LOYOLA
UNIVERSITY CHICAGO
AD • MAJOREM • DEI • GLORIAM
1870

Samuel A. Attoh, PhD
Graduate School Dean
1032 W Sheridan Rd | Chicago, Illinois 60611
p (312) 616-7974 | f (312) 616-3726
sattoh@luc.edu

On behalf of President Michael Garanzini and Provost John Pelissero, it is my honor and privilege to extend a warm welcome to all the program participants, organizers, and sponsors associated with the 2012 Chicago Area Undergraduate Research Symposium.

This year's symposium highlights scholarly and creative endeavors from Chicago undergraduate students across various academic disciplines who collaborate with faculty mentors, research assistants, and graduate students on thought-provoking research projects that contribute to the advancement of knowledge in their respective field. Research collaborations of this nature provide opportunities for our undergraduates to develop reflective thinking, analytical, communicative, and team- building skills that are so necessary in contributing towards a better understanding of the complexities present in local and global communities. As a result of your research experience, most of you are now imbued with the cognitive skill sets and intellectual tools that will help in making informed decisions about graduate education and professional careers. I think that you will also find that these problem-solving skills will also inform other aspects of your lives.

The Chicago Area Undergraduate Research Symposium serves as a forum to foster intellectual exchange, interdisciplinary dialogue, and professional networking while recognizing the contributions of undergraduate research activity. It helps build a community of scholars that will be tomorrow's leaders in developing new and impactful knowledge, shaping cutting-edge technologies, and designing creative solutions to real-world problems. Since its inception in 2005, the symposium has assembled a talented group of individuals who have worked countless hours in their research labs conducting experiments and in their communities reaching out to underserved and underprivileged populations. Much of this commitment and dedication to research has been rewarded through awards and recognition from research organizations and through highly successful placements in prestigious graduate schools.

In closing, I would like to extend my thanks and appreciation to the Inter-School Board, student observers, faculty mentors, judges, the six sponsor institutions, and the corporate sponsors who continue to support and lend assistance to the CAURS. I would especially like to acknowledge the efforts of Kelly Brandstatt, Jaclyn Moloney, Lacy Simons, and Melissa Arquinego who all played an integral role in organizing the symposium. Thank you all for your participation; I know that we will all discover something new in the research presented here today by many of the talented investigators of tomorrow.

Samuel A. Attoh, PhD
Dean of the Graduate School & Associate Provost for Research
Loyola University Chicago

Office of the President

Northwestern University
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NORTHWESTERN
UNIVERSITY

March 3, 2012

Dear CAURS Participants, Supporters, and Guests:

On behalf of Northwestern University, I am delighted to welcome you to the 2012 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

THE UNIVERSITY OF CHICAGO

Office of the Provost
5801 South Ellis Avenue, Suite 501
Chicago, Illinois 60637

Thomas F. Rosenbaum
John T. Wilson Distinguished Service Professor of Physics
Provost

February 20, 2012

Dear CAURS Participants, Sponsors and Guests:

Welcome to the 2012 Chicago Area Undergraduate Research Symposium! The University of Chicago is delighted to support a symposium that highlights such impressive student research accomplishments, and we welcome the opportunity to facilitate the exchange of ideas and foster new connections.

I encourage you to take advantage of this opportunity both to engage with research close to your interests and to delve into fields completely unknown to you. The Undergraduate Research Symposium provides that rare opportunity to explore new directions while making connections to peers who share your love of discovery. We wish you a day of challenge, enjoyment, and intellectual adventure.

With best regards,

Thomas F. Rosenbaum

Telephone: 773-702-8810 • Fax: 773-702-2732 • E-mail: t-rosenbaum@uchicago.edu

UIC UNIVERSITY OF ILLINOIS AT CHICAGO

Office of the Vice Chancellor for Research (MC 672)
310 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612

March 3, 2012

Dear CAURS Participants, Faculty and Guests:

On behalf of the Office of the Vice Chancellor for Research at the University of Illinois at Chicago, I am pleased to welcome you to the 2012 Chicago Area Undergraduate Research Symposium. We are delighted that UIC has been able to join our colleagues from other Chicago area institutions to support this unique event. At UIC we recognize the importance of research at all levels and are pleased that we could help sponsor this program, allowing undergraduate students to showcase their work.

Research experience such as this gives undergraduate students a chance to not only learn what it's like to work in a lab but also helps highlight the importance of research to solving today's problems. Research engages your intellectual curiosity and helps reinforce what is learned in the classroom. It also works to give you a greater appreciation for your field of study. I hope that your interactions today with your peers and with faculty will give you a greater appreciation for the discipline which you are studying

On behalf of UIC, I would like to thank all of the student organizers and the sponsors whose efforts made today possible. I hope that you will continue your pursuit of excellence in research. Congratulations to each of you and best wishes for a successful symposium.

Sincerely,

Mitra Dutta

Mitra Dutta
Interim Vice Chancellor for Research
Distinguished Professor
Electrical and Computer Engineering

Phone (312) 996-4995 • Fax (312) 413-0238 • www.research.uic.edu

GUEST SPEAKERS

Samuel Attoh, Ph.D.

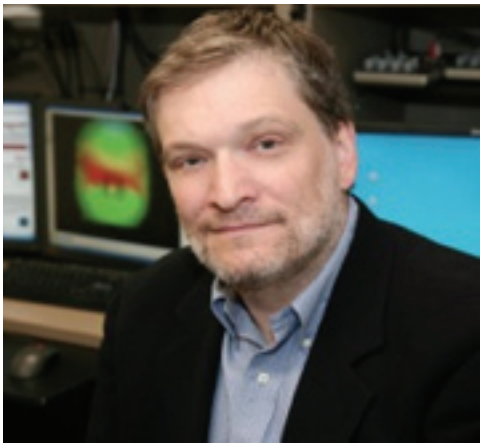
Dean and Associate Provost, Loyola University Chicago
Opening Address

Samuel Attoh, Ph.D., is Dean of the Graduate School and Associate Provost for Research and Centers at Loyola University Chicago. Dr. Attoh is devoted to facilitating the University's commitment to academic excellence, research enhancement, service, and the stimulation of progressive change and innovation at the graduate level in all of Loyola's schools and colleges. Dr. Attoh strongly supports the development of new programs, encouraging interdisciplinary and multidisciplinary initiatives that are intellectually stimulating and mission-focused, and fostering strategic partnerships and alliances within and beyond the University. His research and teaching interests lie in urban and regional planning, housing, and community development, and the geography of international development.

Dr. Attoh served as a fellow of the American Council on Education in 2003-04 and completed his administrative internship at Carnegie Mellon University. Along with editing the book Geography of Sub-Saharan Africa (Prentice Hall, 2009) and contributing chapters in Global Change in Local Places (University of Cambridge Press, 2004), World Regional Geography (Prentice Hall) and the Columbia Gazetteer (Columbia University Press), he has published more than 30 journal articles and technical reports and presented more than 40 papers at national and international conferences. Dr. Attoh received his Ph.D. from Boston University, his MA from Carleton University, Ottawa, and his B.A. with Honors from the University of Ghana.

Robert Morrison, Ph.D.

Assistant Professor of Psychology and Neuroscience, Loyola University Chicago
Keynote Address



Robert G. Morrison, Ph.D., Assistant Professor of Psychology and Neuroscience at Loyola University Chicago and the Stritch School of Medicine, uses behavioral, computational, and neuroimaging methods to investigate memory and reasoning throughout the lifespan. Dr. Morrison received his B.S. in Chemistry from Wheaton College prior to studying visual art at the Cleveland Institute of Art. While working as an artist Morrison became fascinated with the cognitive science of creativity. He pursued this interest studying visual mental imaging at Cleveland State University prior to receiving his Ph.D. in Cognitive Neuroscience from the University of California, Los Angeles in 2004. After co-founding Xunesis and completing a National Institute of Aging-funded post-doctoral fellowship at Northwestern University, Morrison joined the Department of Psychology and the Neuroscience Institute at Loyola in 2009.

Dr. Morrison's research interests include the neurocognitive mechanisms of relational reasoning, the development of analogical reasoning in children, and neurocognitive mechanisms of creativity and insight, and he has published numerous scientific articles and chapters and has edited the Cambridge Handbook of Thinking and Reasoning (Cambridge University Press, 2005) and the Oxford Handbook of Thinking and Reasoning (Oxford University Press, 2012). Dr. Morrison's research has been funded by the Office of Naval Research, the National Institute of Aging, the American Federation of Aging Research, and the Illinois Department of Public Health. In a parallel career as an artist he has exhibited his painting, sculpture and photography in galleries and museums throughout the United States.

ORAL PRESENTATION SCHEDULE

Shakespeare House Room

10:15-10:30 AM:
Hannah Koch, *The University of Chicago*

11:00-11:15 AM:
Jessica Zhang, *The University of Chicago*

11:15-1130 AM:
Bryan Killian, *University of Illinois at Chicago*

11:45 AM-12:00 PM:
W. Grant Wilder, *The University of Chicago*

12:15-12:30 PM:
Alexander Ostapenko, *The University of Chicago*

2:30-2:45 PM:
Berkcan Akpinar, *Northwestern University*

3:00-3:15 PM:
Charles Frye, *The University of Chicago*

3:15-3:30 PM
Benjamin Turturice, *Loyola University Chicago*

3:30-3:45 PM:
Mariam Gomaa, *Northwestern University*

3:45-4:00 PM:
Ahmad Qamar, *The University of Chicago*

4:15-4:30 PM:
Alexandra Rybczynska, *University of Illinois at Chicago*

4:45-5:00 PM:
Kevin Dam, *Northwestern University*

ORAL PRESENTATION SCHEDULE

Lake House Room

10:00-10:15 AM
Ken Park, *Northwestern University*

10:30-10:45 AM:
Yoon Lee, *Northwestern University*

11:00-11:15 AM:
Vitor Possebo, *Northwestern University*

11:15-11:30 AM:
Anvesh Tanuku, *Northwestern University*

12:00-12:15 PM:
Cristian Yugsi, *University of Illinois at Chicago*

2:45-3:00 PM:
Simo Huang, *The University of Chicago*

3:15-3:30 PM:
Willy Gu, *The University of Chicago*

3:30-3:45 PM:
Nasya Mendoza-Elias, *The University of Chicago*

3:45-4:00 PM:
Eda Gjergo, *Illinois Institute of Technology*

4:00-4:15 PM:
Michael Campos, *Northwestern University*

4:30-4:45:
Kody Wyant, *University of Illinois at Chicago*

ORAL PRESENTERS

Berkcan Akpinar, Northwestern University
Identification of the Pharmacophore of Maoecrystal V

Berkcan Akpinar is currently a junior majoring in Chemistry with concentrations in organic chemistry and biochemistry at Northwestern University. Medically relevant research fascinates him and he hopes to become a physician-scientist in the future. Currently, Berkcan performs high-yield organic transformations in Dr. Regan Thomson's Natural Product Total Synthesis lab in order to synthesize their proposed pharmacophore of maoecrystal V. He has also worked in a genetics laboratory at Hacettepe University Hospital in Ankara, Turkey where he discovered a novel mutation coding for systemic primary carnitine deficiency. Interested in both clinical and basic science research, Berkcan hopes to bridge the areas of synthetic chemistry and medical research throughout his ventures in academia. In his spare time, Berkcan likes playing and watching soccer, exercising, hanging out with friends and family, and going to the movies.

Michael Campos, Northwestern University
Titania-Silica Nanocomposites for Solar Fuel Production

Michael Campos is a senior at Northwestern University majoring in Chemistry and minoring in Environmental Policy and Culture. He is currently working under Professor Kimberly Gray in the Department of Civil and Environmental Engineering and Professor Justin Notestein in the Department of Chemical and Biological Engineering. His research utilizes templated titania-silica nanocomposite synthesis to understand the photocatalytic processes relevant to solar fuel production. Last summer, he received an Undergraduate Research Grant from the Initiative for Sustainability and Energy at Northwestern to carry out this work. Michael enjoys undertaking multidimensional challenges, and his current project includes elements of chemical engineering, materials science, environmental engineering, nanotechnology, and inorganic chemistry. Outside of the lab, Michael is also heavily involved in concert production and club baseball at Northwestern, and he is a member of the Sigma Chi Fraternity. After graduating this spring, Michael intends to enroll in a Chemistry Ph.D. program to further pursue research in alternative energy.

Kevin Dam, Northwestern University
In Vitro Characterization of a Magnetic Resonance Imaging Contrast Agent for Labeling Transplanted Islet Cells

Kevin Dam is a senior majoring in biology, concentrating specifically in biochemistry, and minoring in American history at Northwestern University. He has worked in Thomas Meade's lab since the end of his sophomore year. His past research involved in vitro characterization of a MRI contrast agent for tracking transplanted islets. Currently he is working on two projects: developing a theranostic agent for treatment of HCC, and cellular uptake of graphene oxide and MRI contrast agents. Outside of research, Kevin has also been working at the McGaw YMCA since the beginning of his sophomore year as the Tutoring Program Coordinator. He plans on graduating this upcoming June and utilizing his research skills in the biological research industry. Kevin

Charles Frye, University of Chicago
Personality and the Acute Subjective Effects of MDMA in Healthy Volunteers: Preliminary Results

Charles Frye is a third year at the University of Chicago majoring in Biology with a concentration in Neuroscience. Charles works with Dr. Megin Wardle and Dr. Matt Kirkpatrick at the Harriet de Wit Human Behavioral Pharmacology Laboratory. The primary focus of his research is on the subjective and psychophysical effects of MDMA, also known as Ecstasy, with an eye towards establishing a solid scientific foundation for psychotherapeutic use of the drug. Outside of his work in the lab, Charles is also Managing Editor of the student art magazine Vita Excolatur and a teaching assistant in the Biology Department. After graduating, Charles plans to attend graduate and/or medical school and engage in translational research in the fields of neurobiology and psychiatry.

Presenters

Eda Gjergo, Illinois Institute of Chicago
The Accelerated Expansion of the Universe: Dark Energy's Cosmological Parameter Probed with Type Ia Supernovae

Eda Gjergo is a senior majoring in Applied Mathematics at the Illinois Institute of Technology. She is Albanian and grew up in Italy. She has had a passion for astronomy, mathematics and physics from a very young age. Her interest brought her to publish a best selling novel about the fundamental forces in physics, for the general public, at the age of 17. She decided to study Mathematics for her undergraduate because she believes that future breakthroughs in the understanding of the universe will take place by exploiting current fields of research in mathematics. She has collaborated with the Cosmology group at Argonne National Laboratory since September 2011, and the experience made her more enthusiastic about pursuing a career as a researcher.

Mariam Gomaa, Northwestern University
The Effects of Accelerated Motoneuron Growth and Maturation on the Progression of ALS in the G93A Transgenic Mouse Model

Mariam Gomaa is a sophomore at Northwestern University majoring in Biological Sciences and Creative Writing. She is currently working with Dr. Sumit Dhar in Northwestern's Audiology Laboratory. Her studies in the lab revolve around the causes and potential means of preventing hearing loss. In the past she worked with Dr. CJ Heckman in the Physiology Department at Feinberg School of Medicine, researching the effects of maturation on ALS (Lou Gehrig's Disease). Outside of her work in the laboratory, Mariam is a photographer and writer for several student organizations, including the Daily Northwestern. After graduation, she plans on attending medical school.

Willy Gu, University of Chicago
Theories of Social Movements and Mobilization in Egypt 2011

Simo Huang, University of Chicago
Transcriptional Regulation of Breast Cancer microRNAs by GATA3 and TFAP2A

Simo Huang is a junior at the University of Chicago majoring in the Biological Sciences. He currently works in the Greene Lab in the Ben May Department for Cancer Research. He has been working on the effects of microRNAs and microRNA transcription factors in breast cancer metastasis. Simo is very interested in nutrition and biochemistry. He is also an avid cook and is part of Pharmakon, an up-and-coming RSO. Following graduation, Simo will attend medical school and further his career path in medicine.

Presenters

Bryan Killian, University of Illinois at Chicago
Effects of CIA Vaccine Ruse on Immunization in Pakistan

Bryan Killian is a junior majoring in Biological Sciences with a minor in Religious Studies at the University of Illinois at Chicago, and is part of the GPPA-Medicine program. At the start of his sophomore year, he began working with Dr. Robert D. Johnston, researching controversies surrounding vaccination and its effects on public health. This has included examining Supreme Court decisions on vaccine injury compensation, as well as investigating records of the recent outbreaks of pertussis in California. His work has helped him better understand the ways in which social factors influence how public health efforts are perceived. He plans on using these insights as he pursues a career as a physician.

Hannah Koch, University of Chicago
The Effects of Stress on Cortisol Levels in Developing Rhesus Monkeys

Hannah Koch is a senior at the University of Chicago, where she is majoring in psychology with a minor in the biological sciences. She became interested in primate behavior and evolution after participating in a study abroad program in Paris studying primates. She is currently looking at the effects of stress on cortisol levels in developing rhesus monkeys with Dr. Dario Maestripieri (The University of Chicago) and Dr. Robert Martin (The Field Museum of Natural History). In her free time she analyzes CT images of Egyptian mummies at the Field Museum and sings in the alto section of UChicago's Motet Choir. After graduation she plans on attending graduate school in clinical psychology.

Yoon Lee, Northwestern University
Leptin Signaling in Brain Results in Sensitivity of Weight Gain to Time of Food Intake

Yoon Lee is a sophomore majoring in Biomedical Engineering at Northwestern University. She is currently studying the role of leptin in regulation of circadian rhythms and metabolism, specifically in conditional leptin receptor knock-out mice. She would like to thank her advisors, Dr. Martha Vitaterna, Dr. Fred Turek, and Dr. Norman Atkins, and everyone in her lab for their amazing guidance. Other than research, music is a big part of Yoon's life: she sings in Northwestern Community Ensemble (NCE), a gospel choir on campus, and plays violin and piano in her free time. She is also one of the co-founders for Northwestern Emergency Medicine Organization (NEMO) and a member of Chi Omega sorority. She plans to attend medical school and become a pediatric surgeon.

Nasya Mendoza-Elias, University of Chicago
The Significance of Plasticity in Thalamostriatal Synapses in Levodopa-induced Dyskinesias

Nasya Mendoza-Elias is a graduating senior at the University of Chicago. She is completing a degree in Biology with a specialization in Neuroscience. Her research career began in pain modulation, as related to the Raphe Magnus, at the University of Chicago. Nasya then joined the Rosalind Franklin University of Medicine and Science Department of Pharmacology and began research in drug-addiction memory and Levodopa-induced dyskinesias as related to Parkinson's Disease. She has presented at 2009 and 2010 Society for Neuroscience, 2010 Federation of European Neuroscience Societies Forum, and will present at the 2012 Movement Disorder Conference in Dublin. Nasya has volunteered and taught in Howard Area Community Center and at the Community Health Clinic, both in Chicago. Upon graduation, Nasya plans to pursue a graduate degree and a career dedicated to clinic neurology research and medical ethics research.

Presenters

Alexander Ostapenko, University of Chicago
Examining the Role of EcR Binding Sites on Ecdysone Inducible Polytene Chomosome Puffs

Alexander Ostapenko is in his senior year at the University of Chicago, finishing his major in the Biological Sciences focusing on computational biology. He joined Kevin White's lab in his sophomore year, and since then has worked on a series of projects ranging from insulator functions in the even-skipped context, to mapping polytene chromosomes with higher resolution, to regulation of transcription by hormones. After graduation, Alex is planning on continuing his work at the lab for one year, after which he plans to pursue a career in medicine and research.

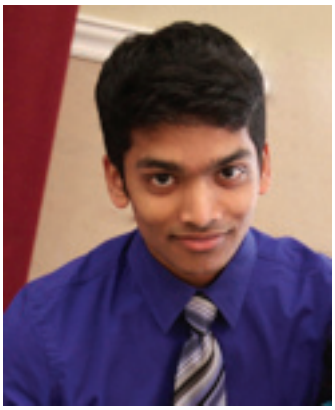
Ken Park, Northwestern University
Determining an Optimal Network-Reducing Methodology for Financial Investment Network

Ken Park is a senior at Northwestern University majoring in Applied Math in the McCormick Engineering School and the Mathematical Methods in the Social Sciences (MMSS) in the Weinberg College. He is a member of Murphy Scholars, one of the prestigious undergraduate groups in the McCormick, which generously funded his research. He has been extremely interested in developing mathematical models and applying statistical tools toward human-oriented activities, and his research on analyzing financial networks using network analysis tools with Prof. Brockmann in the Applied Math Department, who kindly provided many advices during the research, is an extension of his effort along this line. Another project that he has been working with the MMSS program is to detect hot spots in a metropolitan area in collaboration with one of the largest police departments in US. Very fortunately, he found his dream job at Enova Financial, a microfinance company in Chicago, as a data analytics analyst and model developer, which he will join full-time in coming August. He is a passionate player of every kind of sports, especially soccer, and he also likes to cook, both oriental and western recipes.

Vitor Augusto Possebom, Northwestern University
The Price Impact of Webjet's Entry on the Brazilian Airline Market

Vitor Possebom is a senior majoring in Economics. Currently, he is studying at Northwestern University due to an exchange program. His home university is Sao Paulo School of Economics – Fundacao Getulio Vargas. He is interested in Industrial Economics, Econometrics and Economics of Education. Vitor intends to continue his studies after graduating, by applying for a Ph.D program. Presently, he works with Professor Paulo Furquim de Azevedo (FGV) researching topics related to horizontal concentration in Brazilian markets and Sergio Firpo (FGV) studying school accountability in Brazil. While dedicating time and effort to academia, Vitor also was a consultant at Economic Junior Consultancy, where he held the Chief of Financial Office position.

Ahmad Qamar, University of Chicago
Stochastic Modeling of Statistically Unsteady Turbulent Mixing



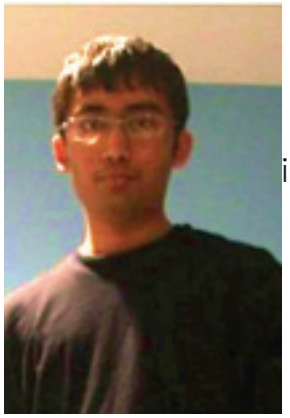
Ahmad Qamar is a sophomore majoring in Mathematics and Physics and minoring in Computer Science at the University of Chicago. His interests center around the interdisciplinary intersection of mathematics, physics, computer science, biology, and economics. He has worked on three independent projects at Baylor College of Medicine researching on projects in bioinformatics, protein imaging, and most recently theoretical neuroscience. This past summer, he interned at CERN with the Large Hadron Collider's ATLAS project in Geneva, Switzerland to increase statistics in the detection of Higgs Bosons. Currently, he is working on a project in UChicago's Astronomy & Astrophysics department investigating stochastic modeling of turbulence in phenomena ranging from super-nova to nuclear fusion. His extracurricular activities include working as an analyst for a partnership investment fund, and also on a separate humanitarian project investing in microfinance institutions. Ahmad plans to pursue graduate studies in Artificial Intelligence and Machine Learning with applications in physics, neuroscience, and financial markets.

Presenters

Alexandra Rybczynska, University of Illinois at Chicago
Treating Lower Respiratory Infections in Developing Countries with Mechanically Powered Nebulizers

Alexandra Rybczynska is a senior majoring in Bioengineering with a concentration in Cell and Tissue Engineering at the University of Illinois at Chicago. Her studies have furthered her appreciation of the application of engineering principles to biological systems and the results, which have the potential to improve the entire medical field as well as the lives of individuals. The engineering curriculum at UIC has provided her with many opportunities to explore the improvement of medical device designs, and she is thankful for the opportunity to work with the members of her design team, Aimee, Amber, and Amanda, and advisor, Dr. John Hetling, to expand this once theoretical idea into a functioning project. Alexandra and her teammates were one of eight teams chosen to compete at Rice University Global Health Technologies Design Competition in April 2011 and won first place for best poster presentation. Alexandra is the manager at Advanced Cancer Clinic, Ltd where she assists in patient care and organizes clinic priorities. After she graduates, Alexandra plans to pursue a career in the sciences as well as continuing her commitment in furthering advancements in global health technologies.

Anvesh Tanuku, Northwestern University
Can We Use Heuristics to Predict the Energy Characteristics of Solids?



Anvesh Tanuku is a junior at the Northwestern University majoring in Applied Mathematics and Electrical Engineering. He is currently working in the Wolverton laboratory in the material science department. Anvesh joined Dr. Wolverton's research group in March 2011 and works with PhD candidate Bryce Meredig on developing heuristic methods for predicting the likelihood of crystal structures in partially occupied systems. His research focuses on the intersection between mathematics and solid state material science. After graduation, he plans on attending graduate school to obtain a Ph.D. in applied mathematics.

Benjamin Turturice, Loyola University Chicago
Expression of Novel and Putative Antioxidative Proteins During Sexual Development of Plasmodium berghei

Benjamin Turturice is a senior at Loyola University Chicago and is majoring in Chemistry and Molecular Biology. He began participating in research his junior year of high school in Dr. Marc Penn's lab at the Cleveland Clinic and was a member of the lab til January 2011. In May of 2011, Ben joined Dr. Stefan Kanzok's lab and has been examining expression profiles of putative and novel antioxidant proteins of Plasmodium beerghei in the sexual life stages. Ben also participates in research in Dr. Nancy Tuchman's and Dr. Tham Hoang's labs. When not in lab, he enjoys playing baseball for Loyola's club baseball team, as well as, constructing pottery in Loyola's clay club. After graduation, Ben plans to apply to MSTP programs.

W. Grant Wilder, University of Chicago
The Role of Cooperative Capsize During Ice Shelf Disintegration

Grant Wilder is a second-year student at the University of Chicago majoring in Statistics and Geophysical Sciences. He is most interested in the intersection between statistics and climate, and currently works with the MacAyeal glaciology group at UChicago. With this group, he has presented a poster at the American Geophysical Union Fall Meeting in San Francisco, and plans on presenting a paper at the International Glaciological Society meeting in Fairbanks, Alaska in June 2012. These projects investigate the cooperative role of icebergs during ice shelf disintegration. Outside of the lab, Grant enjoys dancing in the University Ballet of Chicago and playing French horn in the University of Chicago Symphony Orchestra. Grant plans to continue studying climate science in graduate school.

Presenters

Kody Wyant, University of Illinois at Chicago
Examining Recombinant Antibody Binding Affinities for Various Retinal Tissue Damage Biomarkers

Kody is a senior Biology major at the University of Illinois-Chicago. He took a keen interest in research after spending the summer assisting Dr. Kamaljit Singh with his research at Rush University. While there, Kody investigated different strains of antibiotic resistant bacteria in a clinical setting. He then joined the lab of Brian Kay at UIC in the department of Biological Sciences. Dr. Kay's lab specializes in utilizing phage display to obtain high affinity and selective reagents to any bacterial, viral, or eukaryotic protein. Since joining the Kay lab, Kody has had the opportunity to experience a wide range of laboratory techniques that have inspired him to pursue a career in research. After graduation Kody plans to attend graduate/medical School in order to facilitate his desire to direct my research towards a clinical setting.

Cristian Andrés Yugsi Díaz, University of Illinois at Chicago
Elucidation of the Bolivian Educational Rupture

Cristian Andrés Yugsi Díaz is a senior majoring in Sociology and minoring in Philosophy at the University of Illinois at Chicago. Recently acquainted with social research during his study abroad experience in La Paz, Bolivia, he is still exploring and becoming familiar with various themes in social research. His current interests include: sociological theory, education, power relations, race and ethnicity, globalization and Latino Studies. Excited about social research's potential to unite people through an informative approach, he plans on continuing his education within the discipline of Sociology and pursue a career in both academia and nonprofit organizations. Outside of academia, he is involved with student organization such as Alternative Spring Break and is devoted to understanding the world through first hand experiences i.e., travelling. He has travelled through several countries including Ecuador, Peru, Bolivia, Argentina, and Brazil.

Jessica Zhang, University of Chicago
Prescription Stimulant Use in College Students

Jessica Zhang is a fourth-year Comparative Human Development major at the University of Chicago. Her coursework in interdisciplinary fields such as cultural psychology and medical anthropology has led to both academic and on-the-ground interest in the interactions of health, medicine, and culture. She is exploring this interest academically through her research on college students' prescription and non-prescription use of ADHD medication. On-the-ground, these interests have led to a commitment to the health and education of underserved and marginalized populations. Currently, she volunteers as a Peer Health Exchange Educator, and holds GED tutoring at St. Martin Women's Shelter. She hopes to continue her commitment to culturally-sensitive public health and service by working with a non-profit health services agency after graduation.

BIOLOGICAL SCIENCES

2 Exotic Alternatives as Preventatives for Alzheimer's disease

Ilysha Minor
Faculty Advisor: Dr. Sandra Chimon Peszek
DePaul University

The 22-35 fragment of the wild type (WT) amyloid beta peptide (A beta) forms fibrils in extracellular brain plaques associated with Alzheimer's disease (AD). Although the time frame of fibrilization has been understood, there may be supplements that can delay the speed of fibrilization. Miracle Berry (Richadella Dulcifica) is a shrub that is found in West Africa. Miracle berry is a type of shrub that has the ability to modify taste due to the protein, Mircaulin, altering the tastes of bitter and sour foods into sweet. Research suggests that the usage of miracle berry may affect the fibrilization time of the amyloid beta peptide (A beta 1-40) wild type (WT). The structural conformation and morphology of this species will be studies using attenuated total reflectance infrared spectroscopy (ATR-IR), transmission electron microscopy (TEM), and ultraviolet-visible spectroscopy (UV-Vis). Our preliminary research shows that melatonin and curcumin may decrease fibrilization time while miracle berry may increase fibrilization time.

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3 Emphasizing the Role of Females in Perceiving Vocalizations and Tutoring Vocalizations in a Male-Dominated Process

Kaitlin Smolen
Faculty Advisor: Timothy J. DeVoogd
University of Chicago, Cornell University

Female birds have been greatly neglected in the study of bird vocalizations, and our research sought to highlight female brains and the role of females in the vocalization tutoring process. The brains of females from three different species of South African Warbler were stained for the protein ZENK, which is induced upon hearing song. ZENK was counted in the caudomedial nidopallium (NCM) of each bird because this region controls song perception. Results showed that as the complexity of each species' song increases, the complexity of the NCM increases. This was the first study to suggest that female brains evolved to adapt to the songs of their species and to explain why simple songs excite birds of some species but not birds of other species. In addition, the female role in the vocalization tutoring process was analyzed. Juvenile males were tutored by two adult males, after which the juvenile males were placed in a cage with the daughter of one tutor. Results showed that the daughter influenced the bird to have a song more similar to her father's song than to the song of the other tutor. This shows that females can exert through physical interaction influence over the song of a juvenile male.

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5 Transcriptional regulation of breast cancer microRNAs by GATA3 and TFAP2A

Simo Huang, Kathy Yee, Jessica Bockhorn, Dezheng Huo, Olufunmilayo I. Olopade, Huiping Liu, Geoffrey Greene
Faculty Advisor: Geoffrey Greene
University of Chicago

Metastasis remains a major obstacle in the successful treatment of breast cancer because it is responsible for an estimated ninety percent of breast cancer related deaths. An emerging field in the understanding of breast cancer metastasis is the study of microRNAs (miRNAs) which are short nucleotide sequences shown to be involved in the regulation of cell self-renewal, epithelial-to-mesenchymal transition (EMT) and cancer progression. Our previous data suggested that miR-200 and other miRNAs regulate EMT and breast cancer metastasis. Given the significant roles of miRNAs and their modulated levels in cancer, it is important to understand their regulatory mechanisms. We hypothesize that miRNAs are transcriptionally regulated in breast cancer. Our preliminary data with clinical breast cancer specimens suggest correlative relationships between transcription factors TFAP2A and GATA3 with mir-200a and other miRNAs. The goals of this project are to examine whether TFAP2A and GATA3 regulate these miRNA levels in breast cancer cells. Using quantitative real-time PCR, the miRNA levels were measured in MDA-MB 231 breast cancer cells with modulated expression of GATA3 or TFAP2A. Overexpression of GATA3 in MDA-MB 231 cancer cells significantly increased the expression of miRNAs aberrantly downregulated in ER- breast tumors, such as miR-138. Chromatin-immunoprecipitation and reporter luciferase assays will be used to determine whether the regulation of miRNAs by GATA3 and TFAP2A is a direct transcriptional regulation.

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6 Effects of Orthostatic Hypotension and Simulated Peripheral Neuropathy on Balance Control and EMG Activity of The Leg

Samar Khan
Faculty Advisor: Bijan Najafi Ph.D.
Loyola University, CLEAR Department of Rosalind Franklin University

In previous studies, orthostatic hypotension (OH) has been proven to negatively affect balance control during the stance phase of gait and is a common predictor in those who have peripheral neuropathy (PN) and usually foot ulcers. In contrast, particular muscle firing patterns in the lower extremity, most significantly from the anterior and the posterior muscle groups of the leg have been shown to positively affect balance control during normal stance. This research project applied the knowledge from these previous studies in order to determine how much of an alteration there is in the EMG patterns of these lower extremity muscles in order to maintain balance. Furthermore how well balance is maintained by these alterations in those who have orthostatic hypotension by itself and orthostatic hypotension with peripheral neuropathy was determined. It was hypothesized that the more worse off the subject is (orthostatic hypotension vs. orthostatic hypotension and peripheral neuropathy), the less likely that any altered EMG patterns would be able to significantly aid balance control. However, It has been initially found that under the combined orthostatic hypotension and peripheral neuropathy condition, the patient either had worse balance control or better balance control but with increased muscle activity, particularly in the posterior group. More conclusions will be made once the data is fully analyzed.

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7 Missense Mutation in Familial Alzheimer's Disease

Luvleen Kaur
Faculty Advisor: Sandra Chimon Peszek, Ph.D.
DePaul University

Amyloid diseases are neurodegenerative disorders in Huntington's Creutzfeldt-Jakob and Alzheimer's disease (AD), afflicts about 20 million people worldwide, with increasing prevalence in an aging society.1,2 In AD, multiple studies for the aggregation of fibrilized A□(1-40) and A□(1-42) follow a trend of fibril formation starting from a nontoxic momoner that self assembles to an alpha helical, to

spherical beta-sheet intermediates, and into a fibrillar state. Beta sheet fibrils stack up and form senile plaques, characteristic of AD, which deposit in the extracellular region of the brain causing neural death thus exhibiting the symptoms of seen in Alzheimer's disease. Previous studies demonstrated results suggesting that amyloid beta-sheet intermediate species display a much higher toxicity than those of the fibrils.3 A shorter 14 (22-35) amino acid sequence is of interest due to the hair-pin turn, the exclusion of the amino acid region KLVFFA. The effect of fibril formation without the KLVFFA suggest that the hair-pin turn is an intermolecular hydrophobic core and is not needed for fibril formation. 5% of AD is caused by a missense mutation, in an inherited gene, such as the Italian (E22K) and Dutch (E22Q) mutation and are both capable of forming intramolecular and intermolecular beta-sheets. The single point mutations demonstrate varied rates of beta sheet formation compared to the wild type. Attenuated Total Reflectance Infrared Spectroscopy (ATR-IR) allows the characterization of secondary structure. Ultraviolet Visible spectroscopy (UV-Vis) is used to study the concentration of fibrils, in situ, over the length of our experiment.

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8 Rate of Nitrous Oxide and Nitrogen Gas Production in C. pauculus

Jennifer Obrzydowski, Domenic Castignetti
Faculty Advisor: Dr. Domenic Castignetti
Loyola University Chicago Biology Department

C. pauculus is a heterotrophic nitrifier as well as vigorous denitrifier. C. pauculus belongs to a genus able to degrade pollutants such as drugs and antibiotics and could be used as a bioremediation agent. However, C. pauculus is also a heterotrophic denitrifier and may release harmful intermediates such as nitrous oxide (N2O) gas into the environment. Consequently, the unique chemical metabolism of C. pauculus lends itself to be a bacterium worth further examination. This preliminary investigation was performed to monitor NO2- , N2 and N2O production of C. pauculus in a pure oxygen environment. Further experiments will be conducted in which the bacterium is exposed to other gaseous environments – no oxygen and reduced oxygen. The overall goal off this study is to determine at which growth points, and under what environmental conditions, does C. pauculus produce N2 and N2O. In order to observe if the 100% O2 gaseous condition had any effect on NO2- , N2 and N2O production, two experimental replicates of C. pauculus cells were placed in sealed vials, flooded with oxygen gas, and aerated via agitation. Pyruvic oxime, the carbon source, was then added. A modified nitrite determination assay was used to measure NO2-. Production of N2 and N2O gases was detected using gas chromatography. Samples were tested approximately every thirty minutes and then at later intervals. The C. pauculus in 100% oxygen produced miniscule, yet visibly greater amounts of N2 to air standards. No N2O production was visible. With time, NO2- production very gradually declined in the C. pauculus. Further work must be done to confirm the results.

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9 Individual differences in the effects of chronic stress on memory: Neuropeptide Y and anxiety as biobehavioral correlates of resiliency.

Brian Sweis, Kevin Veverka, Ekamjeet Dhillon, Gurmeet Bawa
Faculty Advisor: Louis Lucas Ph.D., Robert Morrison Ph.D.
Department of Biology, Loyola University Chicago, Chicago, IL; Department of Psychology, Loyola University Chicago, Chicago, IL

Repeated exposure to immobilization stress generally impairs spatial memory in rodents. However, the extent to which memory is impaired is often variable. Stress is a subjective experience and differences

between individuals and their coping-mechanisms determine the impact and severity of a stressor. Individual differences in particular behaviors – including anxiety, locomotor activity, and feeding behavior – may reveal underlying neurobiological mechanisms that could be driving such differences in stress resiliency. 54 adult-male Sprague-Dawley rats were appetitively trained on an 8-arm radial-arm-maze (RAM) to locate rewards before undergoing 10 consecutive days of immobilization stress (2hrs/d). Memory retention was tested in the RAM for 10 days post-stress, after which brain tissues, blood samples, and thymi were collected for neurochemical analyses. Anxiety levels, locomotor activity, and feeding behavior were monitored regularly throughout the experiment. Compared to non-stressed animals, stressed animals that showed little to no impairments in memory post-stress – the more stress-resilient individuals – exhibited anxiety levels and locomotor activity similar to that of the non-stressed animals consistently throughout the experiment. Stressed animals that showed drastic impairments in memory – the more stress-susceptible individuals – displayed higher levels of anxiety and locomotor activity than both the non-stressed and stress-resilient groups before exposure to stress, suggesting that these behaviors may serve as early indicators of susceptibility to stress. All stressed animals, regardless of memory performance, showed dramatic changes in feeding behavior as well as thymus involution, suggesting that the role these changes play in the stress-response system, while important, are independent of the effects of stress on higher cognition. Neurochemically, no differences were observed in blood corticosterone across all three groups; however, lower neuropeptide y receptor binding was observed in the hypothalamus and amygdala of the stress-susceptible individuals. Such neurochemical markers may be targets for pharmacological interventions that can serve to ameliorate the negative effects of stress on memory.

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10 Determing Correlation of the Production of Quorum Sensors and Siderophores in M. Loti

Jeremy Guerrero, Jack Norris
Facultry Advisor: Dr. Castignetti
Department of Biology, Loyola University Chicago

The goal of this project is to investigate the role of quorum sensors in regards to siderophore production in a soil bacterium Mesorhizobium loti. Quorum Sensors are molecules that are derivatives of the chemical N-acyl homoserine lactone or AHL. These are signals that bind to promoter sequences in bacterial DNA and enhance gene expression. Bacteria incorporate many different classes of quorum sensors signal molecules. The AHLs are the most studied class of signaling molecules associated with bacterial quorum sensing. Siderophores are compounds produced by bacteria, such as M. loti, in order to acquire iron from an environment that is iron limited. Our hypothesis is that siderophores may be regulated by a community response that uses AHLs as communications signals. Hence, siderophore formation may be depended on quorum sensor activation. Chrome Azurol S (CAS), which reflects as color change when siderophores bind to an iron dye complex, was used to test for siderophore presence in the growth media at different growth phases. Iron deficient medium was tested to establish time points when siderophores are produced. Our goal is to test each time phase of the growth curve for both quorum sensors and siderophores. We propose to use Agrobacterium tumafaciens KYC55 which has three plasmids (pJZ372, pJZ384, pJZ410) whose promoters can detect quorum sensors. Two bioassays will be used here to test and examine the quorum sensors produced by M. loti. The first assay, O-nitrophenyl-beta-D-galactopyranoside tests for quorum sensor activity mainly LacZ induction. Hence, the more LacZ is induced the more quorum sensor is present. The second assay is Thin Layer Chromatography (TLC), which tests for galactosidase which when present will cleave Xgal which will show as a blue spot on the TLC plate. In this way, we plan to examine if quorum sensors play a role in siderophore production.

Abstracts - Biology

11 Rescuing Mesorhizobium loti Mutants to Find Desferrioxamine B Producing Genes

Jhanvi Shah
Faculty Advisors: Domenic Castignetti
Department of Biology, Loyola University Chicago, Chicago, IL

Our lab created two different Mesorhizobium loti mutants (Mutant 42 &34), by allowing a transposon, Tn5:OT182, to randomly insert itself into the M. loti genome. The Tn5 insertion was then made into a plasmid and transformed in DH5□. Wild type M. loti readily uses desferrioxamine B (DFB), a type of siderophore, as its sole source of carbon. The insertion of Tn5 disrupted the growth of the mutant M. loti when using DFB. As a result, mutant 42 does not grow with DFB as the sole carbon source. Our overall goal is to determine the genes that were knocked out in mutants 42 and 34 (a second, similarly created M. loti mutant). We want to know where Tn5 has inserted itself into the mutants, causing the disruption of DFB metabolism, that is, the use of DFB as a carbon source. Our aim is to rescue the DFB deficient mutants by creating a small fragment library which when inserted into each mutant will restore the ability to use DFB as its carbon source.

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12 Nitrogen Conversion in Venezuelan and Kentucky Caves

Katrina Lamont
Advisor: Dr. Domenic Castignetti
Loyola University Chicago

The goal of this study is to gain understanding of microorganisms that live in nutrient limited environments such as isolated Venezuelan and Kentucky caves. In order to determine how microorganisms native to these caves are surviving in these oligothrophic environments several physiological tests were performed to analyze nitrogen conversion. The Kentucky cave microorganisms were analyzed in terms of their ability to denitrify and reduce nitrate to nitrogen gas. Gas chromatography was used to analyze nitrogen gas production and identified three Kentucky microorganisms as denitrifiers. The Venezuelan cave microbes were analyzed in terms of ammonia production via Indophenol Blue Assay, which indicated that two Venezuelan microorganism are capable of producing ammonia.

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13 The Effects of Accelerated Motoneuron Maturation on the Progression of ALS in the G93A Transgenic Mouse Model

Mariam Gomaa, S. Elbasiouny, K. Quinlan, CJ Heckman
Northwestern University Feinberg School of Medicine

Amyotrophic lateral sclerosis (ALS) is an adult onset neurodegenerative disease. Transgenic mice expressing the human SOD1-G93A gene have been established as a standard mouse model of ALS. Past studies on neonatal SOD1-G93A mice (postnatal day 7, P7) showed that the motoneurons of SOD1 mice have larger soma than the motoneurons of Wild Type (WT) mice. There is no clear indication as to what causes the significant difference in soma size in SOD1 mice. Furthermore, the change in soma size has a strong impact on the motoneuron excitability in ALS, and is suspected to serve as a metabolic stress that would affect motoneuron degeneration over the course of the disease. This study was conducted to determine whether these differences were limited to the neonatal phase (during postnatal development) or continued into adulthood. Results show an increase in size in all soma properties (somatic cross-sectional area, surface area, and volume)

between WT and SOD1 motoneurons in the postnatal age 25-35 days (P23-35), confirming that the abnormal increase in motoneuron soma size progresses into adulthood in ALS. Interestingly, there was no change in soma size between WT and SOD1 P45-55 motoneurons, indicating that the abnormal increase in soma size might not progress into late adulthood, at which ALS symptoms appear.Results also show that all soma properties were larger in the P45-55 group relative to the P25-35 group in WT mice. These properties indicate the effect of the aging process (i.e., motoneurons developing from neonatal stages into adulthood).On the other hand, soma size for SOD1 motoneurons did not change between the P25-35 and the P45-55 age groups. Thus, the data suggests that SOD1 motoneurons reached their maturation earlier than WT motoneurons. Many of the theories on why motoneurons degenerate in ALS involve cellular stressors, and suggest that such stresses are "capable of accelerating disease progression". The mitochondria and the endoplasmic reticulum of motoneurons in ALS show signs of stress, and a larger cell body could contribute to the cellular metabolic load. In other words, a bigger cell requires more energy. The larger, harder-to-maintain size of mutant SOD1 motoneurons may be something that makes them vulnerable to neurodegeneration while other neuron types can survive. This neurodegeneration is significant because it is the defining feature of ALS, specifically the degeneration and death of both upper and lower motoneurons in the brain and spinal cord.

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14 In Vitro Effect of Hexokinase-2 Knockdown on Prostate Cancer Cells Tumorigenicity

Aisha Burton, Nissim Hay, Veronique Nogueira
Faculty Advisor: Dr. Veronique Nogueira
Department of Biochemistry and Molecular Genetics, University of Illinois at Chicago

Prostate cancer (PCa) has become the most common non-dermatological malignancy and the second leading cause of cancer death in US men. Healthy cells derive energy from glucose through two processes: oxidative phosphorylation and glycolysis. Oxidative phosphorylation is the main source of energy, but in conditions where oxygen availability is limited, cells activate their glycolysis pathway. Irrespective of oxygen availability, cancer cells show a very high glycolysis activity, referred as "aerobic glycolysis". This increased aerobic glycolysis is one of the causes of chemoresistance in drug resistant tumors. Therefore targeting drugs against aerobic glycolysis mediators holds a promise to treat drug resistant tumors.
In most of PCa, hyperactive glycolysis is mediated by up-regulation of hexokinase-2 (HK-2), which catalyze the first step of glucose metabolism i.e. conversion of glucose to glucose-6-phosphate. Glucose-6-phosphate is utilized in several metabolism and biosynthetic pathways supporting the proliferation of cancer cells. PCa tissues show a high expression of HK-2, whereas normal prostate doesn't express this protein. This overexpression contributes to increased proliferation and resistance to cell death of PCa cells. Thus HK-2 is a suitable target for PCa therapy.
In our study, we established a human PCa cell line (PC3) with stable down-regulation of HK-2 (PC3 HK-2 KD). The effect of HK-2 knockdown in the tumorigenicity of PC3 cells was assessed through two methods: measurement of proliferation rate in tissue culture condition and ability to grow in anchorage-independent manner (colony formation in soft-agar). We have shown that PC3 HK-2 KD cells proliferate slower (growth curves and BrdU incorporation) and are more susceptible to serum withdrawal-induced cell death (DAPI and Pi staining) than control cells. We have also show that PC3 HK-2 KD cells were not forming colonies in an anchorage-independent manner whereas control cells can. Our data shows that HK-2 is an attractive target for PCa therapy.

15 Nitrogen Cycling by Cave Bacteria

Sarah Massarani
Faculty Advisor: Dr. Domenic Castignetti, Monica MIcek
Loyola University Chicago

Nitrogen Cycling by Cave BacteriaCaves are oligotrophic, nutrient limited environments that receive little sunlight and less than two milligrams of total organic carbon per liter. The way nutrients are cycled in these non-ideal living environments is not well understood. The goal of this project is to examine twenty-five Kentucky and approximately fifty Venezuelan cave bacteria for their ability to denitrify. A polymerase chain reaction was performed on the bacteria to identify the presence of the nirS or nirK genes which code for nitrite reductase. PCR results indicated that three Kentucky isolates: KY64, KY198, and KY429 possess the nirK gene. However, the presence of the nirK gene in the isolates' DNA is not necessarily indicative of the microorganisms' ability to produce nitrogen gas. As a result, gas chromatography was used to identify the isolates' production of nitrogen gas. Gas chromotagraphy results show that seven isolates KY64, KY156, KY198, KY243, KY245, KY246 and KY429 produced the gas. Interestingly, four of the isolates: KY156, KY243, KY245, and KY246 produced nitrogen gas without containing the nirK gene. Future work will include retesting the microorganisms for nitrogen gas production to resolve these unexpected results.

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16 Use of the Adult-Onset Growth Hormone Deficient Mouse Model to Determine the Importance of Growth Hormone on Endocrine Pancreatic Function in Adulthood

Jose Cordoba-Chacon, Manuel D. Gahete, Naveen Kumar Pokala, Raul M. Luque, and Rhonda D. Kineman
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Department of Cell Biology, Physiology and Immunology, University of Cordoba, Instituto Maimonides de Investigacion Biomedica de Cordoba (IMIBIC), and CIBER Fisiopatologia de la Obesidad y Nutricion, Cordoba, Spain

Circulating growth hormone (GH) levels fall with age and weight gain. GH is important to supporting the functioning of the insulin producing □-cells of the pancreas in adults. However, whether GH supports □-cell proliferation and/or insulin production is unknown. Our laboratory has recently examined the metabolic impact of adult-onset isolated growth hormone deficiency (AOIGHD) in mice. AOiGHD mice show improved insulin sensitivity and low circulating insulin levels, despite an increase in fat/lean mass. However, AOiGHD mice become glucose intolerant in response to high fat (HF) feeding, where insulin levels remain inappropriately low, as compared to obese controls. This study investigated if this impaired insulin response was due to impaired function and/or expansion of the □-cell population. To investigate the cause of this decreased insulin production, sections of the pancreas from low fat (LF) AOiGHD and control mice were immunostained for insulin. Mean islet size, islet number/pancreas, frequency of islet size and □-cell mass/pancreas were assessed using image analysis software. We observed an increase in AOiGHD islet (30-60 cells) size coupled with a decrease in the number of small (1-30 cells) islets. This decrease in the number of small islets suggests impaired islet neogenesis. However, overall, □-cell mass was not found to be significantly different between experimental and control groups. Therefore, the glucose intolerance observed in diet-induced obese, AOiGHD mice is not attributed to changes in □-cell mass. Concurrently, we have studying the effects of GH deficiency (GHD) on mouse lifespan. While GHD has not been observed increasing lifespan in humans, in has been observed increasing healthspan, especially in the prevention of metabolic disease. To investigate further, we are monitoring a set of AOiGHD and control mice until

natural death when we will collect tissues to determine the cause of death. Initial data suggests AOiGHD mice do live longer than controls.

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17 **Genetic Analysis of Sleep and Circadian behaviors and Volatile Gas Anesthetic Response via Forward Insertional Mutagenesis in Drosophila melanogaster.**

Justin O'Hare, Ravi Allada
Faculty Advisor: Ravi Allada, M.D.
Departments of Neurobiology and Pathology, Center for Sleep and Circadian Biology, Northwestern University

Despite spending approximately one-third of our lives asleep, the critical function of this highly regulated behavior remains a mystery. It is known that sleep behavior is regulated at various brain centers by the circadian clock, located in the suprachiamstic nucleus (SCN). Interestingly, anesthesia homeostatically mimics sleep; time spent under anesthesia compensates for lost sleep. Volatile gas anesthetic (VGA) action is largely uncharacterized in terms of molecular targets. Therefore, the study of VGA response is useful not only to uncover the mechanism(s) by which VGAs bring about anesthesia, but also to elucidate its apparent relation to sleep. Genetic screens are useful in the study of multiple related behaviors as the number both of mutants generated and of behaviors screened is theoretically infinite. Here, a forward insertional mutagenesis screen of Drosophila melanogaster chromosomes II and III, using a piggyBac transposable element, reveals potential relationships and dissociations between the clock, sleep, and VGA response. Ongoing work includes continued production and screening of new mutants as well as identification of disrupted genes of interest via inverse polymerase chain reaction (iPCR) and DNA sequencing.

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18 **Differential fear learning and anxiety-like behavior mediated by quantitative trait loci (QTL) on chromosome 10**

Emily Leung
Faculty Advisor: Abraham Palmer, Ph.D.
University of Chicago

C57BL/6J (B6) and A/J (AJ) inbred mice differ in freezing to context with AJ mice displaying a greater degree of freezing to context compared to B6 mice. Previously, we used a standard fear conditioning paradigm (FC) in a panel of chromosome substitution strains (CSS) where each strain is created by introgressing a single chromosome from the AJ strain on an otherwise uniform B6 genetic background. In that study, C57BL/6J-Chr10A/NaJ mice (CSS-10) showed higher freezing to context and to tone compared to B6 mice suggesting that pleiotropic alleles influencing both innate and learned fear may be present on chromosome 10. To determine the chromosomal region corresponding to these differences, a F2 cross was produced between B6 and CSS-10 mice. We identified a region on the distal portion of chromosome 10 that corresponded to both freezing to context and to tone with a Bayesian 95% confidence interval spanning approximately 17.43 Mb (110.23-127.66 Mb). To distinguish between learning and innate fear, we have bred and phenotyped two congenic lines spanning most of the confidence interval. One of the congenic lines spans from 122.387121 to 129.068 Mb while the other spans from 127 to 129.068 Mb. The larger congenic region captures both phenotypes of elevated freezing to context and tone while the smaller congenic region captures only elevated freezing to tone suggesting the presence of two loci affecting innate and learned fear. Gene expression data was collected for 12 genes found in this region that are expressed in the hippocampus and amygdala. Since B6 and AJ mice show a difference in freezing to

context, a difference in gene expression between these two strains of mice in the congenic regions was also found. This in turn, will hopefully lead to identification of homologous genes in humans that may contribute to anxiety-like behaviors in the future.

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68 Early Detection of Diabetic Peripheral Neuropathy Using Virtual Obstacle Crossing

Yaser Khan
Faculty Advisor: Rashad Sayeed, DPM
Loyola University, College of Podiatric Medicine

This is a pilot observing the effect of virtual reality techniques on the early detection of diabetic peripheral neuropathy. Current methods of detecting diabetic peripheral neuropathy are inconsistent, invasive, and detect the neuropathy too late in its progression. Through the analysis of these shortcomings, CLEAR has developed a promising new interface, virtual obstacle crossing (VOC), to accurately detect Diabetic Peripheral Neuropathy earlier than current known methods. VPT was used to establish the reliability and sensitivity of VOC. Sixty-eight participants were recruited from private Chicago clinics. Each participant underwent a training discussion, Rhomberg balance test, and three virtual obstacle crossing tasks with alteration in obstacle height. Following this, the participants completed one more balance test and a final gait crossing task to determine if balance improved. We predicted that DPN patients would show a misjudgment of foot position during obstacle crossing, and altered reaction time, and an impaired balance and stability. Those with considerable DPN hit obstacles more frequently than those without. Some patients with a VPT score of 2 showed signs of PN by frequently hitting obstacles and having improper reaction times. This may be indicative of detecting it earlier than other methods.

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69 A Spontaneous Transformation Model Of Rat Prostate Epithelial Cells And Derived Microvesicles

Mark Sikov, DongQin Yang, Helen M. Callanan, Kate E. Brilliant, David R. Mills.
Faculty Advisor: David Mills
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To date, the critical molecular and cellular mechanisms involved in the development and progression of prostate cancer remain elusive. We have developed an in vitro model of spontaneous transformation using rat prostate epithelial cells (PEC) that culminates at high passage (p>85) in anchorage independent growth when plated on soft agar. High passage anchorage independent PEC also formed large tumors when injected into immunodeficient mice while low passage PEC (p<30) did not. We have also observed a dramatic change in cell morphology and increased motility of these cells with increasing passage. Furthermore, we have identified a marker, OC.5, that is expressed by a high percentage of low passage PEC but is not expressed as strongly in high passage PEC. We have shown by transmission electron microscopy that PEC emit a heterogeneous mixture of membrane bound particles defined here collectively as microvesicles. Preliminary data showed that pre-incubation of natural killer (NK) cells with high passage-derived microvesicles significantly suppressed NK cytotoxicity. In contrast, microvesicles purified from low passage PEC had no affect on NK cytolytic activity. The ability to detect critical molecular events driving spontaneous transformation, anchorage independent growth and tumorigenicity will provide information necessary to establish better methods of early cancer detection and identify potential targets for treatment.

70 Potential Effects of Glo1 on Increased Susceptibility to Seizures, and Methylglyoxal's Ability to Treat Seizures in Mice

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A seizure is an "episode of disturbed brain function" caused by "abnormally excited electrical signals in the brain." Because GABA is the main inhibitory neurotransmitter in the brain, activation of GABA signaling has the ability to terminate or alleviate seizures. Glo1 is a ubiquitously expressed protein involved in glucose metabolism that breaks down methylglyoxal (MG). The Palmer lab has demonstrated that increased expression of Glo1 is correlated with an increase in anxiety-like behavior in mice. In addition, preliminary data show that MG acts as an agonist at GABA-A receptors. In this project, I aimed to assess whether pharmacological treatment with methylglyoxal or inhibition of Glo1 can prevent, reverse, or reduce the severity of seizures in wild type mice. I tested for seizure susceptibility by administering pilocarpine, a muscarinic cholinergic agonist, intraperitoneally at 350mg/kg and 250mg/kg. I administered MG at 200mg/kg or 50mg/kg either 10 minutes prior to pilocarpine or 10 minutes afterward, and compared seizure severity to vehicle controls over a 90 minute period. Additionally, I administered Glox1, a pharmacological inhibitor of Glo1, two hours prior to pilocarpine injection. Seizure severity was scored according to the scale adapted from the Racine scale by the Winawer lab.iii Mice were monitored and scored as being in stages 1-5 for each minute in the 90 minute period. MG proved to successfully prevent seizure severity in mice when administered prior to pilocarpine at both doses. MG was also able to alleviate seizure severity when administered 10 minutes following pilocarpine, but only at a high dose. Furthermore, Glox1 was able to alleviate seizure severity. Reduced severity was most commonly displayed by a significant reduction in the minutes spent in stage 3, latency to stage 3, and highest stage reached.

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71 Nitrite Reductase in Jamaica Bay, New York Sediments

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In eutrophic, or nitrogen (N) enriched waters such as urban and agricultural rivers and estuaries, phytoplankton growth can be stimulated to "nuisance" levels. By removing phytoplankton and delivering N-rich material to the sediment, filter feeders, like oysters, may improve overall water quality. Through examining the microbial community in the sediment, we may be able to see how the oyster treatments interact with denitrifying bacteria in N removal. In New York City, oyster restoration has been proposed to clean up the Hudson-Raritan estuary. Jamaica Bay sediment samples were screened for the presence of nirS or nirK genes in order to detect the presence of denitrifying bacteria. These genes code for nitrite reductases and can identify microorganisms that are capable of NO2- reduction to N2O or N2 gas. Denitrifying bacteria contain structurally different but functionally equivalent enzymes that catalyze nitrite reduction. A cytochrome cd1-containing nitrite reductase encoded by the nirS, and a copper nitrite reductase encoded by nirK. This method is more suitable to investigate communities of denitrifying bacteria instead of using 16S rDNA because nitrification is widespread among unrelated groups. As a result, the nirK and nirS genes are useful targets for PCR primers to detect communities of denitrifying bacteria in Jamaican Bay sediment samples. Thus, isolated genomic DNA and the gene of interest were amplified via PCR. The PCR products were analyzed through gel electrophoresis and compared to known controls.

72 MicroRNA regulation of PRC2 epigenetic modifications in mouse embryonic stem cells

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Embryonic stem (ES) cells, derived from the inner cell mass of the early stage blastocyst, are characterized by their pluripotency and capacity for self-renewal. The pluripotency of these cells is maintained by a network of crucial transcription factors, most notably Oct4, Sox2 and Nanog, which create an autoregulatory feedback circuit to activate genes important for pluripotency and repress genes that initiate differentiation. Recent work has also implicated characteristic patterns of epigenetic regulation in maintenance of ES cell pluripotency and correct lineage-specification during differentiation. These characteristic epigenetic marks include histone modifications and DNA methylation. Polycomb repressive complex 2 (PRC2) initiates trimethylation on lysine 27 of histone H3 (H3K27me3), an important epigenetic mark in ES cells. PRC2 has three major subunits, enhancer of zeste 2 (EZH2), suppressor of zeste (SUZ12) and embryonic ectoderm development (EED). These three subunits are all highly expressed in ES cells and their expression levels drop off during differentiation, but the mechanism by which PRC2 activity is suppressed during differentiation is unknown. Because microRNA regulation is also necessary for correct ES cell differentiation, we have identified several microRNAs that showed reverse correlation with Suz12, Ezh2 and Eed and also are predicted to target these genes. We overexpress these microRNA individually in murine ES cells in vitro; the most significant effects we observe are downregulation of Suz12 levels by miR-26a/b, miR-196b, miR-494 and miR-495. These microRNAs are silenced in ES cells and are activated during differentiation. Furthermore, we overexpress these microRNAs in combination with each other and observe synergistic knockdown effects. Future work includes the validation of Suz12 3'UTR as the direct target of these microRNAs.

74 Leptin Signaling in Brain Results in Sensitivity of Weight Gain to Time of Food Intake

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Obesity is correlated with many detrimental diseases such as cancer, coronary heart disease, and mental health problems. Scientists have observed the correlation of propensity for obesity with an abnormal circadian rhythm, implying a strong relationship between circadian rhythms and metabolism. Existing research has not yet uncovered specific pathways by which this occurs, but leptin, a hormone that is involved in both the regulation of the master circadian clock and metabolism, may play a role in this pathway between circadian rhythms and metabolism. Conditional leptin receptor (Lepr) knockout mice, which lack leptin receptors, and thus leptin signaling in the forebrain, have an irregular circadian rhythm and are significantly more obese than wild-type mice, also supporting the role of leptin in the regulation of circadian rhythms and metabolism (Turek lab, unpublished data). At about 9 weeks-old, 20 C57BL/6J mice (Lepr conditional knockout or wild-type) were divided into two experimental groups, in which they were fed high-fat diet either during the light cycle or the dark cycle. The mice were transferred between two cages with or without food to restrict times of food availability every 12 hours. Body weight and food intake were measured at every cage switch. Student's t-test showed that there was a significant percent weight change in the light-fed and the dark-fed groups for the wild-type mice (P=0.012134), but no significant difference between the two groups for the Lepr knockouts (P=0.479157). The results

indicate that the loss of leptin causes mice to gain similar percentage of baseline weight regardless of the time of feeding, while the wild-type can differentiate the time of feeding, as observed by the difference in percentage weight gain. The lack of leptin results in insensitivity to the time of day, which implies that leptin plays a role in regulating metabolism in correspondence with the circadian rhythm.

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75 Examining the role of EcR binding sites on ecdysone inducible polytene chromosome puffs

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The steroid hormone ecdysone plays a crucial role in the development of insects. In Drosophila melanogaster, ecdysone pulses regulate the developmental transition of both molting and metamorphosis by inducing genome-wide changes in gene expression. The ecdysone response can be strikingly visualized by puff formation on polytene chromosomes from late third instar salivary glands. The Ecdysone Receptor (EcR) has been shown to be required for this response, but it is not yet known which EcR binding sites are necessary and sufficient for puff formation and gene regulation at the transcription level.
We hypothesized that EcR binding sites contained within ecdysone responsive puff regions are necessary and sufficient for the puff response. We studied the transcriptional ecdysone response by visual examination of the puffing on polytene chromosomes. Our results indicate that EcR and its binding sites are required for puff formation. Using immunohistochemistry on polytene squashes we confirmed that EcR binds to previously described ecdysone inducible puff regions. By inactivating EcR with a heat-shock inducible RNAi, we produced alterations within the polytene structure and confirmed a reduction of puff sizes at the primary ecdysone response loci 74EF, 75B, and Broad-Complex. Using BAC recombineering, we generated transgenic fly lines with insertions of eGFP-tagged ecdysone-inducible genes containing several EcR binding sites in large BACS at attP sites on chromosomes complementary to their endogenous locations. We found that 74EF, EcR, and BR-C genomic regions are sufficient to induce ectopic puffs. We confirmed EcR binding to both ectopic and endogenous puffs using immunohistochemistry. We used Chromatin Immunopreciptiation and Sequencing to finely map EcR binding in these regions. We plan on further studying changes in chromatin structure at these puffing loci with a Chip-Seq experiment focusing on chromatin marks associated with activation and repression of transcription.

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76 Convergent evolution of blue eye color in non-human primates

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Convergent evolution is the independent acquisition of similar biological traits in distantly related species. Japanese macaque (M.fuscata), black lemur (E.macaco fluvifrons and E.macaco macaco) and human are three primate species in which blue eye color is found in addition to the prevalent brown eye color. The aims of this study are (1) to assess the degree of eye color variation in Japanese macaques and lemurs; and (2) to investigate and compare the genetic basis of blue eyes in different species. Phenotypic variations were quantitized in Japanese macaques and black lemurs from photos taken by my collaborator and by the animal provider. Photos were pre-processed by Adobe Photoshop to select the iris area (i.e. the region in the eye with variable color) and pixels with the most frequently appeared colors were selected based on a color histogram. The mean of these

selected pixels were calculated and expressed in the hsv (hue, saturation, lighting) color space to represent the color of the iris. Overall, our result shows that saturation gives the best separation between blue and brown eye color, with brown eyes having significantly higher saturation than blue eyes.For black lemurs, iris color generally cluster into either the gray/blue or the brown group, while for Japanese macaques show a continuous iris color spectrum from blue to brown. Lemurs have wider range of hue and saturation than Japanese macaques. To investigate the genetic basis behind iris color variation, a region of 700 base pairs in eight Japanese macaques from the Primate Research Institute at Kyoto University homologous to the only known causal site of eye color variation in humans (rs12913832 in HERC2 gene) were sequenced and aligned. So far, we did not find any significant association between polymorphisms in this region and iris color variation. Ongoing study is aimed at sequencing the same region of the wild macaque fecal samples collected from Japan, because they show a wider range of iris color spectrum than the previous ones that we analyzed. In addition, whole genome sequencing was conducted for a female blue-eyed lemur. Contigs were constructed and blasted against the known lemur genes from ENCODE project. Substitutions specific to blue eyes will be identified.

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78 Methylation of SIRE1 retroelement family members in Glycine max

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SIRE1 is a young, relatively high copy-number retroelement that is among the most prevalent transposon families in the soybean genome, with between 1,000 and 2,000 full-length copies. It is a member of the Maximus lineage in the Ty1/Copia superfamily and is characterized by an intact, env-like ORF immediately downstream of pol. Such elements have been designated Sireviruses and are widely dispersed with moderate to high copy-numbers in Lotus, Trifolium, Medicago, Arabidopsis, Brassica, Mimulus, rice, maize, and other taxa. In G. max, most members are found in pericentromeric regions, having inserted into the morass of other transposons. Despite the observations that the ORFs of dozens of SIRE1 copies contain no stop codons or frameshifts and that the 5' and 3' LTRs of these copies are identical, full-length transcripts have not been detected. Transcripts of unknown biological function have been detected by RT-PCR of leaf and root tissue.
Cytosine methylation is known to epigenetically silence plant transposons, as has been experimentally demonstrated in the case of several plant elements. But detecting the collective and specific methylation of a large family of elements like SIRE1 may be less straightforward. Knowing the sequences of flanking DNAs, in a preliminary, small-scale analysis we designed primers to amplify the 5' LTRs of specific, recent SIRE1 insertions (LTRs 100% identical) with primers flanking a single MspI/HpaII site (CCGG) in the LTR. In all cases, digestion of genomic DNA with the methyl-insensitive restriction enzyme MspI, as opposed to its methyl-sensitive isoschizomer, HpaII, prior to PCR amplification resulted in the absence of amplicon(s) corresponding to the flanking fragments. Thus even the newest insertions are apparently silenced by DNA methylation.

Keywords: Retrotransposon, silencing, epigenetics, DNA methylation

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79 The role of spike-timing-dependent plasticity (STDP) in reorganizing cortical assemblies

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Neuronal assemblies, defined as sets of cells that fire in a stereotyped spatiotemporal sequence, are thought to have some role in cognitive processing and the representation of external stimuli. One possible mechanism for the formation and modification of assemblies is spike-timing-dependent plasticity, or STDP. Sparse intermittent associations of a synaptic input during spontaneous assembly activity are sufficient to produce long-term potentiation in a patch-clamped neuron in neocortex. Conversely, pairing while assemblies were quiescent resulted in long-term depression. We further examined the role of STDP in the reorganization of cortical assemblies by attempting to use an STDP protocol to potentiate two nearby neuronal assemblies. STDP may serve as one of the mechanisms by which assemblies are formed.

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80 Shifting the commonly accepted paradigm: incomplete inhibition of protein synthesis by clinically important antibiotics

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The ribosome is the protein synthesis machinery of the cell and hence indispensable to cell survival. This makes ribosomes an excellent target for antibiotics. Ribosomal antibiotics differ in their binding sites and mechanisms of actions, ranging from inhibiting peptide bond formation to preventing the binding of aminoacyl-tRNA during translation. A thorough understanding of the mechanism of action of the existing antibiotics is mandatory to help us develop novel, more potent drugs. In this project, we investigate the protein inhibition capacity of different classes of clinically important ribosomal antibiotics. Contrary to the common assumption that ribosomal antibiotics completely inhibit protein synthesis, residual translation was observed even in the presence of high concentrations of the drug. We use the Staphaloccocus aureus RN4220 strain, which closely resembles its pathogenic counterpart, to test the effect of different classes of antibiotics like chloramphenicols, oxazolindinones, lincosamides, macrolides, streptogramins, and tetracyclines. Bacteria were incubated with drugs at different concentrations and different times of incubation. Protein synthesis was followed by adding radioactive 35S-methionine to the medium and measuring the extent of incorporation. Our preliminary experiments showed that all the drugs tested allowed residual translation but to varying extents depending on the type of the antibiotic tested (1-5%). In order to obtain a deeper understanding of the 'resistant-proteome' characteristic of each of these drugs, we analyzed the radiolabeled proteins synthesized in the presence of high drug concentrations by two-dimensional gel electrophoresis. Our 2D-gels showed that while few proteins escape most of the tested antibiotics, several others escape only specific antibiotics. Collectively, our data indicates that even at high antibiotic concentrations proteins are still able to bypass the inhibitory effects of antibiotics. Our results potentially explain the discrepancy in the effectiveness of these drugs in different pathogens since the spectrum of escape proteins can determine the outcome of a drug-treatment.

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81 Characterization of the Subtelomeric Region of HC21p

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Telomeres are heterochromatic regions at the ends of all chromosomes composed of 6 base pair

tandemly repeated units (TTAGGG)n. Complicated subtelomeric regions are located proximal to the telomeric repeats. Both the telomeric and subtelomeric regions on the short (p) arms of human acrocentric chromosomes are poorly characterized.
Previous studies in our lab have identified a 6kb repeat in the subtelomeric region of HC21p which contains a weakly conserved tandemly repetitive 147bp sequence and a 580bp sequence found in the subtelomeric regions of all human acrocentric chromosomes that was isolated due to its abundance in cancer cells. We previously isolated a 523bp sequence (E9A) on HC21p which overlaps with the 580bp subtelomeric sequence. Using E9A as a probe the HC 21 lambda phage library was screened, positive plaques containing the 6kb repeat were purified and the DNA was isolated.
In this project, the 6kb DNA fragment present in the purified phages was cloned into the pUC18 vector and E. coli cells were transformed. The bacterial plasmids were purified and the insert was sequenced using the technique of primer walking. The 6kb fragment contains a cluster of 147bp repeats that spans a region of about 1265 bp. Additionally, the 6kb segment has two regions approximately 500bp long, located in close proximity to each other, that share 80% similarity. PCR primers that anneal to different regions in the 6kb consensus were designed to test the presence and degree of conservation of this repeated sequence on HC21p. Several clones containing the PCR products were sequenced, analyzed and compared to the 6kb consensus. Copies of the 6kb repeat are highly conserved (98%) on HC21p and bear 96% similarity with the subtelomeric regions contained in BACs of HC22 identified in the NCBI database. This is the first detailed characterization of an acrocentric p arm subtelomere.

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82 Organization of Satellite I on HC21p

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The Human Genome Project did not study the 10-15% of the genome consisting of heterochromatic regions. These uncharacterized, tandemly repetitive sequences are found in the centromeric and peri-centromeric regions of all chromosomes as well as the short (p) arms of the acrocentric chromosomes. My work involves studying the organization of the satellite I family, which consists of clusters of a 42 bp tandem repeat that is located on the p arms of all acrocentric chromosomes. I am specifically focusing on the structure of this sequence family in the distal p arm of chromosome 21 (HC21p).
We have been characterizing this satellite I region by designing primers that solely amplify the clusters of 42 base pair repeats found at the distal end of HC21p through the use of various primer design programs and repeated PCR reactions. We have isolated a number of satellite I sequences from the distal region, all of which contain substantial sequence heterogeneity; however, these PCR reactions also result in simultaneous amplification of the proximal satellite I region of HC21p due to the high degree of sequence similarity between the distal and proximal satellite I sequences. Currently, a new method of primer design utilizing monomer comparisons is being tested to target differences in monomeric repeats between distal and proximal satellite I. The goal is to devise PCR primers that will amplify only the distal HC21p satellite I cluster.
HC21p distal satellite I sequences will then be assayed for chromatin histone modifications in normal and malignant cells using ChIP and qPCR. The chromatin structure of this region of the genome is currently uncharacterized. Recent studies indicate that heterochromatic genome regions become transcriptionally active in malignant cells. We hypothesize that chromatin epigenetic modifications will thus be different in heterochromatic regions of normal versus malignant cells. Our work will test this hypothesis using the histone modifications H3Ac, H3K9me3, and H3K27me3.

83 Characterization of the Organization of Beta Satellite on HC21p

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The heterochromatic regions were largely left out of the Human Genome Project. We are studying the short arm of chromosome 21 (HC21p) as a model for understanding the structure of these genomic regions. A large number of different tandemly repetitive sequence families (satellites) are found on HC21p. satellite is one such sequence that is poorly characterized and found on HC21p as two distinct subfamilies, distal (and proximal (to the rDNA genes. The 7 family is organized as a 68 base pair repeat unit that is repeated tandemly to form a higher order repeat of about 2.0 kilobases. Recent studies have shown that while the transcription of a number of satellite sequence families is increased in many cancers, satellite transcription is reduced in cancer cells relative to normal tissues.
I have begun characterizing the 7 cluster using PCR. I needed to create primers that amplify only the satellite on HC21p with the entire genome as a template. Primers were designed from a short preliminary sequence of the region and clones obtained. From a few rounds of primer design, cloning, sequencing and data analysis, I have designed primers that are HC21p specific for the distal cluster. I am using the accumulated sequence data to design another set of HC21p specific primers more appropriate for qPCR. I will then use chromatin immunoprecipitation and qPCR to determine if there are chromatin structural differences between malignant and normal cells in the satellite regions of HC21p. I hypothesize that the chromatin of this region in normal cells will have histone modifications characteristic of active regions but have inactive modifications in cancer cells. Understanding this phenomenon will help in understanding the role that the 7 family plays in malignancy.

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84 Morphology of Cranial Musculature in Crocodile Shark, Pseudocarcharias kamoharai, and its Evolutionary Implications

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The crocodile shark, Pseudocarcharias kamoharai, is a poorly-studied, open-ocean shark found nearly worldwide. It is the smallest species among the 15 living forms of the shark order Lamniform that includes more well-known species such as the great white, mako, and sand tiger sharks. Wilga (2005, J. Morphol., 265:102-119) examined the pattern of cranial muscles in selected lamniform species and proposed a simple successive evolution of jaw musculature through lamniform phylogeny. However, Wilga's study did not include the crocodile shark, and the cranial musculature of the species has remained unstudied. Here, its cranial musculature and ligaments associated with jaw suspension are described in detail for the first time. The anatomical data are then mapped onto previously proposed phylogenetic trees to examine the evolutionary pattern of jaw morphology through lamniform phylogeny. My results show the evolution of characters associated with jaw suspension is more parsimonious in the morphology-based phylogenetic tree than the molecular-based tree. Additionally, the evolutionary scenario of lamniform jaws is found to be more complex than previously thought regardless of the tree used. In addition to preformed dissections, a computed tomographic (CT) scanner in Chicago's Children's Memorial Hospital was used to analyze internal anatomy.

85 Purification of Apolipoprotein A-1 For the Synthesis of Nanodiscs in the Structural Study of Bcl-2 family Membrane Proteins

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Nanodiscs are a novel model membrane system, ideal for the structural biology of the membrane proteins. Nanodiscs are discoidal phospholipid bilayers bounded by a membrane scaffold protein; such as Apo A-1 and its derivatives. The purification of apolipoprotein A-1 is essential for the synthesis of Nanodiscs. For protein expression, the apoA-1 cDNA was subcloned into the pET20b+ plasmid (Novagen, Madison , WI) to yield the plasmid construct, pNFX-pET20b (Provided by John Voss Ph.D. of UC Davis). The plasmid was propagated in the XL1 blue cells (for storage), purified using a DNA purification system, and analyzed by DNA sequencing (Sequencing facility at University of Chicago). After confirming the DNA sequence coding for the Apo A-1 protein, the plasmid was transformed into the expression host, BL21(DE3)pLys E. coli cells. The protein was over-expressed by induction using IPTG (isopropyl thiogalactoside) and confirmed by SDS-PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis) analysis. The protein will be further purified using a Hi-Trap affinity column chromatography. Nanodiscs will be formed by reconstituting the purified protein with different lipids that mimic the native membrane environment of the Bcl family proteins. Subsequently, Nanodiscs will be used to perform structural studies of the Bcl-2 family membrane proteins.

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87 Mapping the Binding Sites of FN3 Monobodies to the Fyn SH3 Domain

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Protein cascade pathways are vital to cellular functioning in humans. Fyn, a non-receptor tyrosine kinase involved in several such pathways, has been shown to be involved in tumor development and metastasis in many cancers. A part of the family known as Src-family kinases, Fyn contains an SH2 domain, an SH3 domain, and a kinase domain. When the protein is active, a binding site on the SH3 domain is revealed. Affinity reagents that bind to this particular site would make good biosensors because they would be able to detect when Fyn is activated. The goal of this study is to map the exact binding sites of previously isolated fibronectin III (FN3) monobodies E10 and G9, which are known to bind specifically to the Fyn-SH3 domain. To do this, a competition enzyme-linked immunosorbent assay (ELISA) was performed against 1F11, another FN3 monobody that binds nonspecifically to the SH3 domain site that is open when Fyn is activated. Results show that both E10 and G9 compete with 1F11 for this site; this makes them good candidates for development into biosensors that specifically detect the activation of Fyn.

88 Light effects on the Movement of Pennate Diatoms

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Diatoms, unicellular eukaryotic algae, occupy a variety of aquatic ecological niches. They utilize photosynthesis for food production, but what makes diatoms unique is their formation of a hard silica cell wall, and the constraints this gives to their motility. Based on previous research, this motility is dependent on light wavelength and intensity, which regulates the cells' direction changes. In this laboratory, we aim to determine the sensitivities of light wavelength and intensity of three diatom species: Stauroneis sp., Pinnularia sp., and Craticula sp. Epi-Illumination microscopy using fluorescent filters was utilized to determine light sensitivity of diatoms. Cells were irradiated with varying wavelengths and light intensities throughout the experiments, using OD (Optical Density) filters to adjust the intensity. The smaller the OD, the higher the intensity (more light is able to go through the filter). From the compiled data, Craticula is sensitive to blue (450 nm) and green (550 nm) lights at stronger intensities. Pinnularia is also sensitive to blue light (450 nm) at stronger intensities, but it is not as sensitive as Craticula. Stauroneis is slightly sensitive to green (550 nm). Strauroneis is sensitive to red light (650 nm), at low intensities with trailing end irradiation. Craticula and Pinnularia were not significantly responsive to red light (650 nm) and intensities. Pinnularia was not clearly responsive to green (550 nm), while Stauroneis was not clearly responsive to blue (450 nm).

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89 Gut microbiata affects circadian gene expression in peripheral tissues involved in host metabolism

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Many studies have been conducted to investigate the presence and role of the circadian gene network in organisms ranging from bacteria to humans. Data from experiments involving both rodent models and human subjects show that circadian genes play a significant role in metabolism. Additionally, recent studies suggest that gut microbiota play a crucial role in host metabolism. However, a clear link between circadian gene network, host metabolism, and gut microbiota has not yet been elucidated. Preliminary evidence from our lab suggests that in the absence of gut microbiota (germ-free; GF) circadian gene expression is altered. Liver samples from GF mice exhibited significant upregulation of circadian clock genes Cryptochrome 2, Period 1-3, and DBP, while Clock and Bmal-1 expression were downregulated when compared to mice with gut microbiota (specific pathogen-free; SPF). To further investigate, a study was designed to test the hypothesis that a reduction of gut microbes, via treatment with antibiotics, alters circadian clock gene expression in a similar manner to that seen in GF mice, resulting in arrhythmic behavior patterns. SPF mice were exposed to drinking water with or without antibiotics for 10 days. Activity was monitored pre and post treatment. At the termination of the experiment, mice were harvested every 4 hours over a 24-hour period; liver samples were collected and analyzed for circadian gene expression. Surprisingly, no differences in activity were exhibited between control and antibiotic-treated animals. Analysis of Period2 gene expression in liver showed significant downregulation at t16:00 when compared to controls, resulting in a slight phase shift and reduced amplitude. No other genes involved in the circadian gene network were significantly altered. While these results differ from those seen in GF animals, this data suggests that alterations in gut microbes do play a role in

maintaining circadian rhythm in peripheral tissues.

90 Human Chromosome 21p Subtelomeric Characterization

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The 10-15% of the human genome consisting of heterochromatic repetitive sequences has not been characterized. Our lab is determining the structure of the short arm of human chromosome 21 (HC21p) as a model for understanding the structure and function of heterochromatic genomic regions. Telomeres are heterochromatic and consist of a six base pair repeat (TTAGGG)n that together with shelterin proteins cap the ends of chromosomes to prevent fraying and end to end fusion. Juxtaposed to the telomere is the subtelomeric region consisting of a mosaic of degenerative telomere sequences, tandem repeats and low copy number sequences. While the subtelomeres of most chromosomes have been sequenced and annotated, these regions remain poorly studied on the p arms of the acrocentric chromosomes. Degenerative telomere repeats consist of the telomere repeat with one or two nucleotide differences, and our previous work showed that such sequences in the subtelomere of HC21p and HC13p are inverted with respect to each other since a single primer could amplify these regions in PCR reactions. We have now cloned and sequenced these PCR products from HC21 and HC13. Both chromosomes produced two distinct-sized PCR fragments of 675 bp and 1500 bp. Multiple clones of each fragment were isolated and sequenced from both chromosomes. In both cases, clusters of inverted degenerate telomere repeats flank sequences that are not found elsewhere in the genome. These sequences are highly conserved both on a single chromosome (99% identity) and between chromosomes 21 and 13 (99% identity), but the 675bp and 1500bp sequences do not themselves have significant similarity. Southern blot analysis and polymerase chain reaction techniques are now being used to determine the location of these sequences on the chromosome with respect to one another.

120 Self-Monitoring Glucometer Devices Versus GBP (Glucose Binding Proteins): Developing an Alternative Biosensor to Monitor Blood Glucose Levels in Diabetic Patients

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Diabetes is a major public health issue, and there has been much research into finding more affordable and accurate ways to monitor blood glucose levels in diabetic patients. Currently, self blood glucose monitoring systems (SBGMS) are most commonly used to monitor blood glucose levels in diabetic patients. However, recent research has shown that the enzymatic glucose oxidase (GOx) biosensor in the SBGMS has some problems such as interference from other substances. Also, its sensitivity may not be accurate enough for hypoglycemia. This can lead to inaccurate glucose level readings. Because of these issues, our work focuses on developing an alternative biosensor to GOx that can detect glucose through different means. The biosensor we are developing is found in E. coli and is known as the glucose binding protein (GBP). Unlike GOx, GBP is not an enzyme. GBP goes through an "open" to a "closed" conformation as it binds to the glucose molecule. In order to detect the conformational change, we use a fluorescent dye and attach it to the GBP. We observe, through the use of a spectrofluorometer, that the fluorescence intensity of the dye is inversely proportional to the glucose concentrations. To ensure a similar protocol to the test strip method used for the

SBGMS device, we apply our glucose standards onto filter strips and expose the filter strips to our GBP sensor. Each filter strip contains different concentrations of glucose that span across hypoglycemic, normoglycemic, and hyperglycemic levels. We then use the SBGMS device to take readings of our glucose standards. By collecting our data in triplicate, we are able to compare our data from both the GBP sensor and the SBGMS device. After performing a student t-test for the data, we calculated a t value of 0.9581 and a magnitude difference of 0.8228. Thus, the two different methods we used to measure glucose levels (one using a GBP sensor and the other using a SBGMS) gave significantly similar results. With this research, we are moving in a positive direction which will lead to alternative, more accurate, and more affordable ways of monitoring blood glucose levels for more than 220 million diabetic patients.

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121 Examining Peptidomimetics as Potential Inhibitory Agents for Leishmania

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Leishmania spp. are protozoan parasites, which are transmitted by the bite of sand flies, causing the infection leishmaniasis in humans as well as other mammals and reptiles. Each year close to two million people are infected worldwide (Parasites – Leishmaniasis, 2010). Leishmania pose serious health problems, yet the available treatment measures are not adequate, causing serious side effects (Morgenthaler et al., 2008). In search for more effective treatments, I tested the effect of three compounds -- synthetic peptidomimetics imitating bioactive peptides -- on Leishmania tarentolae, a species infectious to reptiles. Peptidomimetics are of interest since previous research points to their promising potential for being developed into effective drugs (Thayer, 2011). My specific goals were determining the peptidomimetics concentration dependency on parasitic Leishmania tarentolae cell viability and evaluating the response of cells introduced to the compounds at various time points during their growth cycle. The cells were evaluated by light and confocal microscopy as well as MTT viability tests. The obtained data allow me to conclude that two of the tested peptidomimetics have the potential for being developed into successful treatments for leishmaniasis.

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122 Eating and sleeping, is this a cure for Alzheimer's disease?

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The accumulation of misfolded amyloid proteins has proven to be the common link between neurodegenerative diseases such as Alzheimer's, Huntington's, and Parkinson's disease. According to previous studies done by numerous researchers, the diffusible beta sheet intermediates are in fact the most critical step in the prevention of Alzheimer's disease (AD) due to their high toxicity levels and function as precursors to amyloid beta
proteins. Research has been focused on the amyloid beta (22-35) portion of the single point wild type mutation because of its high toxicity level during the progression of AD. Orthomolecular compounds, such as melatonin and curcumin, will be combined with the amyloid peptide in various concentrations and times to test their preventative effects on the amyloid fibrils due to their neurotoxicity. The hormone melatonin is naturally secreted by the body and can not only reduce AD patient symptoms of insomnia but it can also disrupt A□ toxicity in the early stages of AD. Additionally,

curcumin is the key component of the plant turmeric. Attenuated Total Reflectance Infrared

Spectroscopy (ATR-IR) along with Ultraviolet visible spectroscopy (UV/Vis) and electron microscopy (EM) will be used in order to determine the structural confirmation and morphology on the pathway to fibril formation. This knowledge will help determine the specific mechanism used to destabilize the intermediate structures before they can form amyloid plaque and possibly lead to a cure and/or preventative. Our results suggest that both melatonin and curcumin decrease the rate of fibrilization.

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123 White Blood vs Cell Lines: Evaluating the Utility of Cell Lines Based on Changing Methylation Patterns

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This study evaluates the integrity of EBV-infected cell lines (LCL) as interchangeable and reliable models for genetic and epigenetic research based on differences in methylation levels. Changing methylation levels is the cell's mode of regulating the expression of certain genes. Previous studies have documented aberrant changes in methylation patterns in cultured cells due to various environmental and intrinsic biological factors. This study employed microarray assay to quantify methylation differences between Whole blood cells (WBC) and LCLs from 31 individuals. This was followed by additional analysis to annotate differentially methylated genes to compare changes in gene expression between WBC and LCL.

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124 Knockdown of important splicing factor sensitizes ovarian cancer cells to chemotherapeutic agents in vitro

Matthew Maggio, Ahmet Dirim Arslan, Lamiaa El-Shennawy, Xiaolong He, and William T. Beck
Faculty Advisor: William T Beck, Ph D.,
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While chemotherapy is the second-line of therapy for the treatment of epithelial ovarian cancer (EOC) after surgery, drug resistance constitutes a significant obstacle to achieving a complete response in many patients. There is a clear unmet need for new treatments for EOC patients. We have shown that polypyrimidine tract-binding protein (PTB) is frequently overexpressed and associated with malignancy in EOC. PTB knockdown via RNA interference significantly impairs EOC cell growth in vitro and in vivo, as well as invasiveness and colony formation in soft agar in vitro. PTB or hnRNP-I is a splicing factor that regulates alternative pre-mRNA splicing, and has been implicated in metabolic, cytoskeletal, and cell membrane changes in cancer cells. In this study, we used A2780 cell lines carrying doxycycline (doxy)-inducible PTB shRNA. We characterized stable transfectants of A2780 cells that carry shRNA against PTB and produced cells carrying a non-targeting control shRNA. In a 48 h MTT cytotoxicity assay, knockdown of PTB inhibited cell growth. When cells with PTB knockdown were treated with carboplatin or paclitaxel, drugs used as current standard of care in EOC, we observed 3- to 6-fold increases in drug sensitivity compared to the vector control. To rule out any drug-drug interaction (e.g., doxy-paclitaxel) in our assay, we evaluated the kinetics of the inducible knockdown system by western blot. We found that a 120 h doxy treatment was optimal to insure full depletion of PTB, and after doxy removal PTB suppression lasted 48 h more before recovering to its basal level. Based on those data, we performed all the cytotoxicity experiments within 48 h without exposing cells to both doxy and drug at once, and thereby avoiding drug-drug

interactions. Findings here support the idea that PTB and other splicing factors may be novel drug targets in the treatment of ovarian cancer.

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125 Knowledge, Attitude and Practice of Family Planning in a Slum Neighborhood in India

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The Indian government has undertaken several family planning initiatives in order to control population growth. A total of 130 women were surveyed for knowledge, attitude, and practice of government-sponsored contraceptive methods over the span of one month (June 22 – July 22, 2011) at Srimati Shardaben Chimanlal Lalbhai Municipal Hospital (Shardaben Hospital) in Ahmedabad, Gujarat. 62 newly delivered mothers in the post-natal care ward and 68 women in the gynecology outpatient department were surveyed. Knowledge of family planning was high and attitude towards family planning was positive but practice of family planning was low. The commonest method used was combined hormonal contraceptive pills. The commonest source of information regarding contraception was family and friends. Therefore, the author recommend that family planning education should work specifically to minimize stigma associated with open communication regarding contraception and its usage.

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126 Offloading, Thermal, and Vascular Responses in Individuals with Diabetes:Cycling with the CLEAR Cleat

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A minimal amount of study has been conducted concerning the practicality of off-loading footwear for diabetic patients with forefoot ulcerations. This study further explores the viability of the CLEAR cleat designed by Klein et al. in 2008 for such use. The design for the CLEAR cleat was based off of a Controlled Ankle Motion (CAM) walker. Truncated below the knee in the interest of patient comfort, the cleat uses an off-loading insole in place of a standard, unmodified insole. Utilizing the cleat on their right foot only, 7 diabetic subjects at-risk for forefoot ulceration cycled on a recumbent stationary bike for a total of 10 minutes. To account for fatigue, the subjects cycled for 5 minutes and then took a 15 minute break and then resumed cycling for 5 minutes. Measured from sensors embedded within the insole, data for peak pressure (PP), plantar contact area (CA), and pressure-time integral (PTI) was recorded. Temperature (C°) and perfusion level (tpu – total perfusion units) were also examined using a thermal camera and a laser Doppler probe, respectively. Two different conditions were examined: an unmodified running shoe and the CLEAR cleat. The CLEAR cleat yielded significantly lower ($p \leq .05$) values for peak pressure, contact area and pressure-time integral of the forefoot. Significantly higher ($p \leq .05$) values were observed for peak pressure, contact area and pressure-time integral of the rearfoot. Differences in midfoot pressure were observed, but these values are not significant at this time. Differences in perfusion and plantar temperature were also observed, but these values are also not significant at this time.This study further explored the viability of the CLEAR cleat for use with diabetic subjects at-risk of developing a forefoot ulcer. Results suggest that the CLEAR cleat is safe for use in such patients.

127 Amygdalin and its Potential Effects on the Progession of Alzheimer's Disease

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With Alzheimer's disease being an ultimately fatal, neurodegenerative disorder with no current cure, newer and more effective treatments are in need of development. Our work will include the conduction of studies on the glycoside, amygdalin (D-mandelonitrile-beta-D-gentiobioside), and its possible effect on the Alzheimer's beta amyloid peptide. Amygdalin, also known as vitamin B17, can be found naturally in apricot pits as well as in bitter almonds. An enzyme found in human small intestine, beta-glucosidase, is known to release cyanide that is present in amygdalin, leading to potentially toxic effects on the body. Infrared Spectroscopy as well as UV-Vis Spectroscopy will be utilized to determine the outcome of the potential relationship between amygdalin and the Alzheimer's beta amyloid peptide.

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128 The significance of plasticity in thalamostriatal synapses in Levadopa-induced Dyskinesias

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The gold standard to treat Parkinson's Disease (PD) is currently levodopa. (L-DOPA). However, a debilitating side affect is observed in patients: levodopa induced dyskinesias (LIDs). The mechanistic pathways responsible for LIDs are as yet unknown. Studies in dyskinetic animal models have shown that glutamatergic connections to the striatum are aberrantly altered. Studies in humans with LIDs have suggested that reducing glutamatergic activity in the striatum might be efficacious in regulating LIDs. This study attempts to answer the question: how are glutamatergic inputs into the striatum from the thalamus modified in rats that develop LIDs? Adult male Sprague-Dawley rats were unilaterally lesioned with 6-OHDA (MFB and SNc) or given a sham lesion. The lesion was confirmed with cylinder and vibrissae tests. The rats were treated for 3 weeks with L-DOPA (L-dopa and benserazide, each at 12.5mg/kg, i.p.) or saline. Abnormal involuntary movements (AIMs) were rated after injections 3 times a week. Animals were placed in 3 groups: severe AIMs, 6-OHDA/saline, and sham/saline. Once treatment was completed, rats were anesthetized, perfused, and their brains were cut at 60 µm. Sections were immunoreacted with vGLut2 antiserum, which labels glutamate transporter present at thalamostriatal terminals, and embedded for electron microscopy. Synapses were estimated using a physical dissector design; stereology. The total number of synapses was estimated in a striatal volume of 150-190 µm2 over 60 sections/animal. The total number of thalamostriatal synapses and their targets were quantified for the entire striatum.

Results showed a significance decrease of severe asymmetrical inputs ($p<0.05$) versus sham/saline control. There was a significant decrease in vGLut2-labeled axospinous inputs versus sham/saline control. Contrasting to previously hypothesized, thalamostriatal contacts in the dyskinetic striatum decreased, especially onto spines. These findings suggest that there is a specific loss of thalamic connections, which could affect glutamate regulation in the striatum.

129 Microstructural analysis of the effects of different sucrose and quinine concentration on the ingestive behavior of rats

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Examination of the microstructure of the licking behavior in rodents is an analytic technique that provides a unique opportunity to investigate the complex sensorimotor control system underlying the ingestive behavior of these animals. For over twenty years researchers have been using this method to accurately characterize the internal structure of the meal under a variety of conditions. It is now well known that licking behavior of rats ingesting a liquid diet occurs in bursts of licking separated from each other by intervals from 251-500 ms (inter-burst-intervals, IBIs), and that bursts are themselves organized in clusters of licking separated from each other by pauses longer than 500 ms (inter-cluster intervals, ICIs)1. Because the IBIs, unlike ICIs, are very brief in duration, some studies have considered them to be an artifact, such as missed licks, although others have suggested that they might represent a unique behavior, such as lateral tongue movements2,3. Nothing else has ever been reported about IBIs. The purpose of this experiment was to investigate the effects of stimulation by four different concentrations (1.25%-10%) of sucrose and three different concentrations (0.00125%-0.005%) of quinine added to a 10% sucrose solution on the licking behavior of nondeprived rats, with emphasis on the IBIs. Regardless of the solution consumed, the proportion of interburst intervals (pIBI) increased across the duration of the test session. We determined that increasing the concentration of sucrose has no effect on p(IBI), although the proportion of ICIs (pICI) was significantly decreased by this procedure. In contrast, adding quinine increases the p(IBI) as well as p(ICI). These data indicates that there is certainly a function for IBI, and that they are very unlikely to be random missed licks. It is not yet clear what the functional significance of IBI is, but it is possible that IBI may reflect either the development of satiation or the presence of an aversive component to the taste of the ingestate.

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130 Examining Recombinant Antibody Binding Affinities for Various Retinal Tissue Damage Biomarkers

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The rise in availability and use of high-powered lasers poses a dangerous threat to a pilots ability to operate aircraft if exposed to the eye. Whether retinal damage is accidental or intentional it is important to develop a rapid diagnostic test to asses their ability to safely operate their aircraft. Currently there is no such test available apart from examination by an opthamologist. Affinity selection of synthetic peptides representing the identified biomarkers of retinal damage will be conducted using a phage-display library displaying single-chain variable fragments. Single-chain variable fragments (scFv) are composed from the fused proteins of the heavy and light chains of variable regions in immunoglobulins. They retain their epitope specificity despite being removed from the remaining portions of immunoglobulins. ScFvs can be linked together via sulfide bonds and a constant Fc region to yield a divalent product opposed to the monovalent scFv. One could hypothesize that these products should lower the disassociation constant, meaning an increase in the affinity to the target. Preliminary results from western blots show that affinity with the di-scFv appears to be higher when directly compared to binding with the scFv version. This divalent scFv product could be very beneficial to one performing experiments such as an immunoassay, where efficient protein-ligand interactions are crucial.

131 APC loss disrupts epithelial morphogenesis in polarized colon cells

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The APC (adenomatous polyposis coli) tumor suppressor has been well characterized as an important player in colorectal tumorigenesis, primarily through regulation of the Wnt signaling pathway. However, there is growing evidence that APC is also critical in maintaining epithelial cell and tissue architecture, including apical-basolateral polarity, cell migration, cell differentiation, DNA replication and repair, and apoptosis. Previous work in our lab has demonstrated that APC is required for integrity of the mammary epithelium, perhaps through its interactions with various junctional and polarity complexes as well as the microtubule and actin cytoskeletal. In this study, we show that APC is required for normal epithelial polarization and morphogenesis in the colon using an in vitro model. Transient knockdown of APC in HCA7 cells resulted in mulitlayering on Transwell filters and disrupted cyst development in 3D Matrigel cultures. Additionally, intestinal tissues isolated from ApcMin/+ mice and humans with Familial Adenomatous Polyposis (FAP) demonstrated abnormal epithelial organization with perturbed basolateral and apical marker localization. Because these events were found to precede the translocation of □-catenin to the nucleus, an indicator of Wnt pathway activation, these data suggest that APC plays a fundamental role in epithelial morphogenesis and that the disruption of epithelial architecture by APC loss is an important preliminary, Wnt-independent, step in colorectal tumorigenesis.

133 In Vitro Characterization of a Magnetic Resonance Imaging Contrast Agent for Labeling Transplanted Islet Cells

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Type1 Diabetes is a disease characterized by the body's inability to produce insulin. Abnormal blood glucose levels can result in serious health problems, including nerve damage and cardiovascular disease. One developing therapy to treat Type 1 Diabetes in humans is islet transplant. Transplanting islets increases insulin levels and improves glucose regulation. However, the viability of the islets is unclear post transplantation. Therefore, contrast agents are used as a cellular label in order to track and evaluate the transplanted cells. Unfortunately, current contrast agents fail to achieve the desired reliability. Gadolinium (Gd3+) containing contrast agents are able to be detected in vivo using magnetic resonance imaging (MRI). MRI is preferred over other forms of imaging because it (1) provides better spatial resolution, (2) provides better soft tissue differentiation, (3) is not toxic to the body, and (4) works at greater depths. By using more reliable contrast agents in conjunction with MRI to track islets, health care providers will be able to determine initial engraftment rates, respond quickly and early if the islets fail and determine how the islet cell mass responds to therapeutic treatment. Optimal incubation conditions are crucial in order to maximize labeling and signal while minimizing toxicity. The work presented in this paper involves in vitro studies of the immortalized cell line, NIH-3T3, labeled with a novel membrane anchoring contrast agent, C3Gd-Lipo. Results indicate that C3Gd-Lipo is somewhat toxic to NIH-3T3 cells and some background Gd3+ may prevent an accurate reading of actual labeling. Even with such issues, C3Gd-Lipo exhibits extraordinary labeling efficacy when compared to the medical standard contrast agent. These results assist in moving C3Gd-Lipo into islet studies and in vivo imaging as a viable option for post-transplantation islet

labeling.

134 Spatial working memory in a mouse model of Obsessive-Compulsive Disorder

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Obsessive-compulsive disorder (OCD) is a common neuropsychiatric disorder that is characterized by obtrusive and reoccurring thoughts/images, and repetitive or ritualistic behaviors. OCD patients consistently exhibit impairments in cognitive tasks such as executive functioning, decision making, and working memory. Previous studies have shown that patients with OCD consistently make mistakes in the delayed alternation task (DAT) of spatial working memory, which is thought to measure the ability to recall and utilize recent events. In the DAT, a rule is learned and needs to be inhibited and reversed in order to maintain good performance. Recently, we developed and validated a drug induced mouse model of OCD-like behavior using RU24969, a serotonin agonist for the 5-HT1B receptor. In these studies, we have sought to characterize spatial working memory using this model and the DAT. After acclimation to the task, mice were pre-treated with RU24969, 8-OH-DPAT, a serotonin agonist for the 5-HT1A receptor, or saline. 8-OH-DPAT and saline were used as negative controls to ensure that any behavioral effects were due only to activation of the 5-HT1B receptor. After pre-treatment, mice were placed in a stationary T-maze in which the DAT was performed. As hypothesized, pre-treatment with the 5-HT1B agonist in both a high and low dose caused deficits in the DAT as opposed to the controls. Our results support our hypotheses and suggest a role for the 5-HT1B receptor in spatial working memory deficits in OCD.

135 Expression of Novel and Putative Antioxidative Proteins in the Mosquito Stages of the Malaria Model Parasite Plasmodium berghei

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Plasmodium spp. are the causative agent of Malaria. This protozoan parasite is transmitted between people by Anopheles mosquitoes. Taken up by the insect as part of a blood meal the parasite encounters an environment dramatically different from the human host. It is not well understood how the malaria parasite adapts to and develops under the hazardous conditions of the digesting blood meal. Using confocal microscopy we present the mosquito-stage specific expression and subcellular localization of four putative stress response proteins in the mouse malaria parasites Plasmodium berghei. All proteins under investigation belong to the thioredoxin superfamily: thioredoxin-1 (trx-1), thioredoxin-dependent peroxiredoxin-1 (tpx-1), 1-Cysteine peroxiredoxin (1-Cys prx) and the novel thioredoxin-like 469 (tlp-469). While trx-1 and tpx-1 show ubiquitous expression predicted cytosolic localization we found the 1-Cys prx is limited to the apical end of the developing ookinete. Surprisingly, tlp-469 while showing cytosolic expression seems to be localized to the subpellicular mircotubules that facilitate the highly polarized shape of the ookinete. Our findings give new insight into the protein expression and localization of three putative antioxidant proteins in the mosquito stages of the malaria parasite while the fourth protein may be associated with the microtubular network pointing to a novel function for a protein from the thioredoxin superfamily.

Abstracts - Biology

136 Avian Biodiversity in South Asia

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Research is being done to examine the affects of urbanization among a wide range of organisms. Not only does urbanization play a role in the expansion and growth favoring humans, but it also plays a role in the depletion or strain on avian species diversity in terms of species richness and abundance. The purpose of our study was to examine the effects of urbanization on avian biodiversity in rural and urban areas in three South Asian countires; Bangladesh, India, and Sri Lanka. These countries are considered to be among the most densely populated countries in the world which might show significant effects on avian diversity. Within those regions the study used six different habitat types for examination consisting of agricultural land, urban low density housing, urban medium density housing, urban high density housing, maintained park sites, and finally unmaintained park sites. The data was gathered via 10 minute visual point counts within 4 hours of sunrise over a 6 week period in May and June 2010. A total of 373 point counts were recorded and while looking at the whole picture of species richness and abundance among different habitats, the study examined 4 specific species of "indicator birds"; the Common Myna(Acridotheres tristis), House Crows (Corvus splendens), Rock Pigeons (Columba livia), and House Sparrows (Passer domesticus). A total of 2021 House crows, 654 House Sparrows, 174 Rock Pigeons, and 663 Common Mynas were found within the 6 studied habitats. Through data analysis we found that House Crows were the most abundant species among the four focus species in all six habitats and the total abundance of the four species was found to be the highest in maintained park sites and lowest in urban high density housing. Our least abundant species among the four in all six habitats were the Rock Pigeons. This study shows specific evidence that urbanization does have a negative effect on avian biodiversity.

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137 Fossil Vertebrates from the Basal Lincoln Limestone (Late Cretaceous) in Southeastern Colorado

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The basal Lincoln Limestone is a 95-million-years-old fossiliferous rock deposited under the Late Cretaceous Western Interior Seaway in North America. Over 4,500 identifiable vertebrate remains were collected from the stratigraphic horizon at a new fossil locality referred to the Table Mesa locality in southeastern Colorado. Twenty-nine marine vertebrate taxa are identified comprising 13 chondrichthyans (cartilaginous fishes), 14 osteichthyans (bony fishes), and two squamate reptiles (lizards). The proportions of common taxa at the Table Mesa locality are similar to another basal Lincoln Limestone locality located about 100 km west from there in which remains of bony fishes dominate.

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138 A phylogenetic analysis of Alouatta pigra inhabiting the Calakmul site of Campeche, Mexico
Imaging and Quantification of Microvascular Changes in Colon Carcinogenesis

Arpa Mukherjee, Sarah Ruderman, Mariano Gonzalez-Haba, Urszula Dougherty, Andrew Gomes, Jeremy Rogers, Vani Konda, Vadim Backman

Faculty Advisor: Vadim Backman
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The American Cancer Society reports colorectal cancer (CRC) as the 3rd leading cause of cancer deaths in the US. Even though colonoscopy is regarded as the gold standard for CRC screening, it is estimated that >20% of polyps, precancerous lesions, are missed during examination. Previously, the Backman Research group had shown in-vivo that an early increase in blood supply occurs within capillary networks and is detectable outside of the lesion. We wanted to investigate this phenomenon further to elucidate the mechanisms responsible for the observed increase in blood supply, and identifying the angiogenic events that occur during early carcinogenesis. For simulation of these events, a set of mice were injected with a carcinogen (Azoxymethane) that replicates many of the salient changes that occur with human sporadic colon carcinogenesis, while others received saline to serve as controls. Colonoscopies were performed to detect presence of lesions; if found, videos of the capillary networks were taken on or near the lesion. From these videos, images were extracted, and a MATLAB algorithm developed for analysis. The algorithm included elements to calculate vessel density, obtain vessel segmentation and diameter, and evaluate vessel network structure and spatial distribution. Mean vessel diameter was similar for both control and treated groups, but microvessel density increased significantly and there was a significantly higher standard deviation for the treated group. Fourier analysis also indicated a more uniform spatial distribution of vessel networks in control rather than treated groups. Additional image analysis techniques will be applied to identify more quantifiable parameters. The hope is that the image analysis program will be able to serve as a powerful screening tool that can detect and identify early signs of cancer, ensuring more time and success in its treatment.

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139 Identification of Proteins Involved in Anaphase Spindle Length Regulation

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Chromosome segregation is orchestrated by the mitotic spindle, a complex structure comprised of dynamic microtubules (MTs) and associated proteins. Proper functioning and regulation of the mitotic spindle is essential for eukaryotic cells, because improper chromosome segregation could result in cell death, tumorogenosis, or birth defects. The physical separation of the chromosomes occurs during anaphase, where the mitotic spindle elongates to pull the duplicated chromosomes apart. While several studies have uncovered mechanisms regulating spindle elongation, how the process is halted at the end of anaphase is yet unknown. Kinesin-8 is a highly conserved family of MT motor proteins, which possesses plus-end directed motility and plus-end depolymerase activity. Yeast cells lacking the budding yeast Kinesin-8 homolog, Kip3p, exhibit slightly longer buckled anaphase spindles. We previously used yeast molecular genetics and live cell fluorescence microscopy to more closely examine the role of Kip3p specifically during anaphase. Under anaphase arrest, spindles will normally stop elongating once they obtain a length appropriate for the cell diameter. In the absence of Kip3p, however, spindles continue to uncontrollably hyper-elongate, reaching lengths more than twice that of the cell. These results indicate that Kip3p plays a novel role during anaphase to actively restrain hyper-elongation. We next wanted to identify other proteins that could potentially work in a pathway with Kip3p to restrain spindle elongation during anaphase. We screened subset of 12 genes, whose knockdown mutants show spindle length defects, for hyper-elongation using the same anaphase arrest experiment. Preliminary data have identified Ylr456wp and Dip5p as potential candidates for involvement in restraining spindle length during anaphase. If further testing

confirms that spindles in cells lacking these proteins do in fact hyper-elongate when arrested during anaphase, then it is possible that these proteins are somehow involved in a pathway with Kip3p to control spindle length during anaphase.

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140 The Leucine-Responsive Regulatory Protein (Lrp) influences multiple symbiotic phenotypes in Vibrio fischeri SR5

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The Hawaiian bobtail squid Euprymna scolopes is born sterile, but its light organ is colonized by a single species of bacteria, Vibrio fischeri, within hours of hatching. This symbiotic relationship is essential to the survival of the squid, as the bacterial bioluminescence prevents the squid from casting a shadow while hunting in the moonlit sea, hiding it from predators swimming below. V. fischeri also benefit from the symbiotic relationship, as the squid host provides the bacterial population with nutrients and a competitor-free environment. Although V. fischeri make up less than 0.1% of the bacterial community in the Hawaiian seawater, selective mechanisms exist such that only certain strains of V. fischeri colonize the developing light organ. The V. fischeri/E. scolopes symbiosis is used as a model system to study the mechanisms underlying establishment of symbiosis, as such selective mechanisms are also important in the establishment of human-bacterial symbioses.

My research focuses on V. fischeri SR5, a strain that was isolated from the Mediterranean bobtail squid, and is also able to colonize E. scolopes in the laboratory. My work examines the genetic basis of luminescence regulation in V. fischeri SR5 and constitutes the first molecular examination of this strain. I performed a transposon mutagenesis screen for luminescence phenotypes, and isolated 26 strains (out of 9,000 screened) with insertions that significantly altered luminescence. Of these, only strains with an insertion into the gene lrp-encoding the Leucine Responsive Regulatory Protein-also displayed a squid colonization defect.

My current research aims to understand the molecular basis for the role of Lrp during the process of squid colonization. I am investigating hypotheses that the colonization defect results from Lrp regulation of bacterial motility and/or its regulation of diffusible signal molecules (autoinducers) utilized in the control of luminescence and colonization pathways.

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141 Effective Induction of Chondrogenic Differentiation of Mesenchymal Stem Cells Using a novel Combination of Sox Transcription Factors and Bone Morphogenetic Proteins

Azfar Basunia, Alice Jo, Richard Rames, Gaurav Luther, Joseph Lamplot, Eric Wagner, Martin Leland, Hue Luu, Rex C. Haydon, Sherwin Ho, T.-C. He
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The University of Chicago

Diseases of cartilaginous tissue (eg osteoarthritis) pose unique clinical challenges due to the avascular nature and poor self-healing capabilities of human cartilage. Mesencymal Stem Cells (MSCs) are pluripotent stem cells with an ability to terminally differentiate down a chondrogenic or osteogenic pathway, involving multi-step processes controlled by a variety of growth factors, signaling molecules, and transcription factors. The ability to terminally differentiate MSCs into chondrocytic cells, and subsequently implant these chondrocytes into cartilaginous defects, is

of significant therapeutic value. In this investigation, we demonstrate the successful induction of MSCs into chondrocytic progenitors using a combination of Bone Morphogenetic Proteins (BMPs) and Sox Family Transcription Factors. Murine mesenchymal stem cells (C3H10T1/2 and iMEFs) were transfected with recombinant adenoviruses expressing chondrogenic transcription factors (AdSox5, AdSox6, AdSox9), signaling molecules (AdBMP2, AdBMP7) and negative control (AdRFP). A Collagen X-luciferase reporter gene was subcloned into the two MSC lines to detect hypertrophic (late stage) chondrocytic stage of MSC differentiation. Each MSC line was then infected with different combinations of chondrogenic adenoviruses and Col-X reporter activity was determined. Col-X Luciferase reporter assay revealed that (1) AdSox5,6 and 9, (2) AdBMP2 and AdSox9, and (3) AdBMP7 and AdSox9 were the most potent inducers of chondrogenic differentiation in both C3H10T1/2 and iMEFs MSCs. Alcian blue staining and RT- PCR was used to demonstrate production of chondroid matrix markers typical in chondrocytic cells. Alcian blue staining showed increased levels of chondroid matrix among the treatment groups while RT-PCR confirmed increased expression of the chondrogenic markers COMP, Aggrecan, and Col2a1 in treatment groups receiving the chondrogenic cocktail. Moreover, IHC staining for Col2a1 (an important chondrogenic marker) production showed a significantly greater activity in our treatment groups. Finally subcutaneous injection and subsequent histology was used to demonstrate successful chondrogenic differentiation of our MSCs in vivo.

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142 Effects of Peptides on Leishmania tarentolae cells

Saman Misbah
Faculty Advisor: Dr. Marjorie Jones, Illinois State University
University of Illinois at Chicago

Leishmaniasis is a disease that affects a large population. Research is being done to obtain better medicines to treat this disease. Peptides are being tested to treat Leishmaniasis. Three specific peptides were tested with Leishmania tarentolae cells to see if either one could inhibit cell growth. The resulting growth curves were then compared to control cells. The most inhibitory peptide was then tested at different concentrations to see the least concentration that was effective.

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143 Cortical Degeneration and Contusion Size is attenuated in Calpain-1 Knockout Mice Following a Controlled Cortical Impact (CCI)

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Abstract: Recent research has indicated that calcium-activated neutral proteases– calpains, are essential mediators of cell death in chronic and acute neurodegenerative disorders. Calpain activation has been linked to Traumatic Brain Injury (TBI)-induced pathology as well. Specifically, two isoforms of calpain exist in the brain, calpain-2 and calpain-1, yet the specific roles of each enzyme following TBI are not well understood. Using calpain-1 knockout mice (KO), the current study examined the specific role of calpain-1 in neural degeneration following the controlled cortical impact (CCI) rodent model of TBI. Both Calpain-1 KO and wild type mice received a unilateral CCI over the forelimb sensorimotor cortex. Mice were sacrificed three days post-CCI. Their brains were

sliced coronally and stained with Nissl, Fluoro-Jade C, and TUNEL. Our results demonstrate that the calpain-1 KO mice exhibit significantly smaller contusions, less degenerating neurons surrounding the CCI, and less apoptosis. These finding suggests that calpain-1 is a mediator of cell death via apoptosis and the down-regulation of this enzyme following a TBI may be neuroprotective in vivo.

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144 Utilizing Conductance Assay to Study Efficacy of Flavonoid Compounds on ΔF508-CFTR Recovery

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Faculty Advisor: Robert J. Bridges, Ph.D.
Rosalind Franklin University and Medical School
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Cystic Fibrosis (CF) is a life threatening genetic disease affecting 1 in every 3,200 Americans. Flavonoids are plant-derived heterocyclic compounds that have been found to potentiate mutated, inactive Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) protein channels that cause CF. In this investigation, Fissure Rat Thyroid (FRT) cells with inhibited chloride channels are treated in either a DMSO control or a 951 corrector assay prior to the addition of a flavonoid compound. The electrical conductance of chloride channel activity is measured following the addition of agonists (forskolin and PG01) and inhibitor (Inh 172) using a transepithelial current clamp. Conductance values are used to evaluate the effectiveness of the flavonoid compounds on the CFTR protein, where a higher conductance corresponds to a more active CFTR channel. Flavonoids yielding the highest conductance values are tested at different concentrations to determine the efficacy and potency of each compound. Results indicate that cells treated in a 951 corrector have an increased conductance compared to cells treated in DMSO. Electrical conductance varies in dose response treatments of FRT cells. This data is useful in the development of more effective cystic fibrosis therapies tailored specifically to improving the function of the CFTR protein.

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145 Offspring size vs. number trade-off in Daphnia pulex: Insights into population dynamics

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DePaul University

Populations experience a range of population dynamics, from logistic growth to high amplitude predator-prey cycles to chaos. These dynamics can occur in response to a range of factors including those extrinsic to the population (e.g., food quantity and quality, predation, disease) or by intrinsic structures of populations (e.g., age, stage, or size structure). In this study population dynamics of Daphnia pulex were observed after manipulating the size vs. number of offspring tradeoff. Two experiments were conducted, one with a decoupled food-source, preventing a coupled interaction between D. pulex and its algal food; and a dynamic-food source (i.e. coupled feedback experiment whereby D. pulex populations interact with the population of its algal prey). Altering the size vs. number of juveniles tradeoff was achieved by replacing small juveniles (length<1.2mm) with the number of adolescent sized Daphnia (length1.2 to 1.4mm) that represent the same total ingestion pressure on the algal prey population. As a result of the manipulations, adults dominated these populations, although at lower population densities than their controls. In these manipulated populations at low densities, a low quality but high density of algae was observed. Conversely, the decoupled experiment resulted in a higher rate of reproduction than control, and high survivorship. We will discuss the relationships between Daphnia population structure and population dynamics

with algal dynamics from the results of the coupled feedback experiment. Our results may contribute to our understanding of the role of herbivore population structure as a mechanism by which zooplankton and algal populations interact in aquatic systems which result in their appearance as either turbid or clear.

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146 Analysis of the Histone Modifications on Human Chromosome 21p

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Department of Biology, Loyola University Chicago

While the Human Genome Project provided scientists with an unprecedented amount of information on the molecular sequence of human genomic DNA, the project excluded the 15% of the genome that is heterochromatic and contains highly repetitive sequences. Recent evidence suggests that heterochromatic regions play an important role in gene regulation. Also, transcriptional activation of normally heterochromatic regions of the genome has been observed in a number of forms of cancer. Our lab is characterizing the structure of the short arm of human chromosome 21 (HC21p) as a model for understanding the structure and function of heterochromatic genome regions. HC21 is one of five acrocentric chromosomes in the genome whose heterochromatic short arms share many of the same repetitive sequences and have very similar organizations. The result of this high sequence similarity amongst the acrocentric chromosomes is non-homologous interactions which predispose the chromosomes to non-disjunction. The specific region that we are looking at on HC21p is the chAB4 duplicon, a 200 kb repetitive element found on the acrocentric chromosome p arms. We are determining whether this region has histone modifications characteristic of euchromatic or heterochromatic domains. This analysis is being done by ChIP-qPCR using PCR primers that we designed to be specific for various regions within chAB4. The histone modifications on chAB4 are being characterized in HC21p in both normal and transformed cell lines. We hypothesize that the normally inactive heterochromatic regions of the chAB4 duplicon will have histone modifications characteristic of euchromatin in cancer cell lines. Initial results indicate that chAB4 has both euchromatic and heterochromatic regions in normal cells and that the heterochromatic portions display euchromatic characteristics in transformed cells. This information could be used in the identification of cancerous cells and to help explain the role that expression of repetitive sequences plays in creating the transformed phenotype.

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147 Investigation of a Putative Oxidative Sensing Protein in the Malaria Parasite Plasmodium

Kyle Haselton, Katie Fell, and Emily Shulte
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Department of Biology, Loyola University Chicago

The World Health Organization estimates that 3.3 billion people, half of the worlds population, live in areas where malaria is transmitted. Malaria is also the most deadly vector born infectious disease in the world. Plasmodium, the organism that causes malaria, utilizes two hosts during its life cycle, mammals and female Anopheles mosquitoes. Anopheles uses reactive oxygen species (ROS) and reactive nitrogen species (RNS) as a defense against the Plasmodium invasion. On going research aims to characterize how PBANKA_061050, a putative glutathione peroxidase, participates in the survival strategy of Plasmodium during host transmission. PBANKA_061050 and its ortholog in Plasmodium falciparum have been identified as possible oxidative stress sensing proteins. Both proteins show high similarity to Gpx3, an oxidative stress sensor in yeast. Gpx3 functions by oxidizing

transcription factors, which then up regulate other proteins that protect against ROS. We hypothesize that PBANKA_061050 functions by a similar mechanism. P. falciparum is difficult to study in the mosquito stages, therefore Plasmodium berghei, which infects rodents, was used as a model.

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148 Isolating Microsatellite DNA Loci of Hoplias Microlepis

Vinh Vu, Jane Christman, Windsor Aquirre
Faculty Advisor: Windsor Aquirre
DePaul University

Microsatellites are short, tandemly repeating sequences of DNA found in the non-coding regions of the genome. Because of their high mutation rates and abundance in the Eukaryotic genome, they have been used in many areas of study including population genetics and conservation biology. However, the main drawback for their use is the need for taxon-specific primers for PCR amplification. This project focuses on isolating the microsatellite loci for primer development in the large, South American, predatory fish species Hoplias microlepis. Traditional cloning and genomic based methods were used to isolate the microsatellites. H. microlepis is an ecologically and commercially important freshwater fish from Western Ecuador currently facing threats from anthropogenic sources. This species has been insolated for millions of years and has a very limited range, occurring only in western Ecuador, Panama and Costa Rica. No studies have been conducted to test genetic relatedness or diversity among population in this region. This project will set a foundation for future studies on population genetics of fishes from Western Ecuador.

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149 Diversity of Mitochondrial Haplotypes of Three-Spined Stickleback, Gasterosteus aculeatus, in Cook Inlet, Alaska

Rupali Padhiar
Faculty Advisor: Windsor Aguirre
DePaul University

The three-spined stickleback fish, Gasterosteus aculeatus, demonstrates remarkable morphological and genetic variation throughout its range. The Pacific coast of North America contains two mtDNA lineages, the Euro-North American Clade (ENAC) and the Trans-North Pacific Clade (TNPC). The TNPC haplotype group likely evolved in stickleback that were isolated in the Sea of Japan and spread across the Pacific to North America where it occurs at low frequencies. The ENAC haplotype group is the more common clade found in Europe and North America. There is not much known about the level of genetic diversity within the haplotype groups for the three-spined stickleback. The main objective of this study is to compare genetic diversity within the ENAC and TNPC haplotype groups for anadromous and freshwater stickleback populations in Cook Inlet, Alaska. The mtDNA control region was examined and DNA sequences were aligned and edited using Bioedit, Chromas Lite, and Sequencher. Phylogenetic analysis of mtDNA haplotypes was performed in MEGA. Haplotypes were identified based on restriction enzyme assays and DNA sequencing.

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150 Anti-Mycobacterial Agents From Putatively Inducible Biosynthetic Pathways Of Marine Actinobacteria.

Saba Rezaeian, Xiaomei Wei, Urszula Tanouye, Skylar Carlson, Chang Hwa Hwang, Minjee Kim, Sanghyun Cho, Scott Franzblau, Brian T. Murphy

Faculty Advisor: Brian T. Murphy
Department of Medicinal Chemistry and Pharmacognosy1, Center for Pharmaceutical Biotechnology,Institute for Tuberculosis Research, College of Pharmacy, University of Illinois Chicago

In 2008 the World Health Organization estimated 1.8 million deaths as a result of tuberculosis infection (TB), while one-third of the world's population is infected with the disease. Given that approximately eight million new cases are reported annually and that infections caused by multidrug- and extensively drug-resistant strains of M. tuberculosis (MDR- and XDR-TB) are difficult to cure, new drug scaffolds are in serious need. As part of our program to discover novel classes of antibiotics to treat TB infections, we isolated a diversity of actinomycetes from the Massachusetts coastline and Lake Michigan and co-cultured each with the aquatic pathogen Mycobacterium marinum. Using actinomycete-specific isolation methods, we were able to cultivate over 30 strains from Lake Michigan and several more from MA. We hypothesize that since opportunistic mycobacterial pathogens are known to readily exist in the marine environment, and that the unique nature of their cell wall (conserved among Mycobacterium) provides a greater variety of molecular targets, the presence of M. marinum in co-culture with actinomycetes would more accurately mimic ecological pressures and guide us toward the discovery of selective anti-mycobacterial agents from putatively inducible actinomycete biosynthetic pathways. One Lake Michigan strain in particular, B006, exhibited potent inhibition of M. tuberculosis growth. These results in addition to the cultivation methods used to isolate the actinomycetes, will be presented.

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151 Comparison of Phylogenetic Trees Based on Taxonomy and Amino Acid Sequence of Photoactive Yellow Protein

Penelope Burikas
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The University of Illinois at Chicago

Phylogenetics is the biological field that rebuilds evolutionary history by constructing phylogenetic trees. Phylogenetics also studies the patterns of relationships among organisms. Phylogenetic trees are diagrams that show lines of evolutionary descent of different species. Numerous areas within the field of biology utilize phylogenetic trees, including forensics and developmental biology. In order to create a phylogenetic tree, one must use a multiple sequence alignment program. The algorithms that these programs use are unique to each program and thus each program will produce different trees. Since there is only one correct line of evolution, only one of these programs can create the suitable tree or the tree that is the closest to the truth. Since trees are used to obtain more information about the organisms being used, trees that are inaccurate can lead to inappropriate assumptions. Four programs will be studied in this project: Clustal W, Kalign, MAFFT, and T-Cofee. The trees that these four programs produced were examined and variations were found between all four of the trees.

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152 Lipid-Protein Interactions in Hepatitis C Virus Replication

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Phosphatidylinositol 4-kinase III alpha (PIK4A) is an essential cellular cofactor for replication of hepatitis C virus (HCV). It co-localizes with viral replication complexes and is required for their proper formation. However, the mechanism through which PIK4A and its products, PI lipids phosphorylated on the fourth carbon (PI4P), act in viral replication has not yet been characterized. We examined whether viral proteins interact with PI4KA or its product, PI4P, to better understand the function of PI4K in HCV replication. PIK4A co-immunoprecipitates with the HCV non-structural protein 5A (NS5A) both in vivo and in vitro. Both NS5A and the HCV RNA-dependent RNA polymerase, NS5B, were found to specifically bind certain PI lipids. NS5A binds both mono- and bi-phosphorylated PI lipids, while NS5B preferentially binds mono-phosphorylated PI lipids, including PI4P. NS5A also directly enhances PIK4A kinase activity in vitro, and stimulates PI4P production in vivo. These data suggest that HCV NS5A may recruit PIK4 to generate PI lipids at sites of replication. These PI lipids are then bound by a subset of HCV proteins to mediate membrane interactions and replication complex formation. Currently, we are focusing on identifying the domains of NS5A and NS5B responsible for lipid binding, and characterizing other proteins which could play a role in membrane rearrangements for the formation of the viral replication complex.

Chemistry

19 Testing New Grounds: Making Mutated Peptides Glow and Testing for an Amygdalin (Vitamin B17) Treatment for Alzheimer's Disease

Stephen Pena
Faculty Advisor: Sandra Chimon-Peszek, Ph.D.
DePaul University

As the human life expectancy increases and degenerative diseases, like Alzheimer's disease (AD), become more prevalent, new research experiments are being sought out to aid in the prevention of the diseases as well as advance the search of treatments. Alzheimer's disease, a neurodegenerative disorder due to irregular cleavage of the □-amyloid (A□) peptide by the Amyloid Precursor causing the protein to misfold into amyloid fibrils, has previously been researched only on the 16-21 peptide region ("KLVFFA" region). In examining the hairpin region, 22-35 sequence, it is discovered that toxic fibril formation occurs and promotes Alzheimer's disease. In working with a mutated form of the Alzheimer's beta Amyloid peptide, it is determined that fibril formation occurs about concurrently as the other wild type mutations; future analysis and testing of this mutant peptide will allow fluorescent dye color molecules to attach to each peptide to monitor emission of fluorescence from varying color dyes; indicating fibrillization of the peptide. In also working with "Amygdalin" (D-mandelonitrile-□-D-gentiobioside) in both its cyanide-containing glycoside state as well as a state of the glycoside without the cyanide, the determination of the effects it has on the Alzheimer's beta Amyloid peptide will be seen. The methods being used to identify any possible peptide changes or amygdaline effects are UV-Vis Spectroscopy, Infrared Spectroscopy, and Cell Culture analysis.

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20 Miracle Berry: A possible preventative for Alzheimer's Disease? Type II Diabetes?

Rana Sweis, Illysha Minor, Nadrine Omar, Shawna Liszewski
Faculty Advisor: Sandra Chimon Peszek , Ph.D,
DePaul University

Miracle Berry (Richadella Dulcifica) is a taste-modifying shrub native to West Africa. The berries on this schrub contain Miraculin, a protein responsible for making bitter and sour foods perceived to taste sweet. Although the molecular structure has been understood, it is still unclear how Miraculin interacts with taste buds. Once this mechanism is understood, the use of this natural sweetener could satisfy individuals on low sugar diets. Ongoing current research has focused on studying beta-amyloid peptide through the use of and Ultraviolet Visible (UV-Vis) spectroscopy techniques and Attenuated Total Reflectance Infrared (ATR-IR) The Wild Type (WT) beta peptide A□ 22-35 mutant is the most commonly occurring form of Alzheimer's. We are first going to add the orthomolecular compounds to the WT and then move into different mutations. . We are attempting to apply the ATR-IR bioanalytical approach to study the mechanisms of Miracle Berry. Once we can better understand this compound and its effects, the use of this natural sweetener could be used as a sugar substitute for people living with diabetes and low sugar diets. Miracle Berry is an orthomolecular species, along with Curcumin. Curcumin is an active nutrient in Turmeric, which is derived from the (underground stems) of Curcuma longa. Curcumin is thought to exhibit strong antioxidant properties where it acts to limit the accumulation of damaging plaque and preserve memories helping minimize or eliminate Alzheimer's. Miracle Berry and Curcumin were combined with the amyloid peptide in various concentrations and times to test their preventative effects on the amyloid fibrils and further help us understand the effects they will have on Alzheimer's fibrilization.

21 Is the Prevention for Alzheimer's Already in Your Medicine Cabinet?

Jennifer Sepe, Brandon Polasky, Chuck Wenk, Luck Mockaitis, Sandra Chimon-Peszek
Faculty Advisor: Sandra Chimon-Peszek Ph.D.
DePaul University

Alzheimer's disease (AD) is characterized by the excessive production of amyloid protein and deposition in senile plaques, which are mainly composed of 1-40 amyloid □-proteins (A□40). Various natural mutations of Alzheimer's □-amyloid have been shown to promote an early onset of AD. Recent studies have shown that the Wild Type mutation (A□22-35) enhances neurotoxicity of 40-residue A□(1-40). Our interest is to use this shorter (14 residue) fragment of the A□. Silymarin, a mixture of flavonolignans extracted from the seeds, fruits, and leaves of Milk Thistle, has long been used for the treatment of hepatic disorders, most commonly for liver diseases. Many studies have investigated the inhibitory effects of various flavonoids on A□ aggregation and neurotoxicity. As a result, silymarin, being a mixture of flavonolignane diastereomers and having already been proven safe for human consumption, might be capable of having a preventative effect against the A□-dependent phenotypes of AD.
To identify silymarin as a potential therapeutic agent for the treatment of Alzheimer's disease, various Attenuated Total Reflection Infrared Spectroscopy, ATR-IR,and Ultraviolet Visible Spectroscopy, UV-Vis, assays will be developed to identify and rank whether or not the mixture of flavonolignane diastereomers could inhibit aggregation of A□. To carry out this test, A□ will be incubated with the test compound silymarin at a controlled temperature for a set amount of hours followed by ultrafiltration in order to separate the monomeric A□ from its aggregates. Aliquots of the ultrafiltrate will be analyzed for monomeric A□.

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22 The Electrocaloric Effect and the Relationship Between Homogenous Polarization Switching and Phase Transitions in Ferroelectrics

Maimon Rose
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We use molecular dynamics with a first-principles-based shell model potential to study the electrocaloric effect (ECE) in lithium niobate. The electrocaloric effect has potential for use in solid state refrigeration devices. We believe the results of this study are applicable to a wide range of materials, not limited to lithium niobate. The effects of pressure, temperature and applied electric field on the ECE are investigated. We find that the ECE is greatest about the transition temperature (Tc) from the spontaneously polarized ferroelectric state to the non-polarized paraelectric state. We observe a linear dependence above Tc on applied electric field strength of a quasi-transition between ferroelectric and paraelectric phase. Our study further shows applying an electric field in the opposite direction of the spontaneous polarization reveals a similar linear dependence on electric field strength of homogenous polarization switching which falls on the same line as the aforementioned quasi-transitions. We propose an explanation for this relationship based on the energy potentials of individual atoms and their behavior under an applied electric field.

23 Identification of the Pharmacophore of Maoecrystal V

Berkcan Akpinar, Kiel Lazarski
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Recently, Zheng and co. discovered that diterpenoid natural product maoecrystal V demonstrates high levels of selective cytotoxicity [IC50 = 60 nM] towards the HeLa cell line derived from cervical cancer. Similar to other natural products utilized in medicine, maoecrystal V's desirable cytotoxicity suggests it is a viable candidate for chemotherapeutic development. Since there have been no formal structure-activity relationship studies performed on this compound, an identification of the bioactive portion, the pharmacophore, is crucial to streamlining potential drug development. We propose that the portion of the compound responsible for biological activity is the bicyclic carbon core containing the electrophilic enone functional group. Here, we report progress towards the synthesis of the proposed pharmacophore achieved through various high-yielding transformations starting from commercially available mono-protected 1,4-diketocyclohexane.

24 Structural Crystallization of the E.Coli Copper and Ferric uptake regulator proteins (CueR and Fur)

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Faculty Advisor: Dr. Thomas V. O' Halloran
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Transition metals have played an essential role in the structural composition of biological systems. D-block metals, namely iron and copper, serve as key cofactors for critical protein functions. The intracellular concentrations within such systems must be kept at optimal and highly regulated levels. To normalize the increases in metal content, cells employ metalloregulatory proteins that sense specific metals and control transcriptional functions. These specialized systems are of great importance to the homeostatic stability of each cell. Currently, very little is known regarding the structure and mechanism of these proteins, including CueR and Fur. My research project is focused on the crystallization of both CueR and Fur/DNA complexes in hopes of better understanding their structural function as transcriptional regulators.
My current work in this field is based on previously reported findings of bacterial metalloregulators in the O' Halloran lab. Currently, researchers in the O' Halloran lab have determined a crystal structure of CueR with DNA and a crystal structure for the zinc up-regulator, Zur/DNA complex. These findings lay the foundation for mutants of those receptors, including the metal free form of CueR (apoCueR), and other members of the same family such as Fur. My own work will optimize the empirically successful hits and conditions in order to facilitate our understanding of new and more diverse classes of proteins.
Experiments with these proteins utilize novel techniques and methods, including hanging drop crystallization, high throughput screening to identify novel crystallization conditions, and extensive protein isolation. I am now currently designing novel DNA sequences to stabilize the protein-DNA interactions and have had great successes in the process.5 Through these methods we can ultimately gain a better understanding of these proteins and their function as transcriptional regulators.

25 Controlling Bacterial Growth Using a Lactonase Enzyme to Manipulate Quorum Sensors in the Environment

Susan Duyar, Sylwia Rychtarczyk, Monica Micek
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Pseudomonas aeruginosa is a pathogenic bacterium that causes hospital acquired infections in immunocompromised individuals, such as those with cystic fibrosis and burn victims (Japoni et al). It has also been shown to cause damage to water pipelines due to biofilm accumulation. P. aeruginosa produces, secretes, and responds to N-Acylhomoserine Lactone (AHL) type quorum sensors in order to regulate gene expression of biofilm production and virulence factors. A naturally occurring enzyme, AiiB, a lactonase that degrades AHL type quorum sensing signals, can potentially be used to control bacterial growth in both clinical and environmental settings. We want to use AiiB to reduce concentrations of AHLs in the environment which should reduce biofilm production as well as expression of virulence factors. In order to develop AiiB as a possible treatment we must test the effectiveness of the enzyme in reducing the concentration of AHLs in the bacterial environment. To do so, we will run two different bioassays. The first one is an O-nitrophenyl-B-galactosidase assay which is used to detect changes in concentrations of AHLs in the environment in response to AiiB as compared to samples without AiiB treatment. The second is a Thin Layer Chromatography (TLC) assay which is used to examine substrate preference of AiiB by separating the various sizes of AHLs (based on carbon tail length) in samples treated with AiiB and without AiiB. Thus far, we have only run the TLC assay with positive and negative controls and no AiiB in order to perfect the technique and render future results meaningful. We have obtained somewhat reproducible results; however, they continue to show spurious data which we are trying to eliminate.

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26 Prodrug Synthesis of Inhibitors of the Cholesterol Biosynthesis Pathway in Streptococcus Pneumoniae

JC Jacobs, Richard Silverman, Mizuki Watanabe, Soosung Kang, Ellen Speers, Thomas S. Leyh
Faculty Advisor: Richard Silverman, Ph.D.
Northwestern University, Albert Einstein College of Medicine

Streptococcus pneumoniae is a common pathogenic bacterium and the primary cause of many infections such as pneumonia, acute sinusitis, otitis media, meningitis, bacteremia, and many others. This deadly pathogen kills over one million people per year, mostly in developing countries. In many countries, including the United States, vaccination programs have been used to control this pathogen. Over time, the pathogen has, however, mutated, and strains have been found that are resistant to the streptococcus vaccines. Even vancomycin, the antibiotic that is used as a "last resort" to treat these infections, has been showing weaknesses against these new strains of S. pneumoniae. Therefore, a new approach needs to be found to combat this deadly organism. The pathogen requires isopentenyl diphosphate (IPP) to survive in human lung or serum. IPP is produced via the mevalonate pathway in three ATP-dependent steps, catalyzed by GHMP family kinases, and is an important building block for isoprenoids. Leyh et al. showed that diphosphomevalonate analogs bind to an allosteric site on mevalonate kinase to inhibit the first step in the pathway, while simultaneously mechanistically inactivating the final decarboxylation step of the pathway. This double inhibition is selective for the mevalonate pathway in S. pneumoniae and makes the target compound a possible potent antibiotic against this deadly pathogen. Due to its charged nature however, diphosphomevalonate analogs are unable to penetrate the cell wall of the bacterium. The purpose

of this study, therefore, is to synthesize a prodrug of the desired compound that could penetrate the cell wall and become the desired compound once it is within the cell and inhibit the mevalonate pathway.

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27 Examination of the Soil Bacteria Responsible for the Decomposition of Ailanthone, an Inhibitory Chemical in Ailanthus altissima

Samantha Sasnow
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Chemistry Department, DePaul University

Ailanthus altissima, an invasive tree species in Chicago, produces the inhibitory chemical ailanthone. This compound is primarily found in the roots and bark of maturing trees. It has been shown in laboratory experiments to inhibit seed germination and growth, but its effects in nature are not fully understood. The goal of this project was to determine under what soil conditions ailanthone decomposes. Ailanthone broke down in slightly basic conditions and non-sterile soil while remaining stable in sterile soil over a span of seven days. This suggests that ailanthone is broken down by soil microbes. The next phase in this project was isolating the soil bacteria that may be responsible for ailanthone decomposition in soil. Soil bacteria were successfully cultured from soil samples near A. altissima trees using a structurally similar compound to ailanthone, quassin, for selection.

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28 Rational Design, Synthesis and Biological Evaluation of a Novel Anticancer Probe

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Department of Chemistry, Biochemistry, Molecular & Cell Biology, Neurobiology & Physiology, and Radiology, Northwestern University

Theranostics, a process of diagnostic therapy, has been in recent development to aid in cancer treatments. Small molecule theranostic agents can be used as a combination of anti-cancer drugs and Magnetic Resonance Imaging (MRI) contrast agents to provide information of drug distribution and non-invasive tracking of tumors in vivo. One specific Acridine-based molecule, N-[2-(Dimethylamino)ethyl]acridine-4-Carboxamide (DACA), is in phase II clinical trials as a second-line therapy in various cancers including ovarian and non-small cell lung cancers. MRI, a noninvasive imaging modality, is considered for its excellent soft tissue contrast and deep tissue penetration, the absence of ionizing radiation, and spatial and temporal resolution. MRI contrast agents are used to improve sensitivity of MRI by modulating various contrast parameters. This poster will focus on the therapeutic effect of DACA-based drugs combined with Gd(III) contrast agents to provide live, in vivo tumor imaging via MRI. This combination will provide an increase in molecular weight, resulting in a significant increase of imaging brightness via DNA intercalation of the DACA drug. In addition, various theranostic agents will be synthesized based on a Structure-Activity Relationship Study (SAR). Parameter measurements of these agents will be also presented in this poster. The agents are synthesized with various linker lengths between the DACA derivative and the Gd(III) agent to determine the optimal length for the change in image contrast. Relaxivity measurements show a nearly two fold increase for the three carbon linker and substantial increases for the two and four carbon linkers as well after DNA binding. These results show a great enhancement in image contrast after DNA binding.

29 Purification of Ailanthone from the Tree of Heaven

Adil Mohyuddin
Faculty Advisor: Justin Maresh, Ph.D. DePaul University
Isolation and Characterization of Ailanthone from the Alleopathic Tree of Heaven

The Tree of Heaven (Ailanthus altissima) is an invasive species that is hypothesized to generate an allelopathic toxin, ailanthone. Ailanthone is chemically unstable, thus further understanding of its ecological role requires study of its decomposition. We report the use of dry column vacuum chromatography to isolate pure ailanthone from the bark of A. altissima plant in good yield. We plan to utilize the pure ailanthone to characterize its decomposition and whether this process is chemical or biological.

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30 A Quantitative Analysis of Solids in Water Using X-Ray Crystallography

Wale Afolayan, Trevor Grand Pre, Bella Campana, Lindsey Duncan, Kami Graves, Mark Piraino, Katie Roznai (SA), Germaine Suiza
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The presence of crystalline structures in dissolved solids found in water, in conjunction with Bragg's Law, allows x-rays to diffract off the surface of these solids yielding a unique computerized powder pattern. This powder pattern consists of various components, or phases, which can then be identified and quantified using databases provided by the International Centre for Diffraction Data (ICDD). An X-ray Diffractometer was used to determine crystallographic evidence inside distinct water sources. Four subgroups sought to identify and quantify dissolved solids in 4 sources of Chicago water and 2 sources beyond Chicago: Lake, River, Tap, Fountain, Bottled and Well.

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31 Rank restriction for the variational calculation of two-electron reduced density matrices of many-electron atoms and molecules

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Vibrational minimization of the ground-state energy as a function of the two-electron reduced density matrix (2-RDM), constrained by necessary N-representability conditions, provides a polynomial-scaling approach to studying strongly correlated molecules without computing the many-electron wave function. Here we introduce a route to enhancing necessary conditions for N representability through rank restriction of the 2-RDM. Rather than adding computationally more expensive N-representability conditions, we directly enhance the accuracy of two-particle (2-positivity) conditions through rank restriction, which removes degrees of freedom in the 2-RDM that are not sufficiently constrained. We select the rank of the particle-hole 2-RDM by deriving the ranks associated with model wave functions, including both mean-field and antisymmetrized geminal power (AGP) wave functions. Because the 2-positivity conditions are exact for quantum systems with AGP ground states, the rank of the particle-hole 2-RDM from the AGP ansatz provides a minimum for its value in variational 2-RDM calculations of general quantum systems. To implement the rank-

restricted conditions, we extend a first-order algorithm for large-scale semidefinite programming. The rank-restricted conditions significantly improve the accuracy of the energies; for example, the percentages of correlation energies recovered for HF, CO, and N2 improve from 115.2%, 121.7%, and 121.5% without rank restriction to 97.8%, 101.1%, and 100.0% with rank restriction. Similar results are found at both equilibrium and nonequilibrium geometries. While more accurate, the rank-restricted N-representability conditions are less expensive computationally than the full-rank conditions.

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91 Single-point mutation of the Alzheimer's Beta-Amyloid peptide—Arctic

Anjeanette Mendez, Nadrine Omar, Tsvetozara Kyoseva, Sean Reinsalu, Sandra Chimon Peszek
Faculty Advisor: Sandra Chimon Peszek Ph.D.
DePaul University

Alzheimer's is a neurodegenerative disease that gradually damages the mind in an irreversible manner. This particular type of disorder is caused by fibrilization of beta amyloid peptides (A□) in the brain. Our research is interested at looking at a shorter portion of the beta amyloid peptide which involves the sequences 22-35 which contains the ionic salt bridge. Contrary to popular belief, the "KLVFFA" region is not needed for the production of the beta sheet aggregates. The specific area that we are looking at is the "hair pin" region which had been proven through previous studies to have the ability to form notable structural changes in the peptides. It has been shown that single point mutations arise in the beta-amyloid peptides which are also noticed in the shorter fragments that are used in our experiments. Our research entails comparing the Wild Type (WT) to the Arctic mutant (E22G) to see if there are differences in the rates of fibrilization.
We will also be looking at the effects that certain orthomolecular compounds can have on the rate of fibrilization. Our group will specifically be researching the influences that curcumin can have on the production of these fibrils. Curcumin is an Indian spice that is derived from turmeric powder. It has been used for medical purposes for many years, but recently it has been suggested that this spice might be a potential inhibitor for Alzheimer's disease. In order to test its' preventative effects, we will be combining it with the amyloid peptide. Our studies of the mutant and the orthomolecular compound will involve the use of Ultraviolet-Visible Spectroscopy (UV-Vis) and Attenuated Total Reflection Infrared Spectroscopy (ATR-IR). We are able to use UV-Vis to observe the structural differences because of the use of the Congo red dye. The nature of this dye is to pentimirically bind to the aggregated fibrils which allow us to observe any structural changes that occur to the peptides.

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98 Characteristics of the Arctic Point Mutation in Alzheimer's

Tsvetozara Kyoseva
Faculty Advisor: Sandra Chimon Peszek, PhD
DePaul University

Analyzing the formation of fibrils of the Beta Amyloid peptide. These fibrils are found to contribute to the development of Alzheimer's Disease (AD). The fibrilization rate of the amyloid peptide is observed in the Arctic mutant and compared to formation of fibrils in the Wild Type (WT). The single point mutations in the Arctic mutant result in early development of Alzheimer's Disease. In comparison to the other point mutations like Dutch, Italian and Iowa, where the onset of AD is at age 55-60, the onset in Arctic mutation is as early as 30 years old. The purpose of the research is to see when exactly the fibrils start forming and ways to slow down the process of formation or even stop it. Based on this, the research also included the orthomolecular compound Curcumin, as a compound that can be used as preventative against AD. Curcumin can be found in the Indian spice Turmeric. The data that

is present was collected through ATR-IR ,on a ZnSe crystal which does not cause accelerated formation of fibrils, and UV-Vis with Congo Red dye.

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93 Quantification of Amino Acids in Rat Tear Samples

Duc Ho
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The tear film is a physiological fluid composed of proteins, lipids, amino acids, and salts. Any decrease in production or increase in evaporation is indicative of ocular diseases such as Sjögren's syndrome. In the clinic, tear production/evaporation rates are studied using the Schrimer strip test. Tears are collected on the filter-paper Schrimer strip, and the amino acids can be eluted for analysis. Our goal is to develop a method to study tear film amino acid (AA) content. This method is being developed for rats because this animal model is inexpensive and can match clinical diseases. While the rat eye is approximately four times smaller in size, the corneal surface is analogous to that of the human cornea. Schrimer strips were purchased and cut to fit the rat eye. The optimized size was determined to be 1mm x 25mm and had a volume capacity of 7 µL. The elution procedure was tested by pipetting a volume of stock AA solution onto the strip. After air-drying, the AAs were eluted with a phosphate buffer into a specially made apparatus. Phosphate buffers of several pH values (6.5, 7.0, 7.5, and 8.0) were used to test the effect of pH on elution. We determined that pH does not have a significant effect. The optimized elution method is a two-step rinse of the strip using 4 µL of the buffer. Rinsed solutions were analyzed for AA content by capillary electrophoresis-laser induced fluorescence. Loaded stock solutions of AAs were recovered at approximately 60±2.1% of the original content. Further elution steps did not result in significantly higher recoveries. The collection procedure was demonstrated in vivo on an anesthetized rat by placing a strip at the tear duct for one minute and proved successful. Ongoing studies are aimed at further quantifying the tear film AA content.

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94 Alzheimer's Disease At 30? Is This Possible?

Nadrine Omar
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Amyloid diseases, such as Alzheimer's disease, are neurodegenerative disorders that have been introduced by protein misfoldings into amyloid fibrils. Such diseases, which are characterized by protein misfoldings, are referred to as prions diseases, which include Huntington's Disease, Creutzfeld-Jakobs Disease, and Parkinson's Disease. The Amyloid Precursor Protein irregularly cleaves the the □-amyloid (A□) peptide, causing the hallmark plaques. For both A□(1-40) and A□(1-42), a tendency of fibril formation, processes has been found self-assemble into a non-toxic monomer state to a lethal fibrillar state. It is equally important to examine the hair-pin region without the presence of residues 16-21. In order to study the effect on fibril formation without the "KLVFFA" region, or the sequence in the A□ 1-40, the 22-35 sequence was chosen. The Italian (E22K) and Artcic (E22G) point mutations lead to changes in time of fibril formation as well as solubility and toxicity of fibrils. The single-point mutations are believed to promote early onset of AD compared to the wild type (WT), prematurely producing clinical and neuropathological features which are unchanged from those of late onset AD. The use of Attenuated Total Reflection Infrared Spectroscopy (ATR-IR) and Ultraviolet Visible Spectroscopy (UV-Vis) on the 22-35 sequence confirmed the formation of structures synonymous with toxic beta sheets. Using Congo Red dye, which binds pentamerically to beta sheet fibrils, secondary structures have been confirmed. Orthomolecular species have been introduced to the peptide

in hopes to slow fibril formation, thus pioneering an alternative approach in the treatment of the disease.

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96 Signal Transduction in Allosteric Supramolecular Structures Mediated by Redox-Active Hemilabile Tetrathiafulvalene Based Ligands

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Years of natural modification have created an unmatched efficiency and selectivity of enzymes to catalyze chemical reactions in nature. Chemists have tried to mimic these biological systems with complex supramolecular assemblies created from abiotic elements. Biological systems use redox chemistry to transduce signals across large biological structures. The following reports the synthesis of a new redox-active hemilabile phosphine/thioether (PS) ligand containing a tetrathiafulvalene (TTF) base. The ligand may be incorporated in supramolecular structures, specifically a tweezer complex, using the weak link approach (WLA). What makes WLA so unique is the ability to toggle between two different conformations by selectively cleaving the relatively weaker heteroatom–metal bond with a variety of ligands. Previous research has been conducted to create WLA complexes with the capability of electrochemical control but has not been able to produce a fully functional and reversible complex. Synthesis of the TTF ligand was accomplished by using the pyrrole-anulated derivative of the TTF core, after which an N-arylation reaction was carried out to attach the hemilabile portion of the ligand. After incorporation of the TTF ligand in a supramolecular tweezer complex, the reactivity of the phosphine-thioether ligand with a Pt(II) precursor salt will be investigated to show the formation of a supramolecular tweezer WLA complex.

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97 Magnetic Nanostructures for Potential Theranostics

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Magnetic nanostructures (MNS) are a class of promising theranostic agents by virtue of their unique applicational approaches, such as magnetic resonance (MR) imaging and thermal ablation. Furthermore, MNS can be functionalized for selective surface recognition elements for in vitro and in vivo targeting, diagnosis, and therapy. Here we describe a new methodology for iron oxide nanostructure surface functionalization and applications thereof. Specifically, due to the extraordinary stability of the new MNS in all types of biological media and their elevated R2 contrast for MRI they are a promising new agent for cancer theranostics. Cellular incubation of MNS was characterized with transmission electron microscopy, showing that MNS reside in vesicles throughout the cell. In vitro cellular studies with U251 human glioblastoma, UT197 bladder cancer, and MDA-MB-468 Human Breast Cancer cells demonstrated that the MNS are nontoxic at elevated concentrations and exhibit a high efficacy in thermal ablation therapy.

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101 Synthesizing Diamine and Diacid Oligomers which Promote Parallel Beta-sheet Structure

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Recent studies have provided evidence that Parkinson's and Alzheimer's diseases involve some form of protein aggregation that generates parallel □-sheet structure. The majority of □-sheet literature focuses on anti-parallel □-sheet strands. Our group seeks to study the stability of parallel □-sheet structure. To analyze parallel □-sheet thermodynamics, we have made minor changes to various peptides. These non-natural peptides have been produced to test how small changes to side chain structure, such as disulfide bridges, affect stability. Initially, we synthesized a 'diamine linker,' which promotes parallel □-sheet structure by connecting two strands at their C-termini. Two peptides were compared, one containing a disulfide bridge between the two strands, and the other containing two thiols. NMR analysis by chemical shifts and NOE signals suggest that disulfide bridges promote parallel □-sheet structure. We have recently synthesized a 'diacid linker,' which can promote parallel □-sheet structure by connecting two □-strands at their N-termini. By combining the diamine and diacid linkers, we hope to study how strand number affects global stability of parallel □-sheet structure. By exploring fundamental features of parallel □-sheet structure, such as disulfide bonds and strand number, we intend to gain further insight into the forces which influence protein structure as well as gain insight into protein folding diseases such as Parkinson's and Alzheimer's.

Funded by a generous gift from 3M, The University of Wisconsin-Madison Graduate School and the National Science Foundation (NSF) through the University of Wisconsin-Madison Materials Research Science and Engineering Center (DMR-0520527) and Nanoscale Science and Engineering Center (DMR-0425880).

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155 Will the Mutation of a Peptide Affect Beta Sheet Formation?

Aleksandra Oleynichenko
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This experiment focuses on determining whether or not the wild type peptide from the 16th amino acid through the 21st will still form beta fibrils if one of the amino acids is replaced in synthesis with a cysteine group. This peptide has been observed as the most common mutation present in those with Alzheimer's disease, and the formation of beta-fibrils is seen as a potential cause of the disease. The determination of the formation of beta-fibrils was carried out via UV-Vis and ATR-IR instrumentation analysis over a period of 175 hours. It was found that the mutated peptide does form fibrils.

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156 Tbeta-Sheets, Mutations, And Orthomolecular Inhibitors Oh My: A Comparison Of Beta-Sheet Production Across Mutants And The Effects Of B17 On Inhibition Of Fibril Formation.

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Beta-sheet fibril deposits are a crucial hallmark of Alzheimer's disease. Characterized by accumulations of highly toxic beta-sheet structures, fibril tangles disrupt synaptic function causing impaired memory. Amassing toxicity results in neuronal degradation and ultimately complete brain death. Beta-amyloid research focuses on one region of the 40-42 amino acid length beta-amyloid known as "KLVFFA"; this region, from residues 16-21, is believed to be the single, shortest, and most important contributor to beta-sheet formation. However, these theories overlook the crucial portion of the peptide, at residues 23-28, containing an ionic interaction, inducing a hair pin turn. This potential rate limiting step in the folding of beta-amyloid provides new insight

into the pathogenesis of Alzheimer's disease. Cleavage at residues 22 and 35 excludes the effect of "KLVFFA" and limits secondary folding interactions of the N-terminus after 35. Spectral analysis of the Wild Type WT A□22-35 lays ground work for various single point mutations within the shorter fragment. A□-E22G and A□-D23N, also known as the Arctic mutation and Iowa mutation respectively, are characterized by faster accumulation of amyloid fibrils. Beta-sheet production occurs rapidly, but can be observed by the implementation of ATR-IR spectroscopy focusing on signature chemical shifts in the amide one and amide two regions within the peptide. Secondly, pentamaric binding of multiple secondary beta structures to Congo-Red dye solution confirms the production of beta-sheets via UV/Vis. Moreover, time dependant TEM imaging of the WT revealed the presence of fibrils, demonstrating the importance of studying this shorter fragment. Suppression of fibril formation by the addition of concentrated orthomolecular compounds could yield therapeutic techniques or possibly even a cure for Alzheimer's disease.

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157 Computational design of phosphafluorenes in optoelectronic applications

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Phosphafluorenes exhibit unique optoelectronic properties that can be used to advance related applications. The Phosphafluorenes can be tuned by chemical substitutions to serve as hole or electron transporting materials. We use quantum chemical modeling calculations to gain further insight on their properties and to guide their design. We analyze the effect of bromination on the mobility of substituted phosphafluorenes We employ recently developed range separated hybrid (RSH) functionals in density functional theory (DFT) and time-dependent (TD)-DFT based modeling of the ground and excited electronic states. The success of the RSH functional to reliably describe the mobility properties is demonstrated by benchmarking against available experimental data. Predictions of new designed molecules are then provided to direct the synthesis and device fabrication efforts.

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158 Effects of Milkthistle and Calcium on Aß(22-35) folding

Raymond Wenk
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DePaul University

Alzheimer's disease is a disease of the brain hallmarked by A□-protein aggregates. These aggregates occur when the ß precursor protein is cleaved by ß-secratace creating an insoluble peptide that leads to an alternate confirmation of the protein which ultimately leads to senile plaques in the neuronal extracellular spaces. These plaques are toxic to neurological cells of the brain, and lead to atrophy and ultimately death. It is thought that plaques introduce a high degree of oxidative stress to the neural environment. In our research, we are analyzing the structure of the Aß fragment Aß(22-35). In previous studies it has been shown that this fragment does form aggregates and it has been suggested that the folding intermediaries may be more toxic than the final plaque. These structures are explored in solution using ATR-IR and UV-Vis Spectroscopy. The effects of orthomolecular compounds such as calcium and sylimarin on the folding pattern of Aß(22-35) are also under investigation. In previous work, calcium deficiency has been linked to patients with Alzheimer's disease and loss of calcium homeostasis in the brain has been reported. Sylimarin is a mixture of flavonoids naturally occurring in milk thistle. This compound has been found to have free radical scavenging abilities in the live ans has been found to have some anti-A□ aggregation abilities. In

this experiment we intend to use ATR-IR and UV-Vis Spectroscopy to better elucidate the effect of calcium and sylimarin on protein kinetics of Aß(22-35).

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159 The Effects of Melatonin and Vitamin D with Calcium as a Possible Preventative for Various Amyloid Diseases

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DePaul University

Alzheimer's disease (AD) is a neurodegenerative disorder caused by amyloid formation and the misfolding of proteins. Melatonin (N-acetyl-5-methoxytryptamine), is a hormone that is secreted by the pineal gland. Melatonin is associated with regulating the circadian cycle and it is also a potent antioxidant that may inhibit Aß toxicity, which is found in Alzheimer's patients. Melatonin has been found to have antiamyloidgenic, and mitochondrial effects. Vitamin D and calcium ions are believed to be a preventative of diabetes mellitus (Type II diabetes), which is also an amyloid disease similar to Alzheimer's. The purpose of the research is to see whether these two orthomolecular compounds can be preventative for these amyloid species.

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160 Is Milk Thistle Able to Prevent the Formation of Amyloid Fibrils?

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Faculty Advisor: Sandra Chimon-Peszek Ph.D.
DePaul University

Alzheimer's disease (AD) is the result of of toxic accumulations of misfolding amyloid proteins in the extracellular region of the brain. The build up of toxic amyloid plaque are also found in other neurogenerative diseases, such as Parkinson's and Huntington's. AD is characterized by the excessive production and deposition in senile plaques. The intermediate species involved are seen in the amyloid beta peptides (A□) (1-40) and A□ (1-42). For this research the A□ fragment 22-35 is the fragment utilized from the wildtype mutant and it contains a hairpin turn and a salt bridge. The goal of our experiment is to determine if silymarin, the extract from the milk thistle plant, is able to slow the rate of accumulation of amyloid fibrils. Milk thistle has antioxidant and anti inflammatory properties that has been used for centuries to treat hepatic disorders.

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161 The Effects of Milk Thistle (Silymarin) on Fibril Formation in Alzheimer's

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In recent years, research has begun to be conducted on the effects that the compound Silymarin, a component of milk thistle and a current anticancer treatment for liver cancer, has on the neurodegenerative disease of Alzheimer's. These studies have shown promising results with utilizing Silymarin as both a preventative and protecting agent against Alzheimer's. The aims of this current research is to further examine these possible effects on formation of fibril formation in the brains of those afflicted by Alzheimer's. We aim to examine if this compound has any effect at either slowing or stopping the formation of fibrils all together and if so to what extent.

162 Weak interactions of ligand-receptor binding events: electron transfer of protein-bound transition metals

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Weak interactions between proteins and small molecules, such as van der Waals forces and hydrogen bonding, are crucial in biochemical processes but intrinsically difficult to measure. Marcus theory relates weak interactions to electron transfer rate, so information on these weak interactions can be obtained through electrochemistry. We chose to investigate the interactions between proteins and small molecules using transition metal-modified binding ligands. The biotin/avidin system was chosen for initial studies; bovine serum albumin (BSA) was used as a negative control. Utilizing the avidin binding ligand 4-BMP (biotin aminomethyl pyridine), the monovalent and bivalent trinuclear ruthenium clusters [Ru3O(OAc)6L(py)(4-BMP)]+and [Ru3O(OAc)6L(4-BMP)2]+, (OAc = acetate, py = pyridine, L = pyC16SH) were synthesized. These clusters were designed to maintain coupling with the electrode upon protein binding, which was lost when using mononuclear complexes. Clusters were incorporated into self-assembled monolayers to facilitate electrochemical experiments. Cyclic voltammetry (CV) was performed before and after protein binding. In the bivalent system, a shift in E1/2 of -43 mV was observed upon avidin binding to the transition metal probe. Changing the dielectric constant of the system by using mixtures of DMF and water in various ratios resulted in similar E1/2 changes. The biotin/BSA system verified that the interaction between biotin and avidin is specific, and the shift in E1/2 is due to avidin binding. In the future, trinuclear ruthenium clusters with binding ligands for different proteins, such as 4-pyridinyl-boronic acid that binds to glycosylated proteins will be investigated. This research has applications in the development of electrochemical biosensors.

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163 Titania-Silica Nanocomposites for Solar Fuel Production

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Photocatalysis on the surface of semiconductors, such as titanium dioxide (titania), holds promise for the future of solar energy capture and storage. In photocatalytic processes such as the reduction of carbon dioxide, tetrahedrally-coordinated Ti(IV) sites located at the interfaces between solid phases are more active than the octahedrally-coordinated Ti(IV) in bulk titania. It is not clear exactly what role these sites play, however. Do these sites trap charges and facilitate electron transfer to adsorbed carbon dioxide? Do they themselves serve as binding sites for carbon dioxide? Do they do both? To answer these questions, the known templating effects of tetrahedrally-coordinated silica were exploited in order to synthesize and investigate several classes of novel under-coordinated titania-silica nanocomposites. Additionally, several previously established titania-silica photocatalysts were prepared via sol-gel methods and quantitatively compared to these novel materials. Band gap measurements were obtained via diffuse reflectance UV-vis (DRUV-vis) spectroscopy, and photocatalytic abilities were screened in both solution-phase photo-

oxidations of benzyl alcohol and gas-phase phororeductions of carbon dioxide. Preliminary results indicate good photoactivity among the sol-gel materials; more atomically-precise syntheses are in progress. In order to comparatively assess four-coordinate Ti(IV) content between different formulations, electron paramagnetic resonance (EPR) spectroscopy will be employed as well.

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164 Saving your Memories with Amygdalin?

Veronica Perez
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DePaul University

With life expectancy increasing, treatment and prevention of neurodegenerative diseases is becoming greater of importance. A highly controversial yet popular alternative treatment is known as amygdalin. Amygdalin (D-mandelonitrile-□-D-gentiobioside) is the cyanide-containing glycoside found in the seeds and cores of several members of the Rosaceae family (i.e. apricot). Amygdalin was hydrolyzed and analyzed with its cyanide molecule to determine the impact amygdalin has on the Alzheimer's beta amyloid peptide and its aggregates. AD plaques are clumps of a protein called beta-amyloid that damage and destroy brain cells in several ways, including interfering with cell-to-cell communication. In Alzheimer's disease, threads of tau protein twist into abnormal tangles, leading to failure of the transport system. AD is characterized by synaptic break down and ultimately neural death from these aforementioned toxic accumulations of misfolding amyloid proteins. The link between the fibrils and the etiology of the disease is not well understood but new evidence has proposed that smaller, more random and more soluble oligomers of Aß may be mostly responsible for neurotoxicity.Some studies have implicated neurotoxicity to a given sequence in the Aß (1-40) region before the hair pin turn in the peptide. However, our research focuses on the fibril formation in the smaller 22-35 region in order to determine the rate of ß sheet formation in this hair pin turn. A single point Iowa mutation and the Wild type are both capable of developing intra and intermolecular beta sheets, with the Iowa mutation showing a significantly faster beta sheet formation than the Wild Type. To further evaluate the efficacy of amygdalin in regards to fibril growth and neurotoxicity, amygdalin will be injected in PC12 cells or rat brain cells to show whether it will inhibit toxicity.

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165 Structural Studies of the Alzheimer's Disease Dutch Mutant Peptide via Attenuated Total Reflection Infrared & Ultraviolet Visual Spectroscopy

Ryan Kravetz
Faculty Advisor: Dr. Sandra Chimon Peszek
DePaul University

Thought to be responsible for neurodegenerative amyloid plaque accumulation in the brain causing Alzheimer's disease, the secondary and intermediate structures of the amyloid beta (A□) peptide are explored. This occurs with the formation of toxic □-sheet conformations by the self-fibrilization of amyloid beta (A□) peptides of the A□1-40/42 fragment.1 A mutated strain of the Alzheimer's peptide, the Dutch Mutant arises from a single point substitution at the 22nd residue replacing glutamic acid with glutamine – E22Q. The focus of much previous research due to the presence of a unique salt bridge and hairpin turn, the KLVFFA region found within the A□1-40/42 segment is considered necessary for fibrilization of amyloid plaque. However, our studies of the shorter A□22-35 strand reveal fibrilization without the presence of the KLVFFA region. In vitro incubation of the Dutch strain in phosphate buffer is analyzed in solution via attenuated total reflectance – infrared (ATR-IR) spectroscopy (a superior technique to the use of traditional salt plates that can cause accelerated fibrilization) and ultraviolet visual spectroscopy. While the UV-Vis spectroscopy focuses primarily on

identifying the rate of □-sheet development indicated by a sharp increase in absorbance, ATR-IR spectroscopy allows for the detection of the presence of multiple intermediate species with potentially neurotoxic properties. These intermediate species (including random coil and □-helical conformations) are indicated by a shift and increase in intensity of peaks at the amide I and amide II regions of the ATR-IR spectrum. The rate of this aggregation is then compared and analyzed against that of the wild type strain.

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167 Melatonin and Alzheimer's Disease: the Prevention of Structural Misfolding in the Wild Type Peptide (A beta 22-35)

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Faculty Advisor: Dr. Sandra Chimon-Peszek
Department of Chemistry, DePaul University

Neurodegenerative disorders such as Alzheimer's disease (AD) are perpetuated by the neurotoxicity created by the misfolding of proteins, leading to amyloid formation. Plaques accumulate in AD-afflicted brains as a result of beta-amyloid (Aß) fibril aggregation. The intermediates that have formed during these aggregations have led to neural synaptic impairment, particularly in the hippocampus region, and an increased loss of neurons due to oxidative stress, resulting in cognitive dysfunction. Past studies on the Aß(1-40) strand have shown that melatonin may have an inhibitory effect on the aggregation of Aß peptides in addition to its established neuroprotective potential. Our previous research has focused on the accumulation of beta-sheets associated with the beta amyloid peptide Aß(1-40) and Aß(1-42), specifically the Wild Type (WT) fragment Aß(22-35) that contains the ionic salt bridge. Point mutations in this "hair-pin" turn significantly affect the rate of fibril aggregation as well as the solubility of the toxic intermediates. By incubating the WT Aß(22-35) with various concentrations of melatonin, it is hypothesized that fibril accumulation will be hindered. Using Attentuated Total Reflectance Infrared Spectroscopy (ATR-IR) and Ultraviolet Visible Spectroscopy (UV-Vis), we will be able to monitor the structural changes of the peptide within the mixture from monomer to beta-sheet. The Congo Red dye used in the UV-Vis trials relies on pentameric binding to visualize aggregated fibrils to serve as a quantitative measurement. Conclusions may then be made after comparisons to unaltered WT Aß(22-35) beta-sheet formation. Results from this study may pave the way for future preventative treatments of AD and other neurodegenerative disorders.

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169 Antioxidant Levels in Plant Milks

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Plant milks have become a popular alternative to dairy milk as more people switch to vegan diets for any number of reasons, including the added health benefits. There have been claims that specific plant milks have high levels of antioxidant compounds. The purpose of this study is to assess the antioxidant levels in three popular plant milks: soy, rice, and hemp. Based on previous research done on the raw ingredients of soy, rice, and hemp, we expect hemp to have the highest TEAC measurements, and soy to have the highest polyphenolics. We will conduct our own trials using a TEAC assay with ABTS•+ and Trolox as a control, and run tests for total polyphenolic compounds with Folin phenol reagents. Our results will determine which of the three milks has the highest overall concentration of antioxidants, and therefore, from the perspective of antioxidants, is the healthiest.

167 Synthesis of Various Molecular Probes for the Investigation of Biological Systems

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Synthetic chemical substances can provide a useful tool to investigate and manipulate biological systems. E. coli biotin ligase, BirA, functions by binding to biotin and ATP to form an activated biotin-5'-adenylate (Biotin-AMP) intermediate, then transferring the biotin moiety to another protein. To study the possibility of engineering novel BirA enzymes, we have synthesized a stable analogue, biotin-sulfamoyl-adenosine (Btn-SA), and demonstrated that we can selectively select BirA-displaying cells from the mixture. In addition, by chemically labeling short peptides with biotin tag, we could find out that these peptides can mimic ubiquitin in binding E1 ubiquitin activating enzymes. Currently, we are also synthesizing coenzyme A analogues with differing length to investigate the structural significance of coenzyme A molecule in bacterial biosynthetic pathways. If these synthetic analogues improve the enzymatic activity, there is a possibility that the pathway can be further optimized in in vitro studies via the use of these synthetic analogues.

Computer Science

117 Optimizing Memory Constrained Environments in Monte Carlo Nuclear Reactor Simulations

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Monte Carlo neutron transport codes are a growing subject of research in nuclear reactor analysis. For robust reactor analysis, large-scale neutron transport simulations require computation of reaction rates for tens of billions of particles involving several hundred isotopes. When employing physical-space domain decomposition, minimizing memory consumption while safely and efficiently exchanging massive amounts of data is a significant challenge. To address this problem, we implement and test several "memory-aware", in-place, sparse, all-to-all MPI communication implementations. The algorithms are developed and tested within the open source MADRE (Memory-Aware Data Redistribution) project, which gives application programmers a simple API and set of tools and algorithms for carrying out memory-transparent in-place communication. We explore memory and communication efficiency tradeoffs for a range of in-place algorithms using a simple Monte Carlo communication kernel intended to mimic the behavior of our full Monte Carlo neutronics code.

Economics

32 Science and Superstition: Examining the Health Cost of Traditional Medicine

Weiling Liu
Faculty Advisor: Daniel Bennett
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Instead of dying out in the modern world, traditional medicine has become a growing, billion-dollar industry that is changing the landscape of healthcare in both developed and developing nations. Previous research have shown that traditional medicine can crowd out consumption of western care; yet no study has actually attempted to estimate the health consequences of this substitution effect due to the heterogeneity between patient populations. In this paper, I use the SARS epidemic of 2003 as an instrument to identify the health consequences of switching from western to traditional medical care in the context of Taiwan. In my preliminary data analysis, using a two-stage probit model, I find that when the ratio of traditional to western medicine use increases by one unit, it is associated with significant and positive changes in mortality rates. The magnitude of these changes may vary depending upon the severity of the illness.

153 Microfinance Business Models in Sub-Saharan Africa: Six Ways to Address Poverty

Jacob Runkel
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Loyola University Chicago

Defined by a socioeconomic past riddled with corruption, disease, and colonialism, sub-Saharan Africa posts anemic economic productivity (with a per capita gross domestic product of only $2,744) and a poverty rate of 72.9 percent (2005), which equates to an impoverished population of roughly 590 million people. Despite these dark socioeconomic statistics, multiple non-governmental organizations (NGOs) like World Bicycle Relief and Women's Microfinance Initiative have cast a light of hope on this depressed African region by creating and putting in place microcredit and small loans that have exhibited great success. For example, Women's Microfinance Initiative has established a 36-month, small loan program that increases loan availability as prior loans are used effectively and paid off, an approach that has achieved repayment rates of roughly 97 percent. In my presentation, I argue for the effectiveness of microenterprise and microlending programs in the long-term alleviation of poverty in sub-Saharan Africa. My argument consists of three points. First, I present the obstacles and weaknesses that microfinance organizations experience in sub-Saharan Africa and that lead to their failure. For example, collateral for loan acquisition is extremely difficult for many individuals to attain without group-liability loan programs. Second, I profile six microfinance organizations that are succeeding in sub-Saharan Africa, and I describe the business model they have created to be successful. For example, World Bicycle Relief has significantly improved the access of rural dairy farmers to city markets by providing them with bicycles. Interviews with leaders of microfinance organizations, in addition to research on their operations, inform this part of my argument. Third, I assess the strengths and weaknesses of the microfinance business models that surfaced from the research. Microenterprises offer a powerful solution to ending world poverty and to instilling both initiative and long-term sustainability in the lives of millions of people.

174 The price impact of Webjet's entry on the Brazilian airline market

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On October 2011, it was announced that Webjet Linhas Aereas S.A. and Gol Linhas Aereas S.A., two major Brazilian airline companies, would merge. The conventional way to analyze the competitive effect of mergers like this is to assess market structure and/or upward pricing pressure. In both cases, idiosyncratic features of the acquired company, although relevant, may not be taken into account. For instance, if the acquired company is a maverick firm, competition is likely to be harmed even though conventional assessments may conclude otherwise. This paper aims to estimates the anticompetitive effect of this merger by means of the price impact of Webjet's entry on the Brazilian market. Toward this end, the authors elaborated an econometric model which controls for airport fixed effects, airport time trends, seasonal effects, number of passengers, exchange rate, interest rate, oil price as a proxy for input prices and the occurrence of a relevant strike known as Air Chaos. The variable of interest is a dummy variable that captures the moment when Webjet started operating in each major Brazilian city (Sao Paulo, Rio de Janeiro, Porto Alegre e Brasilia). Using the estimation method called System Two Stage Least Squares and instruments for the variables "numbers of passengers" and "Webjet's entry", we estimated that Webjet's entry reduced the average air ticket price by 4%, featuring it as a maverick company. This result supports the view that the merger between Gol Linhas Aereas S.A and Webjet Linhas Aereas S.A. should be subject to antitrust structural remedies.

Engineering

33 Terahertz Radiation from Corrugated Graphene Films

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Boston University

Semiconductor lasers and light emitting diodes provide excellent sources of visible and infrared light, and at the lower end of the electromagnetic spectrum microwave and radio-wave sources are similarly well-developed. On the other hand, in the Terahertz spectral range (0.3-101012 Hz) there is still a shortage of sources, despite the existence of big application opportunities in biochemical sensing, medical imaging, and security screening. Currently, large research efforts are focused on the generation of THz radiation using carefully designed semiconductor quantum cascade lasers, whose operation however is fundamentally limited to cryogenic temperatures. The ultimate goal of this project is to develop a "tabletop cyclotron source" of THz light. Cyclotron radiation is produced when charged particles are accelerated. Here we plan to use electron transport under angular acceleration in corrugated graphene to produce radiation in the THz range. We expect that the excellent transport properties of graphene (record-high mobilities) will allow for the production of high-quality coherent THz radiation, whose frequency is controlled by the shape of the corrugation.

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34 Induction of Hydrocephalus in Rats and a Novel Treatment Method

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Faculty Advisor: Sukhraaj Basati Ph.D., Dr. Ali Alaraj M.D., Dr. Andreas Linninger Ph.D.
University of Illinois at Chicago

Hydrocephalus, a medical condition affecting approximately 1 out of every 500 births, is an abnormal accumulation of cerebrospinal fluid (CSF) occurs in the ventricles of the brain. This results in increased intracranial pressure (ICP), progressive enlargement of the head of infants, convulsions, tunnel vision, mental disability, and in extreme cases, death. Existing CSF shunting procedures have been deemed inadequate because they withdraw CSF solely based on based on ICP measurements. This often leads to dangerous over- and under-shunting, because ICP can vary due to posture, routine daily activity, altitude, and even atmospheric pressure. Our laboratory has postulated that direct volume monitoring and feedback control as a promising strategy to improve the treatment of hydrocephalus. This novel treatment method involves using a volume sensor to aid pressure measurements to more accurately drain CSF in hydrocephalic patients. Electrodes on the sensor generate an electric field, which measure volume through changes in impedance. Our recent experiments focus on the induction of hydrocephalus in animals with an assessment of sensor performance through post-implantation sensor testing by injection/withdrawal of CSF. We studied the juvenile onset hydrocephalus following kaolin injection in 15 rats, acquiring a 40% induction rate. The key goals of this study were to induce hydrocephalus and obtain data while testing the sensor. Calibration of the sensor was completed via dynamic bench-top testing inside a silicone balloon model in which 100 uL of fluid was injected/withdrawn. Following calibration, testing of the sensor was done in a hydrocephalic rat model in which voltage changes were found to successfully correspond to the injection/withdrawal protocol. Controlled CSF shunting in-vivo with hydrocephalic rats resulted in precise and accurate sensor measurements (R^2=0.98). A maximum error of 17.3% was found between measured volume and actual volume as assessed by a Bland-Altman plot. Ventricular enlargement consistent with successful hydrocephalus induction was confirmed via imaging as well

as post-mortem analysis of brain tissue. We conclude that the intracranial volume sensor is a viable technique to measure intracranial ventricular volume change as evidenced by bench-top testing and animal validation. This study was funded, in part, by a grant from NIH-R21NS071144 as well as NSF REU–EEC0754590, awarded to Dr. Andreas Linninger Ph.D.

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35 Streamtubes Models for Predicting Aerodynamic Performance of Vertical-Axis Wind Turbines

Georgi Subashki
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Illinois Institute of Technology

The current model investigates some aerodynamic performance characteristics of a particular type of wind turbines, namely, Vertical-Axis Wind Turbines (VAWT). By using a simplified low-ordered momentum model, a series of Mathematica codes were generated in order to calculate the output power produced by the turbine as a function of the rotational speed (and wind speed). All models used a combination of actuator disk-theory and blade-element theory approach with an increasing degree of complexity. The VAWT was assumed to have straight blades and variable pitch (angle of attack). Three different models were utilized: Single Streamtube Model (SSM), Multiple Streamtubes Model, and Double-Multiple Streamtube Model (DMS). All of them can be applied for different Reynolds numbers and turbine parameters. Although not as accurate as vortex models, the current ones have the advantage to be much faster and still with a very acceptable accuracy. Thus, they could take an important place in many engineering applications in which it is necessary to define initial turbine characteristics rapidly before utilizing an advanced vortex model. All models showed similar behavior with the best results given by the DMS model. In all cases, the variable pitch could significantly improve the overall performance. However, there were still some aspects that had not been taken into account and need further research, such as: dynamic stall effects and 3-D finite aspect ratio effects (tip effects). Moreover, there is still some place for numerical optimizations and integration of some new sub-models into the existing one (e.g. thrust coefficient and interference factor ameliorations, vortices, etc.). In conclusion, the various models can provide very acceptable accuracy and computational speed, despite all approximations that have been made.

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36 Condom Design: Why is it not always effective?

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Segal Design Institute, Department of Industrial Engineering, Department of Psychology, Department of Mechanical Engineering, Northwestern University

The male condom is one of the most common solutions to birth control and STI prevention. However, the current design affords a number of human errors: according to a study of 362 men at Indiana University exploring condom errors and problems among college students, 40% did not leave a space at the tip of the condom and 30% incorrectly oriented the condom and had to flip it over (Crosby et al. 2002). In a survey created by the authors for a sample of Northwestern undergraduates, approximately 42% of the students felt that applying a condom for the first time is not intuitive and remembered having difficulty deciding which way to orientate the condom when putting it on. The authors explored visual and tactile characteristics that could be problematic and pinpointed areas that would change a user's interaction with the condom and packaging. From this, the team created the redesign of the condom packaging, focusing on 1) allowing removal of the condom from the package only in the correct orientation, and 2) making users remove the condom from the

package by pinching the tip of the condom.

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100 Cortical Facilitation of Flexion Reflexes During Robotic-Assisted Stepping

Timi Chu, Maria Knikou, Chaithanya K. Mummidisetty , Andrew C. Smith
Faculty Advisor: Maria Knikou, PT, Ph.D
Northwestern University, Northwestern University, Rehabilitation Institute of Chicago, City University of New York, Rehabilitation Institute of Chicago

The flexion reflex is one of the many reflexes responsible for locomotion. This study investigated cortical convergence on flexion reflex pathways by utilizing transcranial magnetic stimulation of the cortex during robotic assisted stepping. Throughout the gait cycle, phase-dependent modulation of the flexion reflex is necessary for neural control of locomotion. Following a spinal cord injury, phase-dependent modulation of reflexes is often abnormal. Patients lose control of their lower limbs and are unable to complete the gait cycle successfully. The cortical facilitation of cutaneous reflexes was examined using transcranial magnetic stimulation (TMS). Baseline data was established using the short latency ipsilateral tibialis anterior flexion reflex in the seated condition. The stepping condition on the Lokomat showed that the long latency ipsilateral tibialis anterior flexion reflex was most significant. Maximal flexion reflex facilitation during swing phase initiation suggested facilitation of corticospinal input onto flexion reflex pathways. This work suggests that the Lokomat is an effective rehabilitation device in aiding spinal cord injury patients to regain locomotor function.

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101 Fabrication of TiN Coating by Utilizing Electrostatic Spray Deposition Technology

Xinwei Wang, Quanzhi He
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Electrostatic Spray Deposition (ESD) is a promising technique to deposit both thin and thick layers onto various substrates. In this research, we tend to fabricate perfectly uniform TiN coatings. As we known, TiN is an extremely ceramic material, often used as a coating on titanium alloys, steel, carbide and aluminum components to improve the substrate's surface properties. However it's difficult and expensive to be produced. ESD technology definitely eliminates these worries. It utilizes simple chemical precursors sprayed across an electrostatic field towards a heated substrate, which stands out mainly because of its impressive advantages such as high efficiency deposition, minimal chemical waste, low manufacturing cost, etc. After tons of spraying trials, we found a very interesting phenomenon/correlation among some significant varieties that high affects the quality of spraying patterns. Based on this discovery, a mathematical model will be established in our future work.

102 Mechanical Properties and Durability of Advanced Environmental Barrier Coatings in Calcium-Magnesium-Alumino-Silicate Environments

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Environmental barrier coatings are being developed and tested for use with SiC/SiC ceramic matrix composite (CMC) gas turbine engine components. Several oxide and silicate based compositions are being studied for use as top-coat and intermediate layers in a three or more layer environmental barrier coating system. Specifically, the room temperature Vickers-indentation-fracture-toughness testing and high-temperature stability reaction studies with Calcium Magnesium Alumino-Silicate (CMAS or "sand") are being conducted using advanced testing techniques such as high pressure burner rig tests as well as high heat flux laser tests.

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103 Tensile Properties of the Extensor Hood in Support of a Finite Element Model

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The extensor hood is a complex tendoninous network that transmits force from musculotendon units to the finger phalanges. It is a heterogeneous structure with varying tensile properties which affect the propagation of force. The goal of this research is to characterize the mechanical properties throughout the extensor hood in support of the development of a finite element model of force propagation through the hood of the index finger. The geometric structure of the extensor hood for the index finger was obtained from magnetic resonance (MR) images of a cadaver hand and segmented with Amira software. Extensor hoods were isolated from the index finger of a fresh cadaver hand and divided into dog-bone shaped sections using a custom punch and evaluated with a custom materials testing system. Cross sectional area (CSA) and length was measured before testing. Specimens were stretched to failure at .5mm/s. Displacement and force were measured. Stress-strain curves were generated for the tested specimens; Young's modulus was determined through the linear region of the stress-strain curve. Yield strain and yield stress was determined at maximum stress. MR imaging of the extensor hood revealed marked variability of thickness throughout the structure with the thickest region above the metacarpophalangeal (MCP) joint, and the thinnest region distal the proximal interphalangeal joint. The CSA of each section varied from 1.04mm2 to 6.24mm2. Young's modulus was highest above the MCP and lowest towards the terminal slip. The extensor hood is a heterogeneous structure with varying mechanical properties that determine the stress propagation from the muscles to the fingers affecting the manner in which the finger bends. A finite element model that demonstrates force propagation through the finger will further understanding of hand biomechanics which can assist in improving diagnosis, surgery, and rehabilitation of finger abnormalities.

Abstracts - Engineering

175 Reducing Chance of Injury Through Design Modifications to Figure Skating Boots

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Figure skating boots have long been designed to be as rigid as possible in order to reduce the chance for injury to a skater's ankle. One company, Jackson Skates, challenged that design with their ProFlex skating boot. This boot was designed with a hinge at the ankle joint with the intention of reducing the impact stresses on the body during jump landings in order to prevent stress injuries. After analyzing videos of jump lands in the ProFlex boot as well traditional skating boots and speaking with users of the ProFlex boot, it was apparent that the boot did allow more ankle movement but lacked a robust lateral ankle support. Weak lateral ankle supports increases the chance for ankle injuries. Using two simple design modifications, I developed a way to increase ankle stability with minimal increase to production cost. Be incorporating a roller bearing into the hinge, the force required to move the hinge was reduced, decreasing the stresses on the lateral supports already incorporated into the boot. I also modified the tying system in the boot to increase the level of lateral ankle support it self. My project culminated in a proof of concept model to illustrate my recommended modifications.

176 Treating Lower Respiratory Infections in Developing Countries with Mechanically Powered Nebulizers

Alexandra Rybczynska and Amanda Vicich
Facaulty Advisor: Dr. John Hetling
University of Illinois at Chicago

Nebulizers are important for the treatment of respiratory diseases, primarily lower respiratory infections. Since lower respiratory infections are the second leading cause of death in low income countries, the availability of these devices in developing countries is crucial. Barriers that hinder the distribution include economic, technological, and geographical factors. The initiative for this proposal is the improvement of the accessibility, appropriateness, and affordability of a nebulizer device within developing nations. The nebulizers on the market are too costly for low-income nations, obstructing patients from treatment. Nebulizers are powered by a constant supply of electricity during use. This is unlikely due to the unavailability and/or unreliability of electricity in many underdeveloped countries. Battery-powered nebulizers are too expensive to consider as an option. To create an efficient yet accessible nebulizer, the device must be able to function without electrical power, be durable in various climates, and have minimum manufacturing costs. It must meet the target performance requirements of a constant air flow rate of 5 L/min. This is the average flow rate necessary for the vaporization of the medicine. The device must also have a treatment length of 10 minutes. The design is composed of four parts: a bike pump, a hollow reservoir, a connector cap, and the mouth piece unit. The bike pump and reservoir replace the electric air compressor, eliminating the need for a power source. This nebulizer can then be powered independently by the patient. The impact of this device could contribute to decreasing the rate of lower respiratory infections, specifically in developing countries. REU–EEC0754590, awarded to Dr. Andreas Linninger Ph.D.

177 Size selective oxidation of alcohols by nanocavity containing titanium dioxide catalysts

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Heterogeneous (solid) catalysts, and in particular, supported oxide catalysts, have a wide range of applications in chemical and fuel manufacturing. Unlike many homogeneous (soluble) catalysts, enzymes, or zeolite catalysts, supported oxides typically do not discriminate between two reactants with the same chemical groups, but of different molecular sizes. Thus, the synthesis of oxide catalysts that are size- or shape-selective would open up new possibilities for more efficient catalysis. This presentation describes the synthesis and catalytic testing of materials consisting of partial Al2O3 coatings on TiO2, leading to shape-selective reaction of the residual exposed TiO2 catalytic surface. These materials were synthesized by grafting a molecular template on the TiO2, followed by atomic layer deposition of Al2O3 (1-10 layers), and finally removal of the template by ozone treatment. The size-selectivity of the remaining uncovered TiO2 surface is illustrated by kinetic studies of competitive photocatalytic oxidation of benzyl alcohol (BzOH), 2,4,6-trimethtyl benzyl alcohol (TMBzOH), and 2-adamantanol (AdOH). The ratio of the rate constants for competitive photooxidation of BzOH and TMBzOH [rate(BzOH)/rate(TMBzOH)] was 1.7 for bare TiO2, while the same ratio was 7.7 for TiO2 partially covered by 5 layers (0.5 nm) of Al2O3. An equivalent experiment with BzOH and AdOH showed that the ratio of rate constants [rate(BzOH)/rate(AdOH)] for bare TiO2 was of 1.5, and 5.7 for the catalyst partially coated with 5 layers (0.5 nm) of Al2O3. This and other data to be presented confirm that these modified catalysts are capable of sharp selectivity towards less-bulky reactants, by impeding the bulkier reactants from adsorbing onto the active catalytic surface (the TiO2). These are novel catalytic materials in general and may lead to applications in the selective "green" oxidation of alcohols by atmospheric oxygen.

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178 Fibronectin Functional Domain Complex (III1-2-III9-10) Improves Cell Adhesion, Cell Spreading

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Fibronectin is a major component of the native scaffold assembled during wound healing. It binds a number of molecules and cells and promotes tissue repair through its influence on biological responses such as cell adhesion and spreading. Different parts of fibronectin have distinct functions, but how these different regions work together is not well understood. We have created a fusion protein, III1-2-III9-10, that consists of fibronectin's cell binding domain (III9-10) and a domain that binds other fibronectin molecules (III1-2). We examined how III1-2-III9-10 influenced cell adhesion and spreading and compared its effect to that of a fusion that had a mutation in III1-2, III1-2,mut-III9-10. The mutation enhanced fibronectin binding to III1-2. Fibroblasts, coated with these domains, were incubated for an hour on glass surfaces, after which fluorescence microscopy of cell nuclei and cytoskeleton was conducted. We found significantly higher cell adhesion and spreading on surfaces with III1-2,mut-III9-10 as opposed to surfaces with III1-2-III9-10. This study demonstrates that there is a level of synergy between III1-2 and III9-10 that may involve the binding affinity of III1-2 for fibronectin. This study also provides insight into possible recombinant proteins that may be used to enhance tissue repair in hard-to-heal wounds.

179 Optimization of Lentiviral Vector Production Transfection Conditions via Physical and Active Titration Analysis for Gene Delivery in Spinal Cord Regeneration

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The delivery of genes for transient expression, in applications such as nervous system injury, represents much of the current promise of gene therapy research. Prior studies have demonstrated that lentivector delivery can induce expression above controls for at least four weeks. This approach, with PLG bridges acting as a platform, is thought to be an effective way to both promote the production of factors that both stimulate axon growth and suppress the inhibitory environment. Although the principle of modifying genes to produce target proteins is simple, the engineering of reliable gene transfer vectors has proven to be a considerable challenge. The primary obstacle to the widespread application the technology is the deficiency of adequate methodologies for the development and production of high-titer viral stocks. The proportion of transduction capable viral particles typically represents only a small and variable part of those produced. Furthermore, disparate quantification methodologies have resulted in substantial fluxuations in titer determination while inconsistency in infectious activity impacts toxicity, efficacy and immunogenicity. In this study, we establish a procedure for quantifying viral transducing titer and find that qPCR represents an effective and reliable method for the quantification of virus physical titer. We also compare virus production conditions finding defined titer peaks related to cell incubation time and declines after PEG incubation times. That calcium phosphate mediated transfection demonstrated a comparability to that mediated by Lipofectamine 2000 indicated its potential as a more cost effective mediator. Ongoing studies are aimed at determining conditions which optimize calcium phosphate transfection into a protocol which balances efficiency and cost effectiveness while reducing contamination and maximizing viral titer.

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180 Accelerating the computation of Lagrangian Coherent Structures on GPU

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Finite-time Lyapunov exponents (FTLE) are a metric for measuring the amount of particle separation in a fluid flow, based on taking the maximum eigenvalue of the Cauchy-Green deformation tensor of the flowmap. High-value ridges in a flow's FTLE field, called Lagrangian coherent structures (LCS), are closely tied to stable and unstable manifolds, acting as qualitative separatrices for particle motion. Lagrangian structures have finer scale than Eulerian structures and thus the FTLE must be computed over a dense grid of locations, requiring many points to be integrated to obtain the flow map at every location. Due to such nature, FTLE fields are typically computationally expensive to find, but the use of graphics-card processor technology has allowed us to speed up this process by up to one hundred times. We implemented this enabling technology (nVidia's CUDA) on the computation of FTLE by accelerating the most computationally expensive functions (Integration function and global search function) involved in the process. We achieved speed of 42x, with respect to CPU computing, for global search function. Speed of 11x was achieved for integration function. Overall, the entire computation of FTLE achieved speed of 35x.

181 Abnormalities in Resting-State Functional Connectivity in Early Human Immunodeficiency Virus Infection

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Limited information is available concerning changes that occur in the brain early in human immunodeficiency virus (HIV) infection. This investigation evaluated resting-state functional connectivity, which is based on correlations of spontaneous blood oxygen level-dependent functional magnetic resonance imaging (fMRI) oscillations between brain regions, in 15 subjects within the first year of HIV infection and in 15 age-matched controls. Resting-state fMRI data for each session were concatenated in time across subjects to create a single 4D dataset and decomposed into 36 independent component analysis (ICA) using Multivariate Exploratory Linear Optimized Decomposition into Independent Components. ICA components were back-reconstructed for each subject's 4D data to estimate subject-specific spatial maps using the dual-regression technique. Comparison of spatial maps between HIV and controls revealed significant differences in the lateral occipital cortex (LOC) network. Reduced coactivation in left inferior parietal cortex within the LOC network was identified in the HIV subjects. Connectivity strength within this region correlated with performance on tasks involving visual-motor coordination (Grooved Pegboard and Rey Figure Copy) in the HIV group. The findings indicate prominent changes in resting-state functional connectivity of visual networks early in HIV infection. This network may sustain injury in association with the intense viremia and brain viral invasion before immune defenses can contain viral replication. Resting-state functional connectivity may have utility as a noninvasive neuroimaging biomarker for central nervous system impairment in early HIV infection.

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182 Adhesion Hysteresis and Morphology of Interacting Layers of End-grafted Hydrophobic Polyelectrolytes.

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The interaction forces between two opposing planar surfaces modified by end-grafted weak polyelectrolytes have been studied with a molecular theory. Our results revealed for the first time the presence of metastable systems under poor solvent conditions that suggest the possibility of hysteresis in the contraction-retraction of the two-walled system due to the presence of two or more metastable pathways. For strong van der Waals attraction forces between polymer segments, the polymer chains tend to phase-separate from the polymer solution, however, this process is restricted to the formation of aggregates in the nanometer/micrometer scale because the chains are irreversibly grafted to the substrate (i.e. the polymer microphase separates from the solution). We found that the onset of microphase separation for several combinations of grafting coverages, wall separations and chain lengths can be universally described in terms of the interplay between the maximum segment density in the system and the hydrophobicity of the polymer backbone. We examine the range of stability of the homogenous films with regard to polymer surface coverage, wall distance and pH.

Abstracts - Engineering

183 Minimizing hysteresis behavior within fingertip force sensors

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Detecting the amount of force generated by the fingers is fundamental in monitoring the sensory motor control of the hands of stroke survivors. Capacitive transducers are often used to achieve pressure-to-electrical signal transduction by altering the area and distance between two capacitor plates that are placed on the fingertips. Previous work has investigated sensor structures that used various polymer dielectric materials. However, most practical materials exhibit viscoelastic properties that induce hysteresis, resulting in inconsistent force measurements. In this project, our goal is fingertip measurements of up to 25N, for normal and shear forces, using an array of micro-fabricated springs placed between the capacitor plates; air, acting as the dielectric, would not exhibit viscoelastic behavior. Different types of micro-spring structures are being investigated, and the ability of this transducer design to distinguish between normal and shear forces will be examined.

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184 PEG Hydrogels with Gradients in Elastic Modulus and Immobilized YRGDS Direct Vascular Cell Response

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Cell behavior is mediated by spatial arrangement of immobilized extracellular matrix molecules, soluble growth factors and matrix mechanical properties. These gradients play an important role in many physiological processes from tumor metastasis to vascularization. The goal of this study was to evaluate the effect of these gradients on directed vascularization in synthetic poly(ethylene glycol) diacrylate (PEGDA) hydrogel scaffolds. To accomplish this, a novel perfusion-based frontal polymerization (PBFP) system was used to generate PEGDA hydrogels with 3D gradients of elastic modulus and immobilized YRGDS adhesion sequences. This technique relies on controlled delivery of a photoinitiator to the precursor solution resulting in the formation of a polymer reaction front that is self-sustaining and capable of propagating through the monomeric mixture. Propagation of the reaction front results in simultaneous and tunable gradients in elastic modulus and YRGDS adhesion ligand incorporation. To evaluate the effect of gradients on vascular cell behavior, aggregates composed of 50% endothelial cells and 50% smooth muscle cells were inserted into different regions of the gel using a micropipette tip. The invasion area was quantified manually using image analysis software, comparing bulk polymerized hydrogels to the gradients. Preliminary results indicate that cells seeded in gradient gels spread roughly twice as far in the direction of the gradient as in the perpendicular direction, with a bidirectional preference towards higher elastic modulus and immobilized YRGDS at the top of the gel, and lower elastic modulus and immobilized YRGDS at the bottom. Cells seeded in the bottom of the gradient gel invaded directionally with invasion area similar to bulk controls, while those seeded in the top region displayed limited invasion area but increased directional response. These gradients offer the potential to stimulate directed vascularization in synthetic tissue engineered scaffolds. Future work will quantify in vivo tissue invasion in the presence of the gradients generated.

185 The Interaction of Natural Organic Matter with Calcite

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The Fox River in Illinois is supersaturated with respect to the mineral calcite. However, precipitation of calcite cannot be observed in the river indicating some sort of inhibitory molecule. Natural organic matter (NOM) found in waterways has been associated with forming a complexation with calcite by bonding to its crystallization sites. Suwannee River NOM and Nordic Reservoir NOM were found to possess distinctly different charge densities and were therefore used to study NOM and calcite complexation. This difference in charge density indicates varying types of functional groups as part of the organic matter providing charge to the molecule as a whole. The NOM concentration in solution was measured by a UV Spectrophotometer by means of a calibration curve relating UV absorbance with NOM concentration. The addition of calcite to an NOM solution was done and samples were taken at various time intervals in the mixing process. Analysis of these samples indicated a decrease in NOM concentration in solution which would occur due to complexation with calcite with a total overall decrease of approximately 0.5 mg NOM/L. Although in a small amount, NOM was found to be one of the substituents in natural water bodies to interfere with calcite precipitation. Further studies are being done with various types of ions to observe other forms of complexations.

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236 Control of Yeast Growth by External Factors: A Synthetic Biology Platform for Cell-to-Cell Communication

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Environmental detection mechanisms and cell-to-cell communication are critical biological mechanisms that must be fully understood to exploit in synthetic biology applications, such as diagnostic applications and tissue engineering scaffolding,respectively. Our work seeks to understand how cells detect their environment and chemical signals emitted from other cells (e.g. cellular communication). G-protein coupled receptors (GPCRs) are receptors found in eukaryotes that can sense a molecular signal outside of the cell and trigger a signal transduction pathway, causing a cellular response. GPCRs are very useful for synthetic biology, as (1) GPCRs can be genetically tethered to many different responses, (2) the receptors are highly sensitive, and (3) yeast is inexpensive to manufacture, enabling low cost detection. In cell-to-cell communication, engineered yeast receptors offer a synthetic ecosystem, where only known and defined chemicals signals are responsible for communication, unlike the complex signaling network and lack of control in most multicellular organisms. Greater understanding of cell-to-cell communication will give insight to cellular organization and interaction, important for tissue engineering. Also, establishment of a synthetic GPCR system is a precursor to building a cellular device that can detect biomarkers and give certain responses for outputs. We have engineered two yeast strains to “grow” or “not grow” by activation of the receptor Ste2p in response to the presence/absence of a small peptide called the alpha-factor. We will report characterization/optimization of our engineered strains “on/off” growth behaviors in clonal growth experiments and culture competition experiments via flow cytometry. The results indicate that we can effectively control growth of the cells through stimulation of the alpha factor. Future work will be to characterize another ligand/receptor combination, namely a factor/Ste3p. This study provides the fundamental evidence that mixed cultures, emitting different a or

Environmental and Geophysical Sciences

105 The role of cooperative iceberg capsize during ice-shelf disintegration

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The physical processes responsible for the sudden, rapid collapse of Antarctic ice- shelves (Larsen B, in 2002; Wilkins, in 2008) are poorly understood. Observations are limited to a handful of satellite images. Thus we have undertaken a series of laboratory-scale experiments using a water-filled tank and "ice" made from buoyant plastic blocks to investigate these processes. Previous experiments have quantified how gravitational potential energy of single-iceberg capsize is converted to other forms of energy [described in Burton et al., submitted], including hydrodynamic forms that may feed back on the ice shelf to cause additional calving. The new experiments reported here examine the energetics of hydrodynamically coupled icebergs that exhibit collective behaviors qualitatively similar to features observed in satellite imagery. Our results suggest that there is a critical proximity at which icebergs will capsize in the same direction an overwhelming majority of the time (cooperative capsize), and a significant part of the gravitational potential energy is converted into translational kinetic energy. We speculate that the residual translational energy observed in our experiments may explain the significant expansion rate (~1 meter/second) of collapsing Antarctic ice-shelves.

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106 The effects of temperature and CO2 concentration on plant isoprene production

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Isoprene (2-methyl-1,3-butadiene) is the most abundant biogenic volatile organic compound (BVOC) emitted from plants. BVOCs in the atmosphere react with air pollutants (nitrogen oxides NOx emitted from burning fossil fuels) to form ground-level ozone that is harmful to human health and detrimental to plants. Scientists interested in modeling isoprene emissions have formulated algorithms that predict and scale up isoprene emissions from the leaf to a regional level. However these algorithms are based on empirical relationships observed at the leaf level and would be improved by advancing our mechanistic understanding of the underlying controls of isoprene production. This study tests how the environmental variables of temperature and carbon dioxide (CO2) concentration affect the emission of isoprene. So far, these variables have been studied in isolation, showing that isoprene emissions increase exponentially with increasing temperature but are suppressed by increasing CO2 concentrations. Measurements of isoprene production under a combination of changing CO2 concentration and temperature for multiple tree species (Populus deltoides, Populus tremuloides, Quercus rubra, and Salix pulchra) were conducted. The suppression of isoprene emission observed when switching from ambient (400 ppm) to elevated (800 ppm) CO2 under high temperature (35 C) is reduced compared to lower temperature (25 C). That is, increasing temperature removes the typically-observed suppression of isoprene emissions caused by elevated CO2 concentrations. This reduction of suppression was triggered by both short- and long-term increases in temperature and was observed in the majority of cases, while not in all. The algorithms to predict isoprene emissions should include the combinational impact of temperature and CO2 concentration to accurately predict the role of isoprene in ozone formation, particularly when modeling the future when both

variables will be increasing.

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107 Soil and Leaf Lead Concentrations in the Lincoln Park Area

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Lead is a highly toxic, naturally occurring metal found in small quantities in the Earth's soil and air. The lead content in soil primarily accumulates from human activities, lead-based paint resulting from chipped old buildings mixing with the soil, industrial products or from pesticide remnants. Our first objective is to study the relationship between lead in soils and leaves: what is the source of lead in leaves found in urban trees and specifically does lead enter plants predominantly from the soil? We hypothesize that if accumulation occurs from the soil there should be a significant positive correlation between leaf and soil metal content. Our second objective is to test if lead soil hotspots are associated with lead sources that have been banned: automobile exhaust and lead paint use. In our paper, we demonstrate that Lake Shore Drive and the elevated tracks remain a significant source of elevated soil lead. We now know that lead exposure is associated with serious health consequences such as lead poisoning and negative central nervous system effects. An important result of our work is noting that increased lead levels could impact the growing of fresh foods in gardens near roadways and elevated tracks.

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108 Fungi as a Novel Source for Biofuels

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With the growing instability of Middle Eastern oil and the negative consequences of catastrophic climate change, biofuels present a more sustainable alternative to conventional fossil fuels. Although much research has been devoted towards cellulosic and algal biofuels, fungi, in particular, have been largely unexplored. Previous studies have shown that certain strains of oleaginous yeast can produce sufficient lipids (20-70% biomass) to be considered as a commercially viable source of biofuels. In this study, we first isolated and cultured 80 strains of filamentous fungi and yeast from soils and examined their oil content. Each fungal isolate was sub-cultured on potato dextrose agar to obtain a pure culture, and the fungal biomass was scanned by FT-IR (Fourier Transform Infrared Spectroscopy) to determine lipid content and composition. From this survey, two strains of yeast (Rhodotorula sp.) were found to have the highest levels of extractable lipids, and one filamentous fungus the least (Fusarium sp.).
Next, we evaluated oil production in the lowest and highest yielding isolates in response to different substrate carbon to nitrogen ratios (C:N). Rhodotorula and Fusarium were grown on medium that varied in C:N to determine the ideal growth medium for maximum oil yield; we used C:N of 20:1, 30:1, 40:1, and 50:1. For Rhodotorula, substrate C:N of 30:1 or 40:1 gave the greatest biomass accumulation and oil yield. For this reason, corn silage (C:N 35-45) or fruit wastes (C:N 20-50) could be used as growth substrates. In contrast, biomass accumulation in Fusarium was much slower, and, to date, different responses to substrate C:N have not been observed. Our study thus provides a basic step forward in the development of lipid production from yeasts.

186 Programming an Assessment Tool to Evaluate Environmental Performance of Regulated Rivers.

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Faculty Advisor: John W. Hayse, Samrat Saha, Mark Jusko,
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The U.S. Department of Energy encourages existing hydropower facility operators to evaluate environmental impacts of power generation in day-to-day and seasonal operations. To objectively quantify the impacts of reservoir operations on downstream ecosystems, a computational tool is being developed. The tool is based on relationships among certain parameters such as discharge, temperature, and dissolved oxygen and the ecological and physical concerns within the channel and adjacent riparian areas. A prototype was developed in Microsoft Visual Studio using C# providing an interface for the user to download site-specific instantaneous raw data and store processed data at various timescales to MySQL database. The user has the ability to select an assessment date and module for evaluation of either past performance or optimization of future operations based on water availability. The user then identifies a suite of environmental objectives and tracks their accomplishment for a specified duration, time period, and frequency. For each objective, the constraints and scoring system set by the user are used to query the database at a specified timescale. From this, a weighted score is calculated using embedded formulations and mathematical relationships established from scientific literature. Once all individual objectives are evaluated, an overall environmental performance score or 'index of river functionality' value, between 0 and 1, is calculated. A score of 0 indicates that conditions for one or more objectives were not met. However, a score of 1 indicates that all environmental requirements were fully satisfied, with intermediate values indicating partial fulfillment. This tool will be tested using information gathered from regulated sections of the Feather River in California and the Gunnison River in Colorado. This tool can be incorporated into an optimization model to assist with the identification of alternative scheduling and operating procedures for hydroelectric power plants to enhance revenue while simultaneously reducing environmental impacts.

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187 An Analysis of Suburban Sprawl Case Study: Chicago Metropolitan Region

Joe Nieciak
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Department of Geography, DePaul University

For more than half a century now, the American population has been decentralizing from high density urban centers to very low density suburban sprawling developments. Suburbs are growing much more quickly than central city areas, with most cities losing population, and metropolitan growth occurring in peripheral suburban communities. The objective of this research project is to illustrate how low density sprawl has grown in the last thirty years in the Chicago Metropolitan Area using remote sensing technologies.
A variety of literature exists that supports the idea of the negative consequences of suburban sprawl. These sources touch on a variety of different facets of the issue all seeking to prove how development patterns of the past half century have led to largely unsustainable lifestyles. Using the capabilities of the remote sensing satellite known as "Landsat," images will be retrieved that will illustrate how suburban sprawl has grown in the Chicago region over the past thirty years. The images will be manipulated using a land cover classification that will render densities of development into a specific color value on a map. These colors will show how densities of development have changed

and how suburban development has grown.
The hope of the research is to show how human development is quickly consuming surrounding rural areas, and that extremely low density developments are the culprit. In addition to the main objective, it is anticipated that this study will illustrate where development has grown the most and the quickest. From this information, the viewer can understand where people were/are going and can possibly form opinions as to why people chose to settle in particular areas throughout the metropolitan region. The research will ideally bring an environmental awareness, with a geographic/ urban planning perspective, to the viewer.

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188 Fossil Fish Fauna from the Uppermost Graneros Shale (Upper Cretaceous) in Southeastern Nebraska, Kenshu Shimada

Kevin R. Jansen
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DePaul University

The Graneros Shale is a rock deposited in the Late Cretaceous Western Interior Seaway of North America about 95 million years ago. Many microscopic fossil fish remains were collected from the uppermost portion of the Graneros Shale in southeastern Nebraska. These collected fish fauna consist of at least 24 vertebrate taxa, including 14 cartilaginous fishes, Meristodonoides sp., Chiloscyllium greeni, Cretorectolobus sp., Cretalamna appendiculata(?), Carcharias amonensis, Carcharias saskatchewanesis, Eostriatolamia tenuiplicatus, Eostriatolamia(?) sp., Squalicorax curvatus, Pseudohypolophus mcnultyi, Ptychotrygon triangularis, Ischyrhiza cf. I. texana, Onchopristis dunklei, Cretomanta canadensis, and 10 bony fishes, Hadrodus(?), Caturidae(?), Aspidorhynchidae, Plethodidae, Elopopsis sp., Pachyrhizodus minimus, Enchodus cf. E. gladiolus., Enchodus cf. E. shumardi, Teleostei incertae sedis(sp. A), Teleostei incertae sedis(sp. E). The locality is characterized by the abundance of benthic taxa, bottom dwelling species, indicative of a well-oxygenated, shallow marine environment, and is consistent with the paleoenvironmental inference made previously for the Graneros Shale based on lithological and invertebrate evidence.

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189 Dirty Secrets of Clean Coal A Change Analysis Approach to Forest and Habitat Loss on the Hobet Mountaintop Mine in West Virginia.

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The practice of mountain top removal to gain access to coal has risen substantially since the 1900s. Not only is carbon dioxide released through the burning of coal in power plants, it is also released from the clear cutting and burning of vegetation on the site that is going to be mined. Research by Fox et al. (2010) has shown that carbon dioxide emissions are 17 percent greater if you include carbon dioxide from sources other than the actual burning of the coal - loss of the forest, CO2 released from soils, transportation etc. A 20 year analysis from June 1987 to September 2010 of the Hobet Mountaintop mine in West Virginia will be the focus of the study. Remote sensing techniques, specifically change analysis and ENVIs vegetation analysis tool kit, will be used to assess the the amount of forest and habitat loss as well as estimate the amount of CO2 released from the clear cutting practice. In one of the most biologically diverse places in the US the research shows the rapid loss of forest over the 20 year period and concludes that the idea of clean coal is anything but clean.

37 In-Situ Oil Recovery and the Boom of 'Fort McMoney': Tracking Change in Alberta's Athabasca Tar Sands Region

Scott Stealey
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DePaul University

With the price of oil increasing and the United States' desire to extricate themselves from their dependency on foreign (primarily Middle Eastern) oil, the demand for Canada's reserves has risen considerably over the last few years. However, the in situ process to extract and separate the oil from the Canadian "tar sands" involves significantly more energy than normal oil drilling, a greater carbon footprint, and mass deforestation–calling into question how the land should be developed in terms of sustainability. The Athabasca River Valley in northeast Alberta has been at the center of this economic and environmental quagmire because of its rich deposits, second only to Saudi Arabia in available crude resources. Using remote sensing technology, it is possible to examine the effect the extraction process has had on the land cover over the period of time that the majority of oil sand mining has occurred. In addition, changes in the land cover surrounding Fort McMurray–the nearby boomtown where much of the oil companies' workforces reside–can also be detected with remote sensing. With a quickly growing population coupled with a vastly destructive shift in environmental usage, these two change analyses will provide consequential possibilities to what the oil extraction means for the future of the tar sands regional ecosystem.

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38 Detecting Glacial Change with Landsat and ASTER

Jesse Wood
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DePaul University

The study of glacial change has proven to be a valuable indicator of global climate change. Remote sensing has become one of the primary tools for analyzing glacial change. This research aims to determine whether Landsat TM or ASTER delivers superior performance in glacial change analysis. A comparison will be made among different remote sensing satellites' analytical potential by examining images of the same glacial sites. Images will be selected based on two factors: firstly, mutual proximity of capture; secondly, equal legibility (regarding cloud cover and other conditional detriments to analytical potential). The goal of the research will be to indicate if there is a superior remote sensor for the specific purpose of glacial change analysis.

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154 Detecting Glacial Change with Landsat and ASTER

Ciaran Shaughnessy
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Illinois Institute of Technology

The European shore crab, or "green crab" (Carcinus maenas), is a globally invasive species. In areas where it has been introduced, it causes catastrophic changes to the local ecosystem through competitively consuming habitat (food and shelter) resources, however, these changes might be reversible once the offending species has been controlled or even eradicated. In the

Pacific Northwest, unsuccessful measures to prevent the expansion of C. maenas have included fishing/trapping (man-hours required were prohibitive), chemical (non-discriminative pesticides), and biological (non-discriminative parasites) control. This study investigates an integrated pest management method of eradication (similar to that currently used in terrestrial agriculture) by utilizing the potential signal from a natural predator (Pacific Northwest octopus, Enteroctopus dofleini) as a "push" to force the green crab out of key habitats. We hypothesize that the excrement from the octopus contains a chemical compound related to its diet that serves as a warning signal to the prey-species C. maenas. While the diet of the octopus is varied, we expect green crab will respond statistically negatively (move downstream) to green crab-fed, octopus-conditioned seawater compared to a seawater control. Furthermore, we expect the extent (temporally and spatially) of retreat to be greater than that of bivalve (edible muscles, Mytelus edulis)-fed octopus conditioned seawater. To study the avoidance behavior, a novel laminar flow, multi-treatment flume system was designed. Previous studies have successfully elucidated the female pheromone compound that could be used as the "pull" chemical signal to draw green crab out of breeding areas. Elucidation of the chemical compound(s) responsible for the avoidance signal will be conducted using both solid phase extraction (SPE) methods coupled with high performance liquid chromatography (HPLC) and HILIC MS-MS. Structure determination will be carried out using a battery of spectrometric methods.

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190 Mapping Urbanization, Development, and Land Use Change Through Remote Sensing Analyses: A Case Study of the Zhujiang River Delta

Mike Jersha
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DePaul University

The land surrounding the Zhujiang River Estuary in China has undergone rapid urbanization over the last 30 years resulting in three out of China's ten largest cities; Shenzen, Guangzhou, and Hong Kong. To understanding the magnitude of this change a temporal and spatial change analysis will be performed through the media of geographic information systems (GIS) and remote sensing instruments. The data utilized for this analysis will be obtained through Landsat 4-5 Thematic Mapper imagery, with the purpose of compiling numerous composite images displaying the extent of change in land use development patterns through image differencing techniques. Accordingly, changes in land use from agricultural space to developed land are linked to relocation of resources and will be examined to understand if they are a result of or catalyst to the increased urban development and any subsequent effects on the urban areas surrounding the Zhujiang River Estuary in regards to food resources. In order to record the amount of land use change, a quantification of land change will be performed by measuring the extent of loss of agricultural space as well as the creation of newly developed land, which in some instances could be greater than agriculture space lost due to land infill and coastal land expansion. A GIS and remote sensing research hybrid will maximize the efficacy of capturing the development changes through the region surrounding the Zhujiang River Estuary.

Abstracts - Environmental and Geophysical Sciences

191 Inventory Change Analysis and Land Classification of a Post-Deepwater Horizon Coastline

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The lasting impacts from the deepwater horizon oil spill are presently being distinguished as affected ecosystems react to the influx of externalities. In the months following the spill, marshes along the Louisiana coastline were significantly impacted via root asphyxiation and soil contamination from the presence oil and dispersant chemicals. Scientists later determined damage in the marshes to have reached their apex in October 2010, roughly 2 months after the spewing well had been capped. The ensuing environmental remediation has been focused largely on these marsh ecosystems due to their relevance in local fishing and tourism industries. Time frames for plant life cycles will soon reveal both the overall deterioration of the marshes, as well as any results from the remediation efforts. Using Landsat and ASTER satellite imagery, remote sensing and land classification techniques are able to display these characteristics. This study performed a land change analysis comparing gross change in vegetative land cover from October 2010 to October 2011 from Landsat imagery. In addition, a high-resolution land classification was produced from ASTER imagery to provide a baseline reference as secondary data for future studies. Assuming marsh damages reached their worst in October 2010, it was possible to distinguish locations undergoing significant environmental regeneration, in addition to isolating those areas most requiring remediation attention.

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237 Assessing Soil Acidification at the Wangaloa Coal Mine, New Zealand

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Coal mining is an intensive process that results in severe land deformation. It is frequently the case that following mining at a site, the landscape is left filled with coal overburdens, vegetation is destroyed and there are high levels of erosion. Through mining processes, soil acidification becomes severe potentially reaching pH values under 2, and boron concentrations in the soil can reach toxic levels. The purpose of this study was to investigate soil conditions and vegetation cover to assess the rehabilitation of abandoned coal mining sites. Specifically, this study was conducted at the Wangaloa Coal Mine located near Kaitangata in South Otago. The goal is to understand how best to rehabilitate mining sites by restoring native flora and fauna that are able to cope with soil acidification and boron toxicity. In relation to this, the study is also to understand the controlling factors on plant survival and healthy soil. In relation to soil conditions, the study also tested the idea that boron toxicity is more of a controlling factor than pH on plant re-growth. To assess this situation, extensive pH sampling was conducted within a coal overburden that is heavily covered with the plant species Leptospermum scoparium. Traces of Glissorinia littoralis as well as other plant species are also present though in much less abundance. A base-map was created using ArcGIS which plots pH and vegetative cover as a function of the GPS coordinate. Based on the basemap, the study determined that Leptospermim scoparium is a very resilient plant able to survive in soil pH levels under 2 with boron toxicity. It is the only native plant found at the Wangaloa site able to do this. The remaining plant species survival was found to be controlled by boron toxicity more than low pH due to locations of growth and survival.

History

39 Revolutionary Non-Violence: Brutalization Theory and the Paris Commune

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The Paris Commune was the last major revolution in France in the 19th century. However, its ten weeks of Parisian self-government were brought to an end by the national government in Versailles in a repression which left between 10,000 and 30,000 dead. That this last repression was also the bloodiest in the 19th century is indicative of a larger trend: the increase in the violence of revolutionary action across the century. The concept of brutalization, taken from the work of historian George Mosse, and brutalization theory, taken from the study of capital punishment, provide an explanation of this trend. Their shared claim that persistent violence causes a "heightened indifference to human life" is of use here. Thus, the first goal of my presentation will be the application of brutalization theory to nineteenth century France broadly and to the specific case of the Paris Commune. However, for all explanatory power there is one difficulty in this application: the unequal nature of the violence during the Paris Commune. One would expect, given brutalization theory's claims, that the violence committed by each side would be equivalent or at least proportionate; however, this is not the case. The national government pursued a policy of slaughter while the Commune was remarkably restrained in its use of violence. Thus the second goal of my presentation is an explanation of this imbalance, which I find in a fundamental ideological element of the Commune: an ideal of a government for whom the use of deadly force is the absolute last resort.

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109 Effects of CIA Vaccine Ruse on Immunization in Pakistan

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In the months leading up to the raid on Osama bin Laden's Abbottabad compound in May of 2011, the CIA set up an elaborate fake vaccination program using Pakistani doctor Shakil Afridi. Under the guise of a door-to-door Hepatitis B vaccination drive, the program was meant to collect DNA samples from children living in the residence to confirm the presence of bin Laden himself. While such a program did not lead to the successful possession of any DNA evidence, news of the CIA's covert operation brought the criticism of public health groups and was seen as a blow to vaccination efforts in a region still struggling with endemic cases of polio.
Using press releases, newspaper reporting, and blogs, the reactions of public health groups—specifically those involving vaccination—were compared to assessments by those in the Pakistan region during the time when the CIA's program was revealed. In addition, the events were compared and contrasted to a similar occurrence in Nigeria in 2003, when Muslim religious leaders urged parents to refuse polio vaccinations for their children. Those immunizations were portrayed as part of a Western conspiracy to sterilize their children.
Overall, these reactions are part of a larger sense of mistrust felt by the poor, predominantly Muslim regions toward the vaccine programs which attempt to serve them. Those associated with legitimate vaccine programs are left to assess the damage control needed to counteract this increased skepticism in the wake of the CIA program.

Humanities

40 The Impact of Serious Mental Illness on Society: How less adequate care of SMI persons relates to the economic, societal and public safety instability of the Cook County area and why Cook County jail has one of the largest psychiatric hospitals.

Dartunorro Clark
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Cook County jail has the largest psychiatric hospital under roof. This occurred because of the failure of Congress in 1963 to fund a Community Psychiatric Program after originally approving it set the current stage for the current crisis where more individuals with mental illness are incarcerated in jails and prisons, rather than being treated in mental health facilities. More recently because of the current policies and lack of resources and services provided for people with SMI, if no adequate services or procedures are provided, people with SMI will continue to process through the system in a cycle of hospitalization, jail/prison, and homelessness, which will create high cost for the health care and criminal justice system. This research will focus on how the systems in Illinois (Cook County) has provided inefficiency for individuals with SMI to continue to process and how that effects the economic and public safety status of Cook County and the State of Illinois. It will also provide the current policy status on what is being done at Federal, State and Local levels to correct the issues and what other steps should be taken. Lastly, how the current treatment of individuals with SMI in the Cook Country system relates the larger scale of the affect on Industrial nations such as the United States.

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42 Interactions of Non-Verbal Behaviors Accompanying Deixis

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Deictic referring expressions are linguistic forms that are intended to denote objects in the world and whose successful interpretation by a hearer necessitates additional contextual information besides what their form literally encodes. Pointing is the most widely recognized strategy used by speakers to lead hearers to their intended referent in cases of deixis. However, recent work has shown that a number of non-verbal behaviors, including movement of the whole body toward an object, can make that object salient for deictic reference similarly to pointing. While many studies have sought to model the operation of individual non-verbal behaviors, little is known about the ways in which multiple non-verbal behaviors interact with one another, particularly in a naturalistic setting where interlocutors move freely during the discourse. In order to determine whether pointing and positional evocation of a referent compete with one another for selection, are used to complement one another, or are entirely independent from one another, the interaction between movement and pointing among mobile speakers was examined in a naturalistic reference evocation task. As part of a larger study involving both seated and standing pairs of subjects, seven pairs of mobile speakers discussed four co-present constructed referents in an effort to determine which was the

most likely replica of a valuable sculpture. Onset of gesture was analyzed with respect to the timing of speakers' most recent move toward the selected object in order to determine whether gestures occurred temporally near movement, distant from movement, or were randomly distributed. The results indicated that gestures most often occurred shortly after a movement, suggesting that gesture and movement are complementary evocation strategies. Though preliminary, these results suggest that different non-verbal behaviors do interact and that further study is necessary to fully understand the physical provision of contextual information accompanying deictic reference in naturalistic discourses.

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111 Translational equivalents and code-switching

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There are various methodological issues related to code-switching research, including what "triggers" a code-switch (cf. Pfaff 1979; Clyne 1991, 2003; Backus 2000; Bailey 2000; McCormick 2002). Many bilingual speakers will anecdotally acknowledge that different lexical items can have an effect. It is commonly understood that words without a translational equivalent are more likely to trigger a code-switch. Our study presents the results of an empirical study that tests this. We compare the acceptability of Spanish/English code-switches involving stimuli both with and without translational equivalents.
Consider the following example where the two lexical subjects are similar, but distinct. In one the Spanish subject niño 'boy' has a translational equivalent. That is to say, a Spanish/English bilingual will quickly tell you that niño "means" boy in English. On the other hand the Spanish subject escuincle 'bratty boy' does not have an easy translational equivalent. Although it is glossed as bratty boy, this is only an approximation. In reality, escuincle is a more specific and culturally distinct term that cannot be easily defined in English.Currently a pre-pilot study is being conducted. The data for our study is obtained using written grammaticality judgments with a five-level Likert scale. All participants are native bilingual Mexican-American speakers, raised in Spanish-speaking households and having learned English by the age of five.

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193 Lexical Semantics and Two Types of Scales

Lelia Glass
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Usages like very pregnant seem to contradict the distinction (Kennedy (1997) and others) between gradient ("gradable") adjectives like tall and binary ("nongradable") ones like prime. In very pregnant, pregnant acts gradable, indicated by very, even though traditional tests diagnose the word as nongradable.
I propose that a gradable usage can invoke a scale from one of two sources: either (1) the word has a scale already (tall); or (2) context forges a scale out of the sum of a word's related qualities (for nongradable adjectives with contextual associations, such as pregnant).
I build on Levin and Rappaport Hovav's theory of the conceptual shape of words to propose a new way of creating a scale in context. L&RH (2011) characterize words as both consistent and flexible. Within a shifting cloud of associations, they posit a nugget of lexicalized meaning that the word

contributes to every context. A train hurtling toward a station suggests speed, loss of human control and fear among passengers. An asteroid hurtling toward a moon evokes speed but not loss of control or fear because no humans are involved. Therefore, the lexicalized meaning of hurtle is rapid motion, but different contexts evoke various associations.
I use L&RH's sketch to propose a contextual scale. Intuitively, very pregnant means a woman's appearance and behavior display prominent pregnant qualities. To derive this meaning, the context sums pregnant's associated qualities, weighted by their contextual significance and extent.
[Subexample: ∑(quality)(contextual weight)(extent)]
Very pregnant suggests the computed score exceeds some contextual threshold.
Splitting up adjectives by their lexical semantics allows us, on the one hand, to maintain the accepted distinction between gradable and nongradable adjectives; and on the other, to explain how apparent exceptions like very pregnant obtain a scale in context.

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199 Complementizers in Spanish/English Code-Switching

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This project studies the function of complementizers in code-switching. Complementizers introduce the subordinate clause in a sentence. An example of a complementizer is "that" in English and "que" in Spanish, as in (1) and (2).
(1) John said [that] his dad has bought a car.
(2) Juan dijo [que] su papá ha comprado un carro.
The head of the subordinate clause that the complementizer introduces is called Tense (T), and as part of the derivation to build this structure, the complementizer (C) enters into a grammatical relationship with T. This process has been the site of significant research in modern linguistics. Code-switching, the second element of this project, is the use of more than one language in discourse by bilinguals. This projects studies intrasentential code-switching, where two languages are combined in a single sentence. Code-switching is not something done at random, but rather it follows patterns and rules. In the literature on code-switching, it is claimed (e.g. by Belazi, Rubin, & Toribio 1994, González-Vilbazo 2005) that one such rule is that it is not possible to code-switch between C and T. For example, (3) and (4), with a switch between C and T, are claimed to be impossible.
(3) * Juan said [that] su papá ha comprado un carro.
(4) * Juan dijo [que] his dad has bought a car.
We carried out a experiment testing code-switching between C and T using a Grammaticality Judgment Task; participants are Spanish/English bilinguals, who are self-reported code-switchers. The data collected shows that code-switches between C and T are in fact possible and that there is a difference in the acceptability of the sentence based on the complementizer used. This project provides a deeper insight into linguistic phenomena related to complementizers and into code-switching practices, especially among Spanish/English bilinguals.

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234 Civic Participation and the Environment An exploration of volunteering motives of college-aged students

Pavan S Krishnamurthy
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Northwestern, EPC

The last four decades have seen a particular increase in environmental protection (Pastore and Barbarossa, 2, 2011). While these practices come from governmental, corporate, and international organizations, there is a strong need for grassroots mobilization and often students are seen as the missing link. However, there is currently a lack of extensive research concerning environmental service among undergraduate students. It is understood that non-traditional education is a powerful means to enlighten future leaders. Considering the growing significance of environmental protection, it has become important to analyze and develop better understandings of the motives of volunteers to guarantee stronger retention rates. This study attempts to examine three aspects of Voluntary Environmental Service (VES) and Voluntary Service (VS), in regards to undergraduate Northwestern University students:

(1) What are the demographics (sex, community, and family background) of undergraduate Northwestern University students in VES and VS?

(2) What motivates these students to participate in either VES or VS?

(3) Which of these motives tend to keep students actively engaged?

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194 The Founding of an Undergraduate Marine Research Laboratory: the CRAB Lab

Mariah Kuitse, Miriam Schmid, Ciaran Shaughnessy, Ruth Jimenez, David Burchell, Tim Carsel
Faculty Advisors: Dr. Jennifer Miller and Dr. John Terschak
Illinois Institute of Technology

At the Illinois Institute of Technology (IIT) there has been a growing interest among undergraduates in marine research and application of chemical and biological sciences. However, this field of research has traditionally been unavailable in the greater Chicago area. Interested undergraduates in the fields of chemistry, biology, and animal behavior psychology proposed the founding of a research laboratory at IIT to facilitate a student-directed, cross-disciplinary endeavor, at the heart of which is a uniquely integrated laboratory design for the multi-use of sea water, green crab (Carcinus maenas), and a giant Pacific octopus (Enteroctopus doeini). Students involved in the CRAB Lab not only receive the research experience from their respective studies, they also are engaged in active fund raising, public relations, and outreach efforts to ensure the sustainability of the resaerch. The CRAB Lab currently facilitates four separate undergraduate research groups: (1) a chemical ecology group to isolate a chemical which elicits avoidance behavior by the invasive green crab, (2) a cognitive science group to map the cognitive ability of the octopus against that of developing children, (3) a microbiology group investigating the variations of microbial activity between the seawater conditioned by each species, and (4) an engineering team culturing algae to be used in a community biofuel project. The lab has made a specific effort to ensure the sea water is recycled between the studies as much as the experimental design of each will allow. This novel degree of focus on shared resources in a research setting is the factor that enables the wide undergraduate participation that exists in the Crab Lab.

234 Evidence from Spanish/German Code-Switching in Object Pronouns and their representation.

Ivette Serrano; Sergio Ramos; Kay Gonzales-Vilbazo
Faculty Advisors: Sergio Ramos, Kay Gonzalez
University of Illinois at Chicago

In this presentation, we present an issue we dealt with when gathering code-switching (CS) data. In the study on sluicing in Spanish/German CS, we looked at case identity of the remnant wh-phrase in instances where the case of the wh-phrase is different in Spanish as compared to German (e.g. accusative vs. dative). Highly fluent bilingual speakers rated code-switched sentences in terms of acceptability. Given Spanish's poor case morphology (in wh-phrases) and the possibility of dialectal differences (in case) in Spanish among our participants, they filled out a questionnaire to determine, through the use of object pronouns, which case each of the relevant verbs assigned to their internal complements in each participant's mental grammar. The results from this questionnaire along with the acceptability ratings for the stimuli allowed us to test our hypotheses regarding sluicing under CS, as well as to suggest a possible mismatch between the surface pronunciation of an object pronoun and its underlying representation in the grammar of some of our participants. The results, in general, point to the need—when using data from CS to test general linguistic theories—to find sufficient overlap between bilinguals and monolinguals in the relevant syntactic features when studying code-switching.

International Studies and Social Sciences

41 The Humanitarian Vaccine: How MSF's Creation of the Campaign for Access to Essential Medicines Affects the Organization's Mandate and What It Means for Humanitarianism

Aurelie Merlo
Faculty Advisor: Charlotte Walker-Said, Ph.D.
University of Chicago

Humanitarianism is both an ethics and a practice. It is the desire to relieve the suffering of distant strangers and the act of relieving that suffering. The modern definition of humanitarianism is arguably best resumed by the International Committee of the Red Cross (Hoffman and Weiss 2006). They define humanitarianism in opposition to politics and development aid. Although the definition is largely accepted today, this conformism is challenged by Médecins Sans Frontières (MSF). While MSF also opposes politics, they adopt a témoignage policy, (i.e. bearing witness), that although doesn't involve political action, involves an acknowledgement of the power humanitarian organizations can have on political events. More recently, MSF created the Campaign for Access to Essential Medicines (CAEM) in 1999. This sub-organization is dedicated to placing pressure on pharmaceutical companies, governments, and the public to instigate change in research and development policies. This project argues that the creation of CAEM demonstrates that MSF has changed their mandate from a purely humanitarian mandate to a hybrid political-humanitarian mandate. The paper then presents two models of humanitarian intervention, the war model, and the famine model, in order to assess the applicability of the hybrid MSF approach. Observations of MSF missions within the two models demonstrate that a hybrid approach leaves no place for a humanitarianism distinct from political action, and further, that the use of a humanitarian approach jeopardizes the opportunity for successful subsequent political action. The final claim of this paper is that a hybrid approach is detrimental to both the humanitarian and the political mandate.

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110 By All People, At All Times": The Ministry of Food and Agriculture and the War against Food Insecurity in the Northern Region.

Alexandra Giselle De la Rosa
Faculty Advisors: Edward Salifu Mahama, Olayemi Tinuoye
University of Illinois at Chicago Ph.D., University of Development Studies - Tamale, Ghana, School of International Training, University of Ghana - Legon, Brattleboro, VT

Objectives:
i. Gain a better understanding of food security (FS) issues and the coping strategies in five communities in the Northern Region (NR).
ii. Outline the various types of initiatives that tackle food insecurity (FiS) and understand the challenges to implementing these in the field.
iii. Assess the implementation of the initiatives of the Ministry of Food and Agriculture (MoFA) by the experience of its clients in the selected communities and determine suggestion for improvement.

A combination of observation, participation, and group and individual interviews with farmers, market traders, other rural community members and leaders, and representatives of seven major NGOs and MoFA were used. Five farming villages were visited each for a few days, observation and participation in cooking and other food and income securing activities was completed during these stays, as well as interviews with 180 community members. Most community interviews were done in group format, separating males and females to avoid gender bias, and with the translating help of a local community member in each village.

The reality of FiS observed in these communities is a cycle of debt that traps small-scale subsistence farmers between the seasonal nature and mounting costs of harvesting, and producing enough food for consumption and to sell for additional expenses. Women play a critical role in the survival of farming communities through the lean season. While the direct benefit of NGO programs come and go, the impact in boosting leadership, morale, and group formation in communities is lastingly evident. MoFA, however, faces the task of reaching millions of farmers with astounding understaffing and under-funding from a central level. Small-scale farmers and collaborations with NGOs must be incorporated in the planning process of MoFA initiatives so they effectively reach those who most need it. Lastly, farmers and communities must too change their mindset away from subsistence to business farming so they may plan and harvest for maximum profit and be able to break the cycle of FiS.

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195 Kyrgyzstan and China: Kyrgyz Elites' Opinions of a Giant Neighbor

Samuel Ide
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Department of Political Science, Northwestern University, Evanston IL

Kyrgyzstan, a poor Central Asian country of 5.5 million people with a per capita GDP of $2,200, shares a 858 km border with China, the world's most populous country. As China expands its influence in the Central Asian region, and Kyrgyzstan specifically, I felt that it was important to understand the methods that China was using, and more importantly how China was being politically perceived by the developing countries it was interacting with. In this study, I traveled to Bishkek, Kyrgyzstan and interviewed a wide variety of political officials, NGO workers, and academics to determine how Kyrgyz elites view their political relationship with China. The study determined that Kyrgyz elites politically focus almost entirely on Russia, due to a cultural legacy dating back to Kyrgyzstan's inclusion in the Soviet Union. This is despite the fact that China has increased economic trade and development with Kyrgyzstan. The conclusion reached was that China primarily deploys soft power methods when dealing with Kyrgyzstan, and does not require, nor seek a political relationship with Kyrgyzstan, thus the Kyrgyz are left to pursue a political relationship with whomever they please, as long as China's economic interests in the country are secure. Other factors that the research uncovered in the Kyrgyz elites' perceptions of China was the strength of their own views on Kyrgyzstan, as well as whether or not they were pro-Western. Those with strong feelings of nationalism tended to spurn the necessity of dealing with China or other big powers, while those with pro-Western views tended to view China in a positive light.

234 Theories of Social Movement and Mobilization in Egypt 2011

Willy Gu
Faculty Advisor: Paul Staniland
University of Chicago

There is no doubt that a social movement came together in January 2011 and initiated a chain of events that led to President Mubarak resigning after 30 years of rule. How these events conform to or diverge from existing theories on political mobilization remain unanswered. Egypt serves as a unique case to test these theories as this one event offers a multitude of factors that have yet to be placed into existing theories. Furthermore, activists and policymakers alike can benefit from a more thorough understanding of the nature of social movements as people around the world seek better lives in difficult situations. This paper will examine the Egyptian Revolution through the lens of four major schools of thought: resource mobilization, political processes, network explanations, and framing processes. The events of Egypt 2011 support, detract, and raise new questions about the concepts and propositions from these four theories. Even more, some of the aspects of the theory just do not apply to Egypt. This claim is supported by interviews with activists and analysis of sources like blogs, newspapers, and statements that shed light on the political environment.

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197 Equality, Brotherhood… and Secularism? The Codification of Cultural Values in France

Patricia Radkowski
Faculty Advisor: Nicholas Pedriana
Northwestern University

On April 11th, 2011, France began the enforcement of the 2010 ban on the concealment of the face in public, but it made headlines that day for a different reason: two women were briefly detained during a protest of the ban in front of the Notre Dame Cathedral. Events like this one demonstrate the difficulty heterogeneous countries face today in integrating many peoples. This most recent legislation indirectly constraining Muslims in France brings to mind the 2003-2004 law that banned religious symbols in public schools. How do French lawmakers understand these bans? How were arguments for the bans phrased? What does this phrasing tell us about the French codification of cultural values?

This study analyzes the Stasi Commission Report of December 11th, 2003 for the 2003-2004 ban of religious symbols in public schools and the French National Assembly debate of July 6th, 2010 for the 2010-2011 ban of the concealment of the face in public. French politicians conceptualized these bans as upholding French cultural values, namely the concepts of French secularism, Republican values, "living together," and rights.

198 Understanding Interstate Disparities in Educational Expenditures: Fiscal Capacity, Politics, and Litigation

John J. Lee
Faculty Advisor: Dennis Chong, Ph.D.
Department of Political Science, Northwestern University

Does money matter in education? Over the last few decades, scholars of education finance have produced a significant body of research lending empirical credence to both camps. Some found that there is an economically efficient relation between instructional spending and student outcomes (e.g., Greenwald et al. 1994); on the other hand, some have not (e.g., Okpala et al. 2001). My previous study suggested that the answer may lie somewhere in between. That is, once districts are first disaggregated based on socioeconomic status, and then separate regression models are applied, I found a statistically significant relationship manifest among wealthy districts—but not among their poorer counterparts (Lee 2011). My current research project seeks to build on this finding. If at least in some cases, additional funding yields greater academic output, and there are sizable gaps in spending among the states—e.g., compare Idaho ($6,900) to New York ($16,800)—then the following question is quite important: what factors coalesce to produce these interstate disparities? Based on my theory of the budgetary process, this project examines three broad categories of variables: political (i.e., dominant party at the state and national levels); economic (fiscal capacity defined as total taxable revenues per capita, public debt, budget deficits); and legal (whether the issue has been litigated in the state, and if so, whether the plaintiff won). Multiple regression models are run on panel data, such that changes in the variables can be examined across time (i.e., 1992-2009) as well as within each unit of analysis, the state. Initial results suggest that fiscal capacity and partisanship are the most significant factors related to a state's per capita expenditures on education.

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235 The Politics of 'Transnational Citizenship': Law, Economics, and the International Migration of the Indian Diaspora in Germany

Pavan S Krishnamurthy
Faculty Advisor: Ji-Yeon Yuh, PH.D,
Northwestern University

Over 80,000 Indian Nationals or Overseas Indian Citizens reside in Germany, and despite their seemingly small numbers, they play a unique role in shaping German politics and cultural arrangements. Recent Indian regulations have established an Overseas Citizenship of India program and Germany's Green Card initiative directed at Indians has been quite successful at attracting IT professionals (Statistisches Bundesamt Deutschland 2008). These dynamic factors are among many that have created intricate legal and economic relationships in regards to citizenship in post-European Integration between individuals, identities and nations, which balance financial interests while maintaining a national identity.
My research, in this paper, focuses on the effects of the Indian Diaspora in Germany in regards to: (1) The International Relations of Diasporas; (2) The Economics of Migration; (3) Critical Legal Theory. The role of common identity construction in international relations will be investigated by analyzing the Indian Diaspora in an holistic manner, which includes both global and local politics. Moreover, by examining the microeconomics of immigration, I will be able to investigate the underlying factors behind migration movement. Finally, by employing critical legal theories and studies of transnational ethic networks, I hope to establish a firm theoretical and pragmatic backing for the research.

Mathematics

43 Numerical Methods for Poisson-Nerst-Planck Equations with Applications in Ion Channels

Michael Machen
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Illinois Institute of Technology, Chicago, IL

Ionic solutions are mixtures of interacting anions and cations. They hardly resemble dilute gases of uncharged noninteracting point particles described in elementary textbooks. Biological and electrochemical solutions have many components that interact strongly as they flow in concentrated environments near electrodes, ion channels, or active sites of enzymes. Interactions in concentrated environments help determine the characteristic properties of electrodes, enzymes, and ion channels. Flows are driven by a combination of electrical and chemical potentials that depend on the charges and concentrations. The partial dfferential equations of mixtures, which combine physical properties of individual components, are given by the time dependent PoissonNernstPlanck(PNP) equations of semiconductors, electrochemistry, and molecular biophysics.The PNP equations can be used to model the flows inside ion channels which are driven by a combination of electrical potentials and charge concentrations. These potentials and charges within the channel can be modeled by a PNP equation. The research plan is to develop efficient numerical methods for solving the PNP equations accurately while investigating the conservation properties of the existing numerical methods for the time integration.

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99 Determining an Optimal Network-Reducing Methodology for Financial Investment Network

Ken Park
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Northwestern University, Evanston, IL

Even though network analysis has gained much popularity in analyzing complex systems over the last decades, analyzing financial network has remained as a challenge for network analysts due to the vastness of the network and lack of publicly available data (Allen et al. 2005). Using the major shareholder information each public company has to report in its quarterly reports, I constructed a financial network of more than 6,000 publicly traded companies in the three major exchanged in the U.S. (NYSE, NASDAQ and AMEX) for three different time point in nine months. The resulting networks turn out to be fully connected, requiring a network reducing methodology that eliminates insignificant links without losing important data points. The raw networks were reduced using three methods: the median-cutoff, minimal spanning tree, and link-salience method. The resulting networks showed that the link-salience method is the most optimal method in reducing the investment networks; the ones reduced by the median-cutoff method resemble the reality but still have too many links, and the ones by the minimal spanning tree method lose resemblance to the reality in terms of market capitalization. For next steps, we can statistically analyze relationship between network attributes of nodes and price movements of companies' stocks, and continue further research by building a network based on more tangible links such as operating cash flows among companies.

112 Pricing American Options using the Longstaff-Schwartz Algorithm

Daniel Eckhardt, Illinois Institute of Technology; Adrian Ochoa, University of Arizona; Michael Osorio, Duke University.
Faculty Advisor: Marcel Blais, Worcester Polytechnic Institute and Stephanie Sommersille Texas A&M University

Unlike European options, American options can be exercised at any time up to maturity. As a result of the early exercise feature of American options, they are at least as valuable as their European counterparts. This, however, makes them harder to price as the analytical closed form equations used for pricing vanilla European options do not apply. In order to price an American option, each time t prior to maturity T must be considered to determine whether it is optimal for the option holder to exercise the option immediately or to hold on to the option until a more advantageous future time before it expires. We implemented the Longstaff-Schwartz algorithm, which incorporates Monte Carlo methods and regression to price American options. We also used variance reduction techniques and quasi-Monte Carlo methods to improve the convergence and computational speed of the algorithm. We were able to significantly reduce the width of the 95% confidence interval of our estimated price of the option by using control variates, and we determined the exercise boundary that results from applying the stopping rule. We found that the Longstaff-Schwartz algorithm efficiently prices American put options.

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145 Can we use heuristics to predict the energy characteristics of solids?

Anvesh Tanuku,
Faculty Advisors: Chris Wolverton Ph.D Northwestern University, Bryce Meredig, PhD student Northwestern University

In solid-state chemistry, scientists are often confronted with the problem of partial occupancy. Partial occupancy is a problem that arises when the approximate stoichiometry and lattice sites and in a crystal are known but the specific atomic species that sit on those sites are unknown. The problem arises when one wishes to do quantum mechanical calculation with these structures at 0 degrees Kelvin - at which all species must exist at a specific site. Here we explore the feasibility of using heuristic methods to map these disordered structures with partial occupancy to ordered structures at 0 Kelvin. The approach consists of enumerating all distinct decorations of a given lattice cell at a given stoichiometry. Using this list of decorations, heuristic approaches are used to rank the relative 'likelihood' of a given decoration to exist. These heuristics are then compared to standard techniques for calculating energy such as cluster expansions and empirical potentials.

200 Properties of solutions to the generalized Airy equation on time scales

Madeline Barnicle, Thomas Nevins, University of Wisconsin-Eau Claire; Joseph Varilone,
Faculty Advisor: Chris Ahrendt PhD
University of Chicago, University of Wisconsin-Eau Claire, University of Michicgan

We explore properties of solutions of the generalized Airy equation on various time scales. The time scale calculus unifies and extends the theory of di□erential equations and di□erence equations, and has applications in fields such as population biology. Second-order self-adjoint di□erential equations, such as the Airy equation, can be extended to these general domains. We mention oscillation and disconjugacy results for di□erent self-adjoint equations and power series expressions of the solutions of the Airy equation on particular time scales, Some solutions to the Airy equation resemble the solutions in the classical case on the real numbers.

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201 Comprehending the Menger Sponge

Barrett A. Leslie, Bassil Alcheikh,Brian Pichardo
Faculty Advisor(s): Greg Fasshauer, Arthur Lubin, Fred Weening
Illinois Institute Of Technology

Beginning with a brief history of Karl Menger, this poster explores a three dimensional fractal curve, the Menger Sponge. Then the geometric sum and ternary notation for the one and two dimensional analogous sets, the Cantor Set and Sierpinski Carpet are defined. Once the simpler analogous cases are defined, a simple illustration of how to construct the Menger sponge is given along with it's formal definition, formula for surface area, and formula for volume. Drawing upon these concepts it is then illustrate how to perform the recently popularized "Menger Slicing", thus revealing the iterative hexagonal symmetry of the Sponge. This is accompanied by graphical timeline which outlines a brief history of hexagonal symmetry. Although there is no good explanation of the Sponge's hexagonal symmetry, a reasonable approach for finding such a solution is touched upon.

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203 A Mathematical Model of the Spread of Human Papillomavirus (HPV)

Bailey Steinworth
Faculty Advisor: Dr. Eva Marie Strawbridge
Biological Sciences Collegiate Division, University of Chicago

Human papillomavirus (HPV) is a sexually transmitted infection estimated to cause 99.9% of cervical cancer cases and increasingly implicated in cases of anogenital and oropharyngeal cancers. The Center for Disease Control (CDC) estimates that approximately 80% of women will be infected by HPV by the age of 50. Two vaccines (Cervarix and Gardasil) have been developed which protect against HPV 16 and 18, the two types which cause approximately 70% of cervical cancers. Vaccination against HPV has been widely recommended for 11 and 12 year-old girls, and Gardasil has also been approved for boys. However, it remains unclear what proportion of the population must be vaccinated to control or reduce cases of HPV infection. In light of the recent development of vaccines against HPV, it is relevant to examine the conditions under which this infection could potentially be eradicated. Here, we develop a mathematical model for the spread of HPV. We use this model to theoretically determine under what conditions a disease-free equilibrium state is stable and to model the long-term behavior of HPV-infected populations, with the goal of informing

vaccination strategies.

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204 Counting Vectors in N-dimensional Space and Geodesic Sphere

Deepika Vaid
Faculty Advisor: Dr. Cyrill Oseledets
Department of Mathematics, Richard J. Daley College, Chicago, IL

In many problems of Numerical Linear Algebra it is important to know how many vectors separated by a fixed angle can exist in an n-dimensional vector space. We will give a geometric solution of this problem.

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234 Sampling Within k-Means Algorithm to Cluster Large Datasets

Anita Thomas, Jeremy Bejarano, Koushiki Bose,Tyler Brannan
Faculty Advisors: Dr. Kofi Adragni, Assistant Professor of Statistics,Dr. Nagaraj K. Neerchal, Professor of Statistics, Dr. George Ostrouchov
Illinois Institute of Technology, Brigham Young University, Brown University, North Carolina State University, Oak Ridge National Laboratory, UMBC

Due to current data collection technology, our ability to gather data has surpassed our ability to analyze it. In particular, k-means, one of the simplest and fastest clustering algorithms, is ill-equipped to handle extremely large datasets on even the most powerful machines. Our new algorithm implements sampling within k-means to reduce the amount of data analyzed, thus decreasing run-time. We perform a simulation study to compare our modified k-means algorithm to the standard k-means algorithm by analyzing both speed and accuracy. Results show that our algorithm is significantly more efficient than the existing algorithm with comparable accuracy.
This research was completed as part of the REU Site Interdisciplinary Program in High Performance Computing at the University of Maryland, Baltimore County.

Physics

45 Stochastic modeling of statistically unsteady turbulent mixing

Ahmad Qamar, Snezhana Abarzhi
Faculty Advisor: Snezhana Abarzhi, PhD.
University og Chicago

Rayleigh-Taylor and Richtmyer-Meshkov turbulent mixing are statistically unsteady processes. Their dynamics combines coherence and randomness, and their mean values and fluctuations are both time-dependent. These turbulent processes have a number of symmetries and are characterized by a set of invariant measures [EPL 91, 12867]. Employing these invariant measures, we developed a stochastic model for Rayleigh-Taylor and Richtmyer-Meshkov turbulent mixing in the case of sustained, time-dependent and impulsive acceleration. For the flow quantities, the effect of fluctuations on the mean values is studied and their statistical properties are analyzed. Requirements for statistical quality of experimental and numerical data are outlined. Mechanisms of mitigation and control of turbulent mixing processes are proposed. Their implementation in experiments and simulations is discussed.

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46 Three Fractal Regions of the Universe

Jenna Bergevin, Jesus Pando
Faculty Advisor: Jesus Pando, Ph.D.
DePaul University

Using the Sloan Digital Sky Survey Data (SDSS) Release 8, we calculated the fractal dimension of galaxies as a function of co-moving distance. We determined the fractal dimension using the discrete wavelet transform, and checked the method to confirm that the method did not alter the results. We found that between the co-moving distances 100—1,000 Mpc, the fractal dimension evolves linearly. At co-moving distances greater than 1,000 Mpc, the fractal behavior seems to diminish; however, because the number of galaxies is much less at these co-moving distances, and because the sky coverage per pixel greater, this result is obtained with less confidence. At co-moving distance less than 100 Mpc, the power law behavior is seen over limited scales, but we see some evidence of multi-fractal behavior.

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47 Microscopic Investigation into the Dynamics of Falling Chains

Unleen Kiverkis, Lacy Simons
Faculty Advisor: Asim Gangopadhyaya
Department of Physics, Loyola University Chicago

We are examining the dynamics of a falling chain, a classic textbook physics problem that has never been explained on the microscopic level. Traditionally the problem is presented one of two ways. The first being where one end of the chain is in a stationary fixed position and the other end is hanging suspended at a fixed length. The second presentation of the problem is where the chain is in a straight hanging position. The motion of the chain when released has previously been described as free falling, although studies have been conducted showing the chain is actually following conservation of energy laws. Our preliminary experiments confirm that the chain is conserving energy

as it falls. The purpose of our project currently is to show how energy is conserved at the microscopic level. We will be working mathematically and experimentally to define the forces acting upon the masses in the chain and describe their motion.

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48 Compression of Polystyrene Monolayer Films at an Oil-Water Interface

Brian Reszutek, Elizabeth Denhup, Sean You
Faculty Advisor: Dr. Binhua Lin
Gordon Center for Integrative Science, The University of Chicago

We are studying self-assembling monolayer films of polystyrene particles at a water-dodecane interface in a Langmuir-Blodgett trough and compressed at constant barrier speed. Glucose was dissolved in the water substrate in order to match the density of the particles. Though we have not yet reached firm conclusions about the cause or wavelength of these patterns, the fact that the particles have been made to form a cohesive film both at the water-air and water-dodecane interfaces holds promise for our ability to compare the wrinkling effects between two environments and determine what effect if any the change in surface tension has on their wavelength. This comparison of the physical properties of the layers formed at the two different interfaces should present some insight into general models of bending rigidity for monolayer films in general.

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49 Simulated Hashing of Nanoparticle Films Subjected to Uniaxial Compression

Minke Zhang, Yenchao Chua, Brian Leahy, Ka Yee Lee, S. Coppersmith, Binhua Lin
University of Chicago, Cornell University, University of Wisconsin

Nanoparticle films in Langmuir troughs have been observed to form linear patterns on the surface when subjected to uniaxial compression; such patterns have also been observed to depend on the extent of compression (source), and have been shown experimentally to be indicators of the formation of trilayers on the film. We wish to investigate more thoroughly the nature of this phenomenon and the cause(s) of the particular changes in the surface pattern at low and high compressions.
In order to observe the patterns, we have spread 6nm gold nanoparticles ligated with dodecanethiol over the air-water interface of a Langmuir trough, and subjected the film to uniaxial compression; the patterns observed in experiments have been dubbed "hashing" - at low compression, we observe an irregular network of dark lines that extend across the surface of the nanoparticle film, which gradually gains structure as compression continues. At high compression, we see that such "hashing" becomes more organized, aligning into thick vertical bands of high density. The hashing pattern at low compression is puzzling, as we would expect in terms of energy minimization that the lines do not intersect, and that the pattern would instead be an aligned network of non-intersecting lines, rather than the extensive intersecting array observed.
As a theoretical model for explaining this behavior, we surmise that in this system, thermal equilibrium is reached on an observable time scale; as such, the maximization of entropy will have a noticeable effect on the allowed energy states of the system - in this model, intersecting lines will increase the entropy of the system at large, and thus, is overall more favorable, though such intersections may come at a higher energy cost.
From this hypothesis, we have developed a Monte Carlo simulation to test our theory of pattern formation, and have found several parameters at which the simulated patterns match that of experimental patterns; the parameters, as we hypothesized, favors line formations - however, due the

random nature of the simulations, we see that the probability of any given surface state will favor a system with line intersections.

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50 Sharp and Infinite Boundaries in the Path Integral Formalism

Phillip Dluhy
Faculty Adviser: Asim Gangopadhyaya, Ph.D.
Loyola University Chicago

We revisit the analysis of sharp infinite potentials within the path integral formalism using the image method. We show that the use of a complete set of energy eigenstates that satisfy the boundary conditions of an infinite wall precisely generates the propagator proposed. We then show the validity of the image method by using supersymmetric quantum mechanics to relate a potential without a sharp boundary to the infinite square well and derive its propagator with an infinite number of image charges. Finally, we show that the image method readily generates the propagator for the half-harmonic oscillator, a potential that has a sharp infinite boundary at the origin and a quadratic potential in the allowed region, and leads to the well known eigenvalues and eigenfunctions.

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205 Shear-Thickening Properties in Oscillating Non-Newtonian Fluids

Roxanne Able , Yogi Patel
Faculty Advisor: Jon Bougie1, Ph.D.
Loyola University

Shear-thickening, non-Newtonian fluids increase in viscosity with increasing shear rate. We study the behavior of one such fluid, a solution of corn starch in water, when shaken sinusoidally in the vertical direction at a variety of accelerational amplitudes and frequencies. When a thin layer of fluid is vertically oscillated, it can produce Faraday waves, which are standing waves that form patterns such as stripes, hexagons, or squares. In addition to these patterns, corn starch in water demonstrates other phenomena such as stable holes and time-dependent, delocalized regions that grow from small initial disturbances in the fluid layer or, at some frequencies, develop spontaneously. We investigate how the concentration of corn starch (and as a result the shear-thickening properties of the fluid) affects which phenomena are observed, and we demonstrate that this concentration does have a significant effect on the fluid behavior.

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206 Time Dependence of Density Inversion in Granular Layers

Josh Panfil,Veronica Policht
Faculty Advisor: Jon Bougie, Ph.D.
Loyola University Chicago

Granular hydrodynamics studies the flow, movement, and general behavior of grains, i.e. collections of roughly spherical macroscopic particles. By using a continuum simulation based upon three-dimensional, time-dependent forms of hydrodynamic conservation equations, we are able to study the nature of density inversion. Density inversion is observed when there exist two distinct granular layers characterized by their density; these layers consist of a very low density portion of grains near the plate of oscillation and below a high density portion of grains [1]. In our work, we have closely followed the methodlogy of time-independent simulations performed by Lan, et al. and their subsequent discussion of density inversion, suggesting that density inversion is dependent upon a

relationship between shaking-frequency and amplitude - or the shaking strength S [2]. In order to characterize density inversion we have employed our continuum based computer program to run simulations for several fixed values of S wherein the shaking frequency and amplitude vary. These simulations have shown that the time-dependence of the density inversion is related to its shaking frequency; while density inversion occurs only periodically for lower shaking frequencies, higher frequencies exhibit nearly steady-state density inversion. Additionally, we have observed what appears to be a relationship between the shaking frequency and the height of the layer of greatest density for a given S value.

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207 Dilational and Shear Moduli of Monolayer Films Under Continuous Compression

Rossen Rashkov, Sean You, Minke Zhang, Dylan Banahene-Sabulsky
Stuart Rice, Binhua Lin
Faculty Advisor: Stuart Rice, Binhua Lin
University of Chicago, Materials Research Science and Engineering Center

According to Petkov (2000), the dilatational and shear moduli of Langmuir-Blodgett monolayer films undergoing linear compression can be measured using two perpendicular Wilhelmy plates connected to a pressure sensor . Determining these physical properties of the films will further allow for the development of applications in biology and electronics, where these films can be used to model cellular membranes and conducting surfaces. Revealing the elastic moduli of these films will allow for more accurate physical manipulations of these systems. The main objective of the project is to determine the shear and dilatational moduli of 15 nm FeO, 3 nm Ag, 5-6 nm Au nanoparticle ligated monolayer films using a constant compression pressure – area isotherm. In addition, POPG is a lipid whose film is also studied in the same manner. The values for moduli can be extracted as derivatives of the pressure – area curve as shown by Langevin . A monolayer of each solution is spread over a 73 cm2 Langmuir-Blodgett trough. The area of the trough is then compressed down to 12 cm2 □t a constant rate of 5 cm2/min. The resulting pressure-area isotherms are then fitted to a differentiable function, from which the dilatational and shear moduli are determined. Gold was found to have to have the highest peak moduli, followed by silver, iron, and POPG, respectively.

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208 Precision Measurement of PMT Quantum Efficiency

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We have conducted research to measure the quantum efficiency of photomultiplier tubes (PMT's) over a wavelength range of 300 nm to 600 nm to better than 5% systematic uncertainty. This calibration will be used in conjunction with data taken by these PMT's during the Airfly experiment as part of a larger research project to study ultra-high energy cosmic rays (UHECR's) at the Pierre Auger Observatory. In the Airfly experiment, a particle beam passing through an air chamber simulates the shower of particles produced when a cosmic ray enters our atmosphere. PMT's were used to collect data to determine the constant of proportionality between the energy deposited by a particle passing through air and the number of photons then emitted by the excited nitrogen molecules. A precise measurement of the absolute quantum efficiency of the PMT's, i.e. the ratio of produced photoelectrons to incident photons, reduces the systematic uncertainty in this proportionality constant. In our experiment, the absolute quantum efficiency at a single wavelength was measured using a laser source. This value was used to scale the relative quantum efficiency spectrum produced

by a deuterium lamp emitting light across the range of wavelengths. A monochromator isolated each wavelength as the efficiency measurement was made. The equipment was housed in a black box and operated remotely to minimize electronic noise and background light. We succeeded in determining the quantum efficiency to well within our goal of 5% systematic uncertainty by optimizing our system through a series of trials. The shape of the measured quantum efficiency spectrum is consistent with calibration data provided by the factory, supporting the validity of our findings. Ongoing research will focus on making measurements with an even higher level of precision using additional light sources and detecting devices.

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209 Compression

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Stuart Rice, Binhua Lin
Faculty Advisor: Binhua Lin, Ph.D., Stuart Rice, Professor Emeritus,
Materials Research Science and Engineering Center, The University of Chicago

According to Petkov (2000), the dilatational and shear moduli of Langmuir-Blodgett monolayer films undergoing linear compression can be measured using two perpendicular Wilhelmy plates connected to a pressure sensor . Determining these physical properties of the films will further allow for the development of applications in biology and electronics, where these films can be used to model cellular membranes and conducting surfaces. Revealing the elastic moduli of these films will allow for more accurate physical manipulations of these systems. The main objective of the project is to determine the shear and dilatational moduli of 15 nm FeO, 3 nm Ag, 5-6 nm Au nanoparticle ligated monolayer films using a constant compression pressure – area isotherm. In addition, POPG is a lipid whose film is also studied in the same manner. The values for moduli can be extracted as derivatives of the pressure – area curve as shown by Langevin . A monolayer of each solution is spread over a 73 cm2 Langmuir-Blodgett trough. The area of the trough is then compressed down to 12 cm2 □t a constant rate of 5 cm2/min. The resulting pressure-area isotherms are then fitted to a differentiable function, from which the dilatational and shear moduli are determined. Gold was found to have to have the highest peak moduli, followed by silver, iron, and POPG, respectively.

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211 Coefficient of Static Friction Revisited

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Based on the laws of friction, proposed by Coulomb in 1783, and also the discovery by Amonton that static equilibrium problem involving forces and torque, and can solve for the threshold height upon which a person such as Romeo or a firefighter can climb at a given angle theta. The problem lies within the static friction from the floor on the ladder which is set at a critique that only its edge is in contact with the floor. While Amonton's 2nd law states that the force of friction is independent of area of contact there exists doubt when the area of contact is so small. There also exists a degree of error which can be credited to the coefficient of friction being defined as only plane to plane contact and usually to one decimal point. With our experiment, we seek to add more accuracy in the value of the coefficient of static friction with the conditions that the surface is an edge on a surface and that the coefficient of friction is defined for our exact circumstances.

212 Trends in High School Physics Education

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In recent years, education has adopted a pivotal position in our political and cultural discourse. With growing technological trends, science education in particular has become an arena for study and improvement. Physics education especially has been targeted because of the growing trend to include mandatory courses in high school curriculum. This research aims to pinpoint key differences in high school physics teaching pedagogy as well as disparities in student populations based on location, school type and several other factors. With these divisions in teacher and student populations, recommendations for teaching physics at the secondary level can better be adjusted to each group. Often pedagogies are presented in a blanket format for all types of students. By analyzing this project's survey data of physics student populations, more efficient and appropriate allocations of pedagogies become apparent. This research also focuses on which groups of teachers utilize which styles of presenting physics. The data also aids our ability to distinguish effective teaching styles from less informed methods. The goals of this research are to both present demographic information and develop recommendations based on that information. This poster project specifically plans to present target demographic information. Identifying the characteristics of each population in this survey allows for recommendations for physics teachers to be constructed with confidence.

Psychology

171 When analogy is like priming: The N400 in verbal analogical reasoning

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Computational models of analogy have frequently relied on explicit relational representations and mechanisms for structured mapping. This approach predicts engagement of the working-memory system directed by the prefrontal cortex (PFC), a prediction generally consistent with patient and neuroimaging studies. More recently, several connectionist models based on the phenomenon of analogical priming have attempted to provide an alternative explanation for 4-term verbal analogies. These models rely on forms of spreading activation and would predict activation more like semantic priming during verbal analogy solving. To test this claim we recorded scalp electroencephalography during a verbal analogy task. In this paradigm, participants initially retrieved the relationship between a first word pair and then received a cue instructing them to either judge a second pair of words for relatedness (semantic only) or alternatively decide whether they formed a valid analogy (analogy) with the first pair. Bunge et al. (2005) previously found that the analogy condition activates left rostrolateral PFC compared to the semantic only condition. In our study we found that event-related potentials (ERPs) of analogy and semantic only trials diverged at the N400 with semantic only trials giving the more negative N400. The amplitude of the analogy N400 predicted participant performance. These results differ from previous studies of visual analogy that have shown only a late response-locked ERP predicting analogical mapping performance. Taken together these results suggest that under some conditions solving verbal analogies may use a mechanism similar to priming rather than that of analogical mapping.

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44 Category Learning Brain Potentials as Neurocognitive Markers for Pathologic Aging

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Facaualty Advisor: Robert Morrison, PhD.
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A challenge for treating Alzheimer's disease is to develop neurocognitive markers to identify at-risk individuals before significant neural damage. To this end we measured event-related potentials (ERPs) in younger (m = 21 years) and older (m = 71 years) adults while they performed a rule-based category-learning task requiring long-term memory and executive function. In this task participants learn to categorize visual gratings using trial-by-trial feedback. We have previously characterized the ERPs sensitive to strategy and categorization accuracy in this task. Previous functional magnetic resonance imaging studies with this task have demonstrated the importance of prefrontal cortex and medial temporal lobe, two areas implicated in pathological aging including Alzheimer's disease. Older adults showed lower accuracy and longer RTs than did younger adults, but there were two distinct subgroups. The Rule subgroup learned slightly more slowly than younger adults, but showed equivalent asymptotic accuracy. The No-Rule subgroup did not learn and showed near chance performance throughout the task. We calculated ERPs time-locked to the stimulus, response and feedback. ERPs for the Rule subgroup showed a stimulus-locked Late Positive Complex (LPC) larger for correct than incorrect trials, similar to that observed for younger adults. The Rule subgroup also

showed a response-locked contingent negative variation difference between correct/incorrect trials, but this time smaller than that observed in younger adults. Likewise, there were reliable feedback-locked P300 and LPC correct/incorrect differences for the Rule-subgroup, but they were also smaller than that in younger adults suggesting decreased rule-learning confidence (despite similar accuracy across groups). The No-Rule subgroup showed ERPs characteristic of chance performance. The current study suggests that rule-based category learning may be effective for identifying individuals at increased risk for mild cognitive impairment and probable Alzheimer's disease.

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52 Responses to Devaluation among American Muslims

Tasmiha Khan
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We feel emotions in response to the image others have of our group. We present two studies that examined how American-Muslims cope with a negative social image of their group in US society. In Study 1, participants were asked to rate how they thought US society perceives Muslims. On a list of positive and negative adjectives, participants perceived the social image of their group as being more negative than positive. We also measured how participants felt about the perceived image of their group. Participants experienced a range of negative emotions (e.g., sadness) in response to their group's negative social image. In a second study, we asked American-Muslims to tell us about an event in which they felt devalued as members of the Muslim-American community. Participants experienced negative emotions (e.g., sadness) in response to the negative event reported. Furthermore, a content analysis of the participants' narratives revealed that participants tried to dialogue and talk with the person who devalued them. Participants' most important motive was to correct the negative and biased view others had of their group by explaining to them the nature of their religious beliefs.

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53 Watch What You Say: Spoken Self-Statements, Emotion, and Behavior

Alcina Lidder, Travis White-Schwoch, Richard Zinbarg
Faculty Advisor: Dr. Richard Zinbarg
Department of Psychology, Northwestern University, Department of Cognitive Science, Northwestern University; The Family Institute at Northwestern University

Does saying something negative about yourself make you feel worse than saying something positive? Does saying "I can't" make you less able to accomplish a goal than if you had said "I can"? The current study explores spoken positive and negative self-statements ("I can" and "I can't") and their effects on emotion and behavior. White-Schwoch (2011) studied this relationship in participants with different levels of blood-injection-injury (BII) fear. Participants were randomly assigned to read statements that used the words "I can" or "I can't" and then performed a behavioral approach task involving viewing BII, positive, and neutral stimuli. In the "I can't" condition, the greater the individual's level of BII fear, the less time he or she spent looking at the BII pictures. But in the "I can" condition there were no significant differences in looking time based on level of BII fear. Curiously, differences in looking time between the conditions were not limited only to BII pictures. To explore these surprising results, we modified White-Schwoch's behavioral approach task such that the stimuli were grouped together in "blocks" based on valence. Participants with varying levels of BII fear were randomly assigned to read either "I can" or "I can't" self-statements and completed the modified behavioral approach task in which participants' looking times and facial expressions were recorded.

Data has been collected from 38 participants and an anticipated 70 more will complete the study by early March. Looking time results will be analyzed by a hierarchical linear regression. We expect a negative correlation between BII fear and BII stimuli looking time in the "I can't" condition but no differences in the "I can" condition. Furthermore, we predict a localized effect of looking time differences to only BII stimuli. The study's findings can inform clinical intervention with psychotherapy patients who use negative self-statements when discussing their feared stimuli or event.

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54 The Glamorization of Eating Disorders in the Media: How are Women Affected?

Connie Kalble
Faculty Advisor: Scott Leon, Ph.D., Ashley Rolnik, M.A.
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Thin-depicting media, especially the consumption of magazines, has been shown to have a positive correlation with eating disordered behaviors and body dissatisfaction (Cohen, 2006; Vaughan & Fouts, 2003). The media has been criticized for the glamorization of celebrities with eating disorders, failing to illustrate the dangers of these disorders (Thompson & Heinberg, 1999). The current study utilized an experimental design in order to conceptualize the effects of thin-depicting media on the body dissatisfaction, self-objectification, body shame, self-esteem, and affect of college women on their disordered eating behaviors and attitudes.

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55 The role of visual social cues in speech perception under talker variability

Chi-Hyun Kim
Faculty Advisor: Howard Nusbaum
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Listeners are able to easily recognize and understand speech, despite the presence of a large amount of acoustic variability between different talkers. What information allows listeners to contend with talker variability, thereby allowing them to accurately perceive speech from different talkers? One possible source of information derives from the knowledge of social categories. Because some acoustic differences between talkers are correlated with their membership in various social groups (for example, women's speech is often higher in pitch than men's), social category information may have top-down effects that modulate speech perception processes. Here we investigate this hypothesis with a speeded target-monitoring task, in which participants are asked to indicate when they recognize a target vowel from a stream of distractors. The audiovisual stimuli could be delivered by either a single talker, or by two different talkers of different genders. Crucially, the speech of the talkers was manipulated so that there were no acoustic differences between the talkers: the face became the only remaining cue to talker difference. We observed that participants were slower to recognize the targets in the multiple-talker blocks compared to the single-talker blocks, suggesting that visual cues bearing social information may trigger talker normalization processes, independent of acoustic differences.

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56 Early parent-child narratives and children's later literacy skills

Jennifer Liu, Elizabeth DuPond, Özlem Ece Demir, Susan C. Levine
Faculty Advisor: Susan C. Levine, Ph.D.

The University of Chicago

Substantial individual variability exists in the language and literacy skills of young children. Prior studies report that children's early narrative skills predict their later reading comprehension. Here we examine whether variability in children's early narrative skills is related to parent input, in particular, to parents' narrative talk during their naturalistic interactions with their children. Narrative talk included talk about past, future, and fictional events. We examined parent narratives in 25 parent-child dyads observed for 90 minutes at child age 38 months. Children's narrative skills were examined during kindergarten using a story re-tell task in which they were asked to tell what had occurred in two short wordless cartoons. Results show that the quality of children's narratives in this retell task was predicted by the number of narratives parents provided to children two years earlier.

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57 Out-group and In-group Ethnicity-related Stressors' Association with Six Dimensions of Self-esteem for Ethnic Minority Students

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Faculty Advisor: Sabine French, PhD.
Department of Psychology, DePaul University; Department of Psychology, University of Illinois at Chicago

Ethnicity-related stressors and their impact on the self-esteem of ethnic minorities is of much concern, however research in this area is lacking. Discrimination is the most commonly examined ethnicity-related stressor in relation to mental health. More recent research has explored two other ethnicity-related stressors, stereotype confirmation concern (the fear of confirming stereotypes about one's ethnic/racial group) and own-group conformity pressure (how in-group members might exert pressure on group members to conform to group ideals). When ethnic minorities report more experiences of conformity pressure or stereotype confirmation concern, their well-being suffers negatively. Despite the number of studies that have been conducted on ethnicity-related stressors, very little is known about their impact on self-esteem.

The current study examines three ethnicity-related stressors, two out-group focused (perceived discrimination, stereotype confirmation concern), one in-group focused (own-group conformity pressure) on six dimensions of self-esteem (Academic, Athletic, Behavioral, Physical, Social, and Global Self-worth) with a sample of 433 African American, Asian American, and Latino American college students. We examined both race-ethnicity and gender as moderators of the relationship between stressors and self-esteem. Six sets (one for each dimension of self-esteem) of five-step hierarchical regression analyses were conducted. Step 1) gender, 2) race/ethnicity, 3) ethnicity-related stressors, 4) race/ethnicity x stressors, and 5) gender x stressors. Significant interactions were followed up with simple slope analyses.

Asian American and Latino Americans' behavioral self-esteem was negatively impacted when they reported greater perceived discrimination; this was not the case for African Americans. One particularly interesting race/ethnicity difference was the effect of the stressors on global self-esteem, specifically, it was impacted negatively by stereotype confirmation concern (out-group based) for Latino American students, but by own group conformity pressure (in-group based) for Asian American students. This illustrates the importance of taking into account the different race/ethnic groups in the relationship with ethnicity-related stressors.

59 If You Move Like Me, You Must Think Like Me: Synchrony and Egocentric Projection

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Interpersonal synchrony, the simultaneous rhythmic movement in time by two or more individuals, is a pervasive phenomenon that has many consequences, including greater affiliation, greater cooperation, greater feelings of compassion, and greater perception of similarity. However, questions remain about the consequences of interpersonal synchrony for the ability to infer what others are thinking – such as their attitudes and beliefs. We suggest that moving synchronously with others may lead people to infer that others' beliefs are like their own – a process called egocentric projection. To test this hypothesis, participants answered attitude questions before participating in a synchrony paradigm – a foot-tapping task – with a confederate in a synchronous, asynchronous, or solo control condition. The participants then tried to predict their partner's attitudes on the same issues they had previously answered. Preliminary analyses suggest a few key findings. First, participants in the synchrony condition felt more similar to the confederate and liked the confederate more than participants in other conditions, replicating previous studies. Second, collapsing across conditions, the more similar participants felt to the confederate, the more they engaged in egocentric projection, again replicating previous studies. Third, contrary to the primary hypothesis, participants in the synchrony condition did not engage in more egocentric projection than those in the other conditions. Given the success of the manipulation in replicating previous studies, these findings suggest two possibilities: a) synchrony may not impact people's inferences about others' mind states, or b) the egocentric projection measures were not sensitive enough.

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61 On the Same Wavelength: The Effect of Behavioral Synchrony on Core Social Needs

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Previous research regarding social synchrony (i.e., people moving together in time) has shown that synchronous social interactions produce a liking effect, meaning that partners engaged in synchronous movement tend to like one another more than those in asynchronous movement. Theorists have suggested that synchrony could also affect feelings of social connectedness, although this prediction has not yet been tested. As other theorists have asserted, we predict that interpersonal synchrony should lead to greater feelings of social connectedness. We also explore the extent to which social synchrony effects other core social needs including: sense of control, self-esteem, and sense of meaningful existence. To test these ideas, we manipulated social synchrony by randomly assigning participants to one of three conditions involving synchronous, asynchronous, or solo foot tapping with a confederate. After the foot tapping task, participants completed a variety of survey items. Preliminary analyses suggest that the movement manipulation produced the desired effects on perceptions of synchrony. Also consistent with previous research, participants who tapped in sync with their partners liked their partners more than those in the others conditions. Contrary to predictions, there was no effect of the manipulation on any of the core social needs. However, some interesting correlational findings emerged (collapsing across conditions). Specifically, the more participants perceived their interaction as synchronous, the more participants felt a sense of social

connectedness, the higher their self-esteem, and the more they reported feeling their existence was meaningful. Taken together, these data suggest that synchrony may address core social needs. More research, however, is needed to explore these effects using a stronger synchrony manipulation.

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62 Attention Restoration Therapy and Ego Depletion: The Influence of Nature on Cognitive Functioning

Kaitlin Louro, Hailey Barr, Michelle Gryzbowski, and Laura Magnuson
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According to Baumeister, Vohs, and Tice, (2007), the self is a limited resource which becomes fatigued when engaging in activities that require self-control. This fatigue and subsequent limited self-control functioning is referred to as ego-depletion. Research has indicated that interaction with nature can have restorative properties on self-control capabilities. Attention Restoration Therapy (ART) is a form of therapy that utilizes this type of interaction in order to replenish the self's resources and improve cognitive functioning. The purpose of this study was to investigate the effects of ART on ego-depletion. Participants were randomly assigned to one of two conditions, ego-depletion (completion of a difficult task) or control (completion of a simple task). After finishing the task, participants were randomly assigned to view either a nature video or urban video. Attention and cognitive functioning was determined by scores on the Attention Network Task (ANT), which measured how quickly and accurately subjects responded. It was hypothesized that after being ego-depleted, interacting with nature should replenish the self's resources and increase performance. A 2 x 2 between subjects Analysis of Variance was run, with depletion and video type as the independent variables, and the Executive Function Score (ms) from the ANT task as the dependent variable. Results indicated a significant main effect for ego-depletion, in that participants who were depleted (M = 164.77 ms) performed slower on the attention task than those in the control condition (M = 136.80 ms). There was not a significant main effect for the type of video watched or a significant interaction between depletion and video type. This indicates that being ego-depleted diminishes cognitive functioning and decreases performance on attention-based tasks. Future studies would likely benefit from having real-life interaction with nature and urban environments in order to elicit a stronger and more realistic response.

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63 Does personality psychopathology predict treatment response in women who binge-eat?

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Binge-eating disorder (BED) is a clinical disorder characterized by recurrent episodes of overeating and loss of control. Eating disorders (ED) are often comorbid with personality disorders (PD), and, in general, individuals diagnosed with EDs and PDs have more severe psychopathologies and poorer responses to treatment relative to those only diagnosed with EDs. A current debate in the literature concerns whether patients with BED suffer greater symptom burden when comorbid with PDs. Some reports suggest that PD comorbidity in BED patients is predictive of psychotherapeutic outcome, whereas others indicate that PD comorbidity in BED patients is not predictive of psychotherapeutic outcome. This study investigated the effect of PD comorbidity on treatment outcome in a treatment-seeking sample of individuals with BED. Participants (n=108) were female outpatient psychotherapy patients who met DSM-IV diagnostic criteria for BED prior to enrollment in a therapy program for

women with binge-eating problems. Of the sample, 34 participants met DSM-IV diagnostic criteria for one or more PDs. The treatment outcome for all women was measured by treatment attrition and reduction of eating disorder symptom severity as measured by EDE objective binge episodes, EDE global scores, and EDE subscale scores. Preliminary analyses suggest that individuals with comorbid EDs and PDs were more likely to drop out of psychotherapeutic treatment than individuals without PD comorbidity. Further analyses will reveal whether or not comorbid patients who remained in treatment exhibit comparable eating disorder symptom reduction relative to non-comorbid patients. These results may reveal whether or not comorbid PDs reduce the likelihood that ED psychopathology in comorbid patients is treated successfully by existing psychotherapeutic methods. If comorbidity does inhibit treatment response, this observation may be useful in informing treatment outcome and reducing treatment attrition of individuals with comorbid EDs and PDs.

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65 The Relationship Between Adolescents' Daily Hassles and Cyber Aggression: A Longitudinal Investigation

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The general strain theory (GST) posits that individuals may sometimes deal with daily pressures, such a cyber victimization, in maladaptive ways (Agnew, 1992). Cyber victimization may create a strain in an adolescent's life and subsequently result in delinquent behaviors, such as school avoidance and substance abuse (Hinduja & Patchin, 2007). Few investigations have focused on whether daily hassles (e.g., experiencing social rejection) contribute to cyber aggression among adolescents. Furthermore, the relationship between daily hassles and cyber aggression may be stronger when the adolescent is also victimized online. The purpose of this longitudinal study was to investigate these topics among 195 11th and 12th graders who were recruited through Facebook. Adolescents rated how often they experienced cyber aggression (at Time 1 and Time 2), cyber victimization (Time 1), and daily hassles (Time 1) on a scale of 1 (Never) to 5 (All the time). The results indicated that Time 1 (T1) daily hassles were related to Time 2 (T2) cyber aggression, after controlling for gender and T1 cyber aggression. Significant two-way interactions were found between T1 daily hassles and T1 cyber aggression as well as between T1 daily hassles and T1 cyber victimization. More specifically, the relationship between T1 cyber aggression and T2 cyber aggression was stronger when an adolescent experienced higher levels of daily hassles at T1. Additionally, at higher levels of T1 daily hassles, the relationship between T1 cyber victimization and T2 cyber aggression was stronger. This study supports the GST theory and also suggests that daily hassles and cyber victimization jointly produce strain in adolescents' lives, leading to aggressive behaviors online. An implication of this study is to inform intervention programs aimed at combating aggression in the cyber context. Such programs may identify individuals at risk for cyber aggression based on their experiences of daily hassles and victimization.

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67 Formal Mechanisms of Siberian Hamster Ultradian Rhythm Behavior

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Ultradian rhythms (UR) are characterized by short periods (ranging in duration from seconds to less than 12 hours in duration) in behavior and physiology that typically recur multiple times within a day. URs can be observed in feeding and activity behavior in various mammals including humans.

One hypothesis has posited that the circadian (CR) timing system exerts a powerful effect on defining the period of URs. To further investigate such putative CR – UR interactions, circadian cues were eliminated in Siberian hamsters via light treatments that rendered them circadian arrhythmic. Rhythmic and arrhythmic hamsters were then challenged with agents known to alter the period of the circadian clock (deuterium oxide (D2O) lengthens circadian period, and the gonadal steroids, estradiol (E) and testosterone (T), shorten circadian period). URs and CRs were recorded in hamsters before, during and after treatment with D2O, E, or T using passive infrared motion detectors in the home cage. D2O treatments lengthened the period of hamster CRs without altering UR period. Data to be presented will provide specification of whether a shortening in CR period caused by gonadal hormone treatments are accompanied by changes in the period of behavioral URs. Taken together, the results with provide novel insights into whether any of several chemicals affect a fundamental temporal aspect (period) of the ultradian clock responsible for locomotor activity.

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113 Effects of Stress on Cortisol Levels in Developing Rhesus Monkeys

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In this study, we investigated the development of the hypothalamic-pituitary-adrenal (HPA) axis in 42 group-living rhesus monkey infants. Stress is known to impact cortisol levels, but few studies have investigated that impact over time, particularly across milestones in development. Cortisol responses to psychosocial stress (brief separation from the mother and exposure to a novel environment) were assessed at 6-month-intervals during the subjects' first 3 years of life. The infants showed a significant increase in cortisol in response to the stress test across all ages, but the response was lower in the third year. The baseline cortisol level significantly predicted the stress response such that subjects with lower baseline had a larger cortisol increase than subjects with a higher baseline. There were no significant sex differences in either basal or stress levels of cortisol across all ages. The results of this study can improve our understanding of the long-term effects of stress on the developing HPA axis in primates.

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114 Multimodal communication in parent input to children with pre- or perinatal brain lesions

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There is substantial individual variation in language acquisition for both typically-developing and atypically-developing children. Previous research has documented variation in language acquisition in children with pre- and perinatal unilateral brain damage and its relationship to lesion characteristics as well as environmental factors. The current study builds on this research by exploring early parent input to brain-injured children. Child-directed speech and gesture are important predictors of language development in typically developing children, and understanding the impact of these early forms of input to atypically developing children could have important implications for the development of therapies to improve children's language outcomes. We asked whether parent speech and gesture input varies between parents of typically-developing children and children with early brain injury and, if so, whether these differences matter to children's linguistic growth. To address

these questions, we used data from a longitudinal study of language development to compare parent speech and gesture input to 17 children with pre- or perinatal brain injury and 34 typically developing children at 14, 18, 22, and 26-months of age. While parent input to these two populations was overall quite similar, subtle differences emerged in the frequency with which parents combined speech and gesture as well as the content of that communication when communicating with their children. Furthermore, the degree to which parents of brain-injured children combine speech and gesture was predictive of their child's subsequent language development. We characterize the differences in parent speech and gesture input, and ask whether child age, child language, or level of child injury can explain the observed differences. We conclude that parents of brain-injured children provide multimodal language input more frequently than parents of typically-developing children and that this input is predictive of linguistic development in these children.

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115 Examining Homework Effects on ADHD Symptoms in Families with Different Socioeconomic Statuses

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Children with Attention Deficit Hyperactivity Disorder (ADHD) present developmentally inappropriate levels of hyperactivity, impulsivity and inattention. ADHD is one of the most common externalizing disorders of childhood. It is more prevalent in families with low socioeconomic status (SES) and is thought to increase parenting stress. One evidence based treatment for externalizing behavior problems in young children is Parent-Child Interaction Therapy (PCIT), designed to reduce behavior problems and strengthen the attachment relationship. The PCIT program at DePaul University is housed within a Community Mental Health Center that serves children predominantly from lower income families. One standard part of PCIT is weekly homework practice assigned to parents to generalize the skills outside of the clinic setting. The current case study examines the progress of two families of differing SES backgrounds in PCIT to highlight possible relationships of homework completion and parental stress on reduction of ADHD symptom severity over and above SES. At baseline, both cases presented with high ADHD symptomology as assessed by the Child Behavior Checklist. Post treatment, one case, with household income at $20,000 per year, decreased over 30 points in parental stress (assessed by the Parental Stress Index at 95 pre-treatment and 63 post treatment), completed 71% of homework and dropped 20 points in ADHD symptomology (73 to 53). The other case, with an income at $80,000 per year, showed little change in parental stress (91 pre-treatment and 89 post-treatment), rarely completed homework (4%), and maintained the same ADHD symptomology (64). It is tempting to assume that homework completion was the reason for the relative difference in outcomes in these two cases. This study will examine progress notes and case records to assess whether homework completion was the cause for the different outcomes and possible relations of SES, and parental stress, in reducing ADHD symptoms through PCIT.

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116 Autonomic responses to emotional stimuli in children with Conduct Disorder

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Faculty Advisor: Jean Decety, Ph.D.
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Conduct Disorder (CD) is a psychological disorder diagnosed in children, characterized by a pattern of disruptive and antisocial behavior in which the basic rights of others are violated.

Because children with CD often inflict harm on others, it is important to understand whether they exhibit atypical empathic responses to viewing others being harmed and to explore associations between these responses and biological risk factors, such as autonomic dysfunction. There are two prominent theories for how autonomic activity may affect children with CD: one, consistent with a fearlessness interpretation of low autonomic activity in antisocial behavior, that chronic autonomic hypoarousal causes antisocial behavior and aggression and two, that autonomic hyperarousal in response to stressful situations stimulates reactive problematic behavior. The objective of this study was to further investigate these theories, for which findings are limited, by examining electrodermal activity (EDA), a reliable physiological marker of autonomic arousal, in children with CD in response to neutral and emotionally valenced stimuli depicting people being harmed. Participants were 120 children (60 with CD), 9- to 11-years-old. Animated images depicting intentionally and accidentally caused harm and everyday actions werepresented to the participants in a block-design. Tonic skin conductancewasrecorded using a BIOPAC system and EDAwas analyzed offline using AcqKnowledge 4.1 software. The hypothesis is that children with CD will show lower skin conductance levels (SCLs) when at rest, but also more frequent and larger skin conductance responses (SCRs) to negative than nonnegative stimuli, regardless of intentionality. If these are the results, then the distressing general hypoarousal displayed by children with CD may be compounded by distressing hyperarousal to negative emotional stimuli involving interpersonal harm. Although CD driven by genetic, biological, and environmental factors, understanding each component furthers understanding of how CD affects children's interaction with the world, and advances diagnosis and intervention of the disorder.

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117 Media Influences on Women's Self-Concept: Twilight's Bella vs. The Hunger Game's Katniss

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Faculty Advisor: Dr. Robyn Mallet, Kala Melchiori,
Loyola University Chicago

Becoming immersed in a story can cause people to merge the self with fictional characters. For example, people who read about wizards in Harry Potter psychologically became wizards (Gabriel & Young, 2011). Two popular young-adult novels, The Hunger Games and Twilight, portray contrasting qualities of the female protagonist. The Hunger Games', Katniss is agentic and independent whereas Twilight's Bella is communal and dependent. This study tests whether reading about Katniss versus Bella causes female readers to incorporate the character's qualities into their self-concept. Two-hundred twenty-four (147 White) women were randomly assigned to read an excerpt from Twilight (N = 110) or The Hunger Games (N = 114). Endorsement of character-specific agentic and communal qualities was measured by examining participant responses to the statements "I can protect myself in times of danger" (an agentic Katniss quality) and "I would be interested in dating a vampire" (a communal Bella quality). Items were measured on a scale of 1 strongly disagree to 7 strongly agree. A t-test showed that participants who read The Hunger Games (M = 5.31) were more likely to agree with the agentic statement "I can protect myself in times of danger" than those who read Twilight (M = 4.93), $t(222) = -2.52$, $p < .05$. Participants who read The Hunger Games (M = 2.75) were less likely to agree with the communal statement "I would be interested in dating a vampire" than those who read Twilight (M = 3.25), $t(222) = 1.97$, $p = .05$. These results support research showing that reading narratives influences the self-concept. Furthermore, our results offer preliminary evidence that reading popular works of fiction that contain stereotypic versus counter-stereotypic female characters affects how women see themselves. These changes to the self-concept may have important implications for their future behavior, including interpersonal interactions and career-related decisions.

118 JRisk Behavior in Homeless Youth: Relationship with Self-Reported and Objectively Measured Executive Functioning

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National estimates suggest that anywhere from 1.6 to 3.5 million people are homeless on any given night in the United States, with at least 1.35 million of them youths. This population is at risk for cognitive deficits and increased risk behaviors. While several studies have looked at the effects of homelessness on overall cognitive functioning and the correlates of risk behavior, little research to date has examined the relationship between executive functioning (EF) and risk behavior, particularly in this population. This study sought to identify the relationship between self-reported and objective measures of EF and engagement in risk behavior. To assess EF, both a battery of neuropsychological tests, including the D-KEFS, TOL-DX, and IGT, and a self-report measure, the BRIEF, were administered to homeless youth (N = 27, ages 18-21, 44% female, 93% African American) in two Chicago-area homeless shelters. Analyses revealed multiple significant correlations between self-reported and objectively measured dimensions of EF and risk behaviors including substance use and sexual behaviors; however, there was a considerably greater relationship seen between self-report of EF and risk behavior versus performances across objective measures of EF and risk behavior. The implications of these findings will be considered, specifically with regard to future assessment of EF in homeless youth and predicting their vulnerability to risk, as well as how this informs future interventions targeted at supporting EF in this population.

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213 Personality and the acute subjective effects of MDMA in healthy volunteers: preliminary results

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3,4-methylenedioxymethamphetamine (MDMA) is purported by its recreational users to induce both general euphoria and a unique feeling of empathy and closeness with others. There are, however, individual differences in response to the drug in animals and humans. In this ongoing study, we investigated the possibility that differences in personality might explain some of these individual differences in drug response. Individuals with prior MDMA experience (N = 48) completed this multi-session, double-blind, within-participant study in which they received oral MDMA (0.75, 1.5 mg/kg) or placebo. The primary outcomes measures were two subjective effects questionnaires: the Drug Effects Questionnaire (DEQ) and a set of visual analog scales (VAS). Responses were subjected to principal components analysis in order to reduce the dependent variables into a smaller number of higher-order factors. During a previous screening session, they completed the Multidimensional Personality Questionnaire-Brief Form (MPQ-BF). For each MPQ-BF subscore, participants were split into top third and bottom third groups and the groups' subjective responses to MDMA were compared. Principal components analysis reduced the subjective effects measures to three factors, which we named 'Pro-social', 'Euphoria', and 'Dysphoria'. Individuals who scored higher on the 'Stress Reaction' scale, which measures tendency to respond negatively to stressors, also reported greater feelings of MDMA-induced 'Dysphoria'. No other effects of personality on response to MDMA were discovered.

214 Little Mind in a Face: Egocentric Projection Increases Mind Reading Accuracy Compared to Nonverbal Detection

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Faculty Advisor: Nicholas Epley, Chicago Booth School of Business
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Participants in two experiments attempted to predict another person's emotional reactions to graphic images while watching a videotape of the person's facial expressions, while seeing the image the person was viewing, or both. Reading the person's facial expression produced accuracy only slightly better than chance, whereas seeing the graphic image alone produced substantial accuracy. Seeing the image and the person's face did not increase accuracy any more than the image alone. These results suggest that using one's own mind as a source of simulation can be considerably more effective than trying to read another's mind from their nonverbal expressions.
The price impact of Webjet's entry on the Brazilian airline market
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On October 2011, it was announced that Webjet Linhas Aereas S.A. and Gol Linhas Aereas S.A., two major Brazilian airline companies, would merge. The conventional way to analyze the competitive effect of mergers like this is to assess market structure and/or upward pricing pressure. In both cases, idiosyncratic features of the acquired company, although relevant, may not be taken into account. For instance, if the acquired company is a maverick firm, competition is likely to be harmed even though conventional assessments may conclude otherwise. This paper aims to estimates the anticompetitive effect of this merger by means of the price impact of Webjet's entry on the Brazilian market. Toward this end, the authors elaborated an econometric model which controls for airport fixed effects, airport time trends, seasonal effects, number of passengers, exchange rate, interest rate, oil price as a proxy for input prices and the occurrence of a relevant strike known as Air Chaos. The variable of interest is a dummy variable that captures the moment when Webjet started operating in each major Brazilian city (Sao Paulo, Rio de Janeiro, Porto Alegre e Brasilia). Using the estimation method called System Two Stage Least Squares and instruments for the variables "numbers of passengers" and "Webjet's entry", we estimated that Webjet's entry reduced the average air ticket price by 4%, featuring it as a maverick company. This result supports the view that the merger between Gol Linhas Aereas S.A and Webjet Linhas Aereas S.A. should be subject to antitrust structural remedies.

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215 Vestibular Functioning

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Vestibular activities have been used in therapy to improve everyday functioning, such as reading, writing, balancing, and verbal and nonverbal communication. These functions are not just certain mechanism of the Peripheral Nervous System affected by vestibular disorders, but also mechanisms of the Central Nervous System affected by disorders like ADD and Dyslexia. The purpose of this

study is to determine if everyday activities have the same effect as vestibular activities on skills like eye tracking which affects reading, balancing, and auditory recall. I hypothesize that vestibular activities will improve the functioning of auditory recall, tracking, and balancing more than everyday activities. There were two randomly assigned groups: everyday activity group and vestibular activity group. The vestibular activities consist of activities like tracking/convergence and balancing, where everyday activities are running and walking. There was a two month period where the activities were performed for 5 days out of each week. Both of the groups balancing, tracking, auditory recall, and convergence had been assessed at the beginning of the two months, then after the first month. At the end of the two month period of activities the groups were assessed a last time. The assessments conducted were; Romberg Test, Auditory Digit Span, Fukuda Test, One-legged Test, Eye-convergence, Eye-tracking, and Modified Clinical Test of Sensory Organization and Balance (CTSIB). There was no significant difference found between the first round of assessments and the last round of assessments between the two groups. These findings do not support the claim that vestibular activities will improve functioning of everyday life more than everyday activities.

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216 Barriers to Participating in Parent-Child Interaction Therapy: A Case Study of Three Foster Families

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Faculty Advisor: Karen Budd, Ph.D.
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Foster children encounter more challenges forming a secure attachment relationship with their foster caregiver and are more likely to have behavior problems, emphasizing their need for treatment (Dozier & Rutter, 2008; Leslie, Gordon, & Lambros, 2005). Parent Child Interaction Therapy (PCIT) is an evidence-based treatment for young children that improves the attachment relationship between child and parent and reduces child behavior problems (Zisser & Eyberg, 2010).

A pilot study conducted by Lyon and Budd (2010) providing PCIT to a primarily urban, low-income community sample demonstrated a relatively high dropout rate of 67%. High dropout rates in PCIT with urban, lower income families are of great concern because research has shown that families who drop out prematurely do not fully benefit from PCIT (Boggs et al., 2004). The Strengthening Relationship Program (SRP) is a research program working directly with foster parents and foster children between the ages of 2 and 5 in an urban setting. The aim of the eight week program is to examine which aspects of PCIT are most effective at strengthening the attachment relationship. The goal of the current study is to examine barriers to treatment and demographic variables associated with dropout from PCIT services provided by Strengthening Relationship Program using a case study approach with three families. The Barriers to Treatment Participation Scale (BTPS) was used to assess the number of barriers experienced, the Therapy Attitude Inventory (TAI) was used to assess the satisfaction with the process and outcome of therapy, and the Parenting Stress Inventory (PSI-SF) was used to assess stress in the parent and child relationship. One participant dropped out after two PCIT sessions, and the other two completed all PCIT sessions in the SRP. The results will be discussed in terms of their clinical implications.

217 Use of Parent-Child Interaction Therapy to Strengthen Attachment Relationships with Foster Families

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Secure attachment provides a strong base from which a child can develop optimal systems for dealing with stress as well as having other beneficial effects. Fostering children can present a unique set of challenges for foster parents looking to develop a secure attachment relationship with their foster child. Parent-Child Interaction Therapy (PCIT) is an evidence-based treatment that enhances attachment and reduces behavior problems in young children. PCIT is composed of two phases, the first being the Child-Directed Interaction (CDI) phase, where parents learn to improve communication skills and increase their responsiveness to enhance the parent-child relationship, and the second being the Parent-Directed Interaction (PDI) phase, which is focused on enhancing nonviolent discipline skills. Taking the framework for PCIT therapy, the Strengthening Relationships Program focuses on foster children in longer term placements aged two to five and their foster parents. This program lasts for a total of eight weeks, and families enrolled are randomly assigned to receive only the first phase of PCIT, both phases of PCIT, or a bibliotherapy version of PCIT. In this case study, we examined data from three foster families who participated in the Strengthening Relationships Program. The initial attachment security score was looked at in relation to whether or not participants met mastery of the CDI phase skills. The CDI techniques are based on attachment theory and are thought to enhance attachment security between children and parents. After exploring the effects of initial attachment security scores, we will explore the effects of parental age, income, education and duration of foster relationship. Additionally, we will discuss whether these foster families require further training to compensate for the unique challenges of insecure attachment.

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218 Case comparisons of Children with and without Autism Spectrum Disorders Participating in Parent- Child Interaction Therapy

Michelle Tan, Chelsea La Valle, Blanca Sandoval, Erica Bell, Alisia Brannon, Lauren Van Schoick, Courtney Boulukos, and Silvia Henriquez
Faculty Advisor: Dr. Karen Budd
DePaul University

Research on parent training demonstrates the efficacy of early intervention in reducing behavioral problems (Eyberg, Nelson, & Boggs, 2008; Johnson & Waller, 2006). Parent-Child Interaction Therapy (PCIT) is an assessment-driven treatment designed to decrease externalizing behaviors in children ages 2-7 (Eyberg, 2005; Eyberg & Child Study Lab, 1999).
Less is known about how the clinical needs of children with Autism Spectrum Disorders (ASDs) and co-occurring Disruptive Behavior Disorders (DBDs) impact use of standard PCIT, particularly in community mental health settings. Studies suggest that PCIT is a useful treatment for children with high functioning autism (Masse et al., 2008). The proposed poster will present 3 clinical case examples of families with children with a diagnosis of Autistic Disorder or Pervasive Developmental Disorder, Not otherwise Specified (PDD-NOS) who successfully completed PCIT in an urban community mental health center (CMHC). All three children had a primary diagnosis of a disruptive behavior disorder and secondary autism diagnoses or high elevations in the PDD scale on a parent report measure

of behavioral and emotional concerns. We will match the number of cases of families with ASD and PDD/NOS with an equivalent number of cases of PCIT families without these diagnoses. Further, families will be matched on specific demographic characteristics (e.g., socioeconomic status, education). Through the use of the Dyadic Parent-Child Interaction Coding System (DPICS III; Eyberg, Nelson, Duke, & Boggs, 2005), we will measure the content of the parent-child interactions among children with and without a diagnosis of autism. We aim to highlight differences in parent-child interactions between children who fall on the Autism spectrum versus those that do not. Implications may include preliminary evidence that standard PCIT is appropriate for treating some children with co-occurring ASDs and DBDs in CMHCs.

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219 Perception of Harm in Children with Conduct Disorder: The Effect of Aggression, Callousness, and Prosociality on Autonomic Reactivity and Eye Gaze Patterns

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Youth with Conduct Disorder (CD) exhibit a wide variety of antisocial behaviors and attitudes that differ tremendously from those without CD. However, how individuals with CD respond to the antisocial behaviors of others is less understood. Prior work has established that (1) individuals with CD interpret ambiguous scenes as hostile and (2) a highly reliable correlate of childhood Conduct Disorder (CD) is autonomic hyporesponsiveness. This study investigated autonomic responses to third-party scenes involving a victim and a pain-causing perpetrator in 9- to 11-year-old youth with CD and age-matched controls. Autonomic reactivity was measured via pupil dilation and attentional bias was measured via eye gaze fixation duration, frequency and pattern. Prosociality, callousness, and proactive and reactive aggression were measured to determine if dispositional elements of Conduct Disorder correlate with particular looking patterns. The data will permit determination of whether children with CD spend more time looking at the perpetrator than at the victim and whether children without CD spend equal amounts of time looking at both. Higher dispositional prosociality is expected to predict an increased amount of time spent looking at the victim. Higher callousness is expected to predict less of an increase in pupil dilation when viewing painful situations.

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220 Development of Food Entrainment in Juvenile Siberian Hamsters

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Synchrony of circadian biology and behavior to schedules of feeding allows for adaptation to and survival in the environment. This is especially true for individuals living independently of the mother, which is the main food source early in life. Chronobiological investigations of food entrainment are predominantly performed in adult animals; seldom have studies investigated the ontogeny of the ability to entrain the circadian clock to food in weanling or juvenile animals. The present study examined the development of food entrainment in juvenile Siberian hamsters. The purpose was to test the hypothesis that food entrainment would be potentiated in juvenile relative to adult hamsters. Juvenile and adult hamsters were randomly assigned to either the experimental or control conditions. Experimental hamsters received food during a daily five-hour interval around the midpoint of the light phase; control hamsters received ad libitum access to food. Food-anticipatory

activity (FAA; characterized by robust increases in home-cage locomotor activity shortly before the scheduled appearance of food) was measured in all hamsters via passive infrared motion detectors, and provided a measure of entrainment of food-entrainable circadian oscillators in the brain. All hamsters subjected to restricted feeding exhibited FAA, but juveniles exhibited substantially greater FAA relative to adults, suggesting a superior capacity for food entrainment in weanling hamsters. These findings provide the first insights into the ontogeny of the mammalian food-entrainable oscillator. Rapid acquisition of information about the timing of food availability may be of great functional significance in hamsters first learning to feed on their own. Future experiments will examine the development of the food-entrainable oscillator in relation to the development of the light-entrainable oscillator.

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232 The Relationship Between Sexual Orientation and Flirting Style

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Flirting and courtship initiation involves multiple biological, cultural, and social motivations. Much of the previous research completed suggests a large biological sway for flirting. More recently, the attention has shifted towards social influences in flirting interactions. The present study examined the association between flirting style (i.e., traditional, physical, sincere, playful, polite) and sexual orientation. Participants (271 heterosexual and 177 nonheterosexual) completed an online survey. We found a significant interaction between flirting style and sexual orientation. Surprisingly, the relationship between these variables has not been previously studied.

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233 The Cognitive Abilities of Giant Pacific Octopuses

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Research has demonstrated the vast cognitive abilities of the Giant Pacific Octopus (GPO), Enteroctopus dofleini, which has caused them to sometimes be referred to as the most "intelligent" invertebrate. For example, studies have shown that octopuses can distinguish between different shades and textures, "play" with a number of novel stimuli, and open different puzzle boxes, such as child-proof pill bottles. However, to date there lacks a systematic examination of the magnitude of the cognitive skills that are exhibited by octopuses. The purpose of our study is two-fold. First, we want to assess the range of octopuses' cognitive skills through a series of puzzle boxes increasing in difficulty. Second, we want to understand how the cognitive and play skills influence the role in the octopuses' enrichment needs when housed in an enclosure. We want to examine the quality and quantity of enrichment required for captive octopuses by introducing a variety of stimuli to the octopus. Our data will demonstrate the range of cognitive abilities by the GPO as well as gain insight into the nature of enrichment necessary when housing GPOs.

Sociology and Anthropology

66 Photo-elicitation Study on Family Food Choice Strategies

Michael Janusek, Cassandra Anandappa, Keshiha Bathani, Alyssa Clark-Anaman, Jessica Coughlin, Bonita Grove, Andrea Gurga, Gladys Guzman, Juanita Malave, James Murphy, Olivia Scheidler, Nicholas Smolen, Joshua Stein, Argisa Teli, Krystle Vicencio
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Results of intervention and prevention programs aimed at curbing childhood obesity have been inconsistent at best. In an effort to improve these programs, and gain a broader understanding of causal factors, researchers from various fields have been called to provide unique perspectives and use novel research methodologies. These authors, in collaboration with a community center serving a diverse population in large metropolitan area, studied family food choices using a grounded-theory approach and photo-elicitation interviewing methods (PEI). Four primary family food provisioners of varying ethnicity, recruited through the community center, were selected for participation. Participants were provided with disposable cameras, and instructed to take pictures of five main meals. The photos were then utilized by the interviewers to elicit rich qualitative data from the participant. The interviews were transcribed verbatim and coded multiple times until themes emerged. Among the four participants, three provisioning strategies were identified: utilitarian, innovative, and informed. Though not exclusively used, a primary food provisioning strategy employed by each participant became apparent. It is hoped that further identification of strategies, and better understanding of food choice schemas, values, and identities, will allow practitioners and social service centers to effectively tailor nutrition advice to community members.

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192 Catch-Up Growth and Gender Affects on Cognitive Development among Filipino Children: A Non-Interventional Longitudinal Study in Cebu, Philippines

Elisse Kavensky
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Northwestern University

Growth stunting, a sign of chronic malnutrition, is known to have adverse affects on cognitive development, although when these affects are most influential, if they can be negated by catch-up growth, and if they affect men and women identically is unknown. Data was collected from 1,945 Filipino children in Cebu, Philippines through the Cebu Longitudinal Health and Nutrition Survey (CLHNS). Anthropometric heights at birth, two years of age, and 8.5 years of age were collected and growth velocities were examined and correlated with a standardized IQ test that was administered when the subjects were 8 years old. It was determined that proper nutrition is most important during gestation and during the first two years of life. Physical catch-up growth during the first two years of life can negate the cognitive affects of birth stunting in women but not men. Stunting after two years of age can cause permanent residual affects on cognitive development and function, regardless of how much physical catch-up growth takes place.

Abstracts - Sociology/Anthropology

221 Making the Missing Link: Black Women and Black Masculinity

Sharron St. John
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The following paper is a case-study of young black women at UCLA. It explores the role that black women have in the construction of black masculinity. Black masculinity is often caricatured as misogynistic and hyper-(hetero)sexual. However outdated this notion may seem, black women still reward various manifestations of this type of masculinity. Black women serve as the ultimate arbiters of a successful performance of black masculinity by allowing themselves to be dominated in sexualized acts. As a result, black women reinforce the clichéd concepts that define the (black) masculine. Current discourse fails to acknowledge the dialectic nature of performing black masculinity and the black woman's active role in the successful performance of black masculinity. The case study will employ interview-based methodologies to yield the narratives of an active black female voice. Instead of highlighting the black man's experience with black masculinity, or detailing the forms of oppression inflicted upon black women by black masculinity, the narratives will position black women as agents in its construction. Black women actively participate in the construction of various manifestations of black masculinity. Ultimately, my research will explore how black women actively participate in the construction of a gender role based on the commodification of their bodies and the exploitation of their sexualities.

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222 The Reintegration Experience of Deported Salvadoran Youth

Miguel Gutiérrez Jr.
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University of Illinois at Chicago

The 1.5 generation refers to individuals who were born abroad, but were brought to the United States at a young age by their immigrant parents. As a result of their undocumented status, this generation runs the risk of deportation to their country of origin. While residing in the United States, many youth form American identities shaped by their participation in social institutions, particularly educational institutions, from primary education through high school and, for some, college. For many of these immigrant youth, as previous studies have shown, in regards to self-identification, cultural identity often supersedes national identity. Of this broad group, my focus will be on Salvadoran deportees, aged 18-25, who, after having spent their formative years in the United States, are faced with the task of reintegrating into a society that they no longer know. Given the lack of research in this field, this study seeks to reveal insight into the reintegration process of young deportees. Furthermore, the study seeks to understand in which industries deportees are finding employment, how they are creating social networks to aid in reintegration and how local institutions are facilitating reintegration. Furthermore, I will also note issues regarding identity and socio-cultural dislocation. As noted in previous literature, immigrant youth who have spent their formative years in the United States tend to identify as American, regardless of legal status. It is important to note issues of identity, as they can problematize notions of a "natural" reintegration process and demonstrate a rupture from the "homeland" for deported youth.

223 Unveiling "The Veil": Identification among Muslim Women in the U.S.

Bilal Hussain
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This qualitative study aims to investigate how Muslim women who attend a highly diverse public urban comprehensive university in the Midwest negotiate their social interactions within a campus setting. W.E.B. Du Bois' theory of double consciousness was instrumental in analyzing the findings. This research is noteworthy because Islam is the fastest growing religion in the U.S., and its adherents face significant stigma and discrimination. Research indicates that Muslim women actively participate within colleges and or universities throughout the U.S. Therefore, understanding the ways in which gender, race/ethnicity and religion impact this particular social group is significant. In view of the fact that this group will gain substantial numbers in the upcoming years. Furthermore, this research may inform educational practices regarding Muslim women who are college students. Participants were asked to complete an on-line survey consisting of open ended questions. The analysis indicates that Muslim women attending this university experience W.E.B. Du Bois' theory of double consciousness in various respects.

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224 The Elucidation of the Bolivian Educational Rupture

Cristian Andrés Yugsi Díaz
Faculty Advisor: María Luisa Talavera Simoni
Academic Director: Carmen Medeiros
University of Illinois at Chicago, UMSA, SIT
*Location of research: La, Paz-Bolivia

This investigation covers the Bolivian education policies from 1900 to the present and focuses specifically in the division between urban education and rural education which I call the "educational rupture". First, I conduct a historical analysis of the following educational phases in Bolivia: 1900-1930: Liberal Education, 1930-1952: Clandestine Education, 1952-1964: National Revolutionary Education, 1964-1982: Military Education, 1982-1994: Democratic Education, 1994-1004: Neoliberal Education. In each of these phases I write about: 1) Political Climate, 2) Educational policies and 3) The ramification of these policies. I then embark in an analysis of the process of change from 2000 to the present in which, I write about: 1) the political climate 2) the creation process of the "Ley de Educación Evelino Siñani y Elizardo Perez" 3) Understanding the new educational reform. The third phase of the investigation is an analysis of the conjecture in which I interview various actors of the Bolivian educational system in order to understand the political climate specifically in relation to the "educational rupture". In the next section, I write the observations which I see in the interviews which are: 1) the theory of "unified education" which should not be questioned, 2) the contradiction between "ideology" and "reality" in terms of the "educational rupture" 3) The justification of "reality" of the "educational rupture". In my conclusion, I will explore the "artificial nature" of the "educational rupture".

Abstracts - Sociology and Anthropology

225 State and Space in Thailand: History, the Karen, and Transvaluations

Julia Sizek
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Instead of addressing merely the identity of the nation, I address transvaluations of space. Using transvaluations as a means of study allows for new understandings and interpretations of Thai history. Many academics analyze the construction of nationhood through the positive creation of identity, often concluding that identities are varied and malleable. However, this conclusion is lackluster in that it does not discuss the emergence or purpose of identity. Following the scholarship of Winichakul, I will look at the construction of nationhood in Thailand through changes in the conceptions of space. To examine these changes, I use a modified version of Tambiah's term transvaluation. As he defines it, transvaluation is "assimilating particulars to a larger, more enduring, and therefore less context-bound, cause or interest" (Tambiah 1996, 192). In this paper, I interpret transvaluation to mean a decontextualization and recontextualization of terminology regarding regarding land and governance. Using transvaluation in such a way then allows for new interpretations of history, especially during times of change in both popular and state conceptions of space and governance.

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226 Not Just Child's Play: The Archaeology of Children at Shabbona Grove, Illinois

Crystal Croyl
Faculty Advisor: Rebecca Graff, Ph.D.,
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Children are often an understudied population in archaeology. The permanent actions and influence of children are not regularly discussed in archaeology outside of material culture specific to them (toys, clothes, ect). My research done in Shabbona Grove, an abandoned village in rural northern Illinois, will show that concentrations of artifacts found during surface collection suggest deliberate collecting or curation acts by a child or children in the latter part of the twentieth century. The concentrations of temporally and materially diverse objects (including glass bottles and mechanical parts) in small, secluded spots could not have been established by natural processes or animal disturbances. The diversity of the objects suggests that these concentrations are not the result of a single depositional episode. The placement of these concentrations on an abandoned block that are hard to see and hard to access specifically for adults also suggests children as the active collectors. There is physical evidence for the presence of children in child-specific material culture through the sole of a child's shoe and at least one button made in a style marketed for children. These artifacts merely confirm that there is some kind of presence by children in the space while the spatial analysis suggests the exploitation of the space by children. The idea that children's activities may be seen through traditionally adult material culture is rarely flushed out in archaeological analyses. This analysis hopes to champion a more nuanced interpretation of unique assemblages in archaeological datasets that includes children and their activities.

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227 Prescription Psychostimulant Drug Use in College Students

Jessica Zhang

Faculty Advisor: Dr. Eugene Raikhel
Department of Comparative Human Development, The University of Chicago, Chicago, IL.

I am studying college students' use of prescription stimulant drugs, such as Adderall and Ritalin. These drugs are considered safe medication for the treatment of ADHD, but are also classified as Schedule II substances (requiring tight control) by the US Drug Enforcement Administration because of their high potential for abuse and psychological and physical dependency. There seems to be a rising concern about college students' indiscriminate use of these drugs both with and without a prescription.
I am collecting semi-structured interviews with prescription users and non-prescription users to compare the narratives of students using these drugs within a medically sanctioned context with the narratives of students using these drugs outside of this context. In asking how these students narrate their experience with the drug and decision to use the drug, I hope to find what overlaps and/or differences there are in the themes they use to talk about their experience. I hope that this research may supply empirical data to answer many of the questions the literature has concerning this population, and elucidate where the assumptions in the literature might not match up with students' actual perceptions and beliefs surrounding their use of these drugs. Research on this topic may have important implications for drug policy formulation, medical and clinical practices, and internal college policies.
In my first set of interviews I have found that although students who use these drugs without a prescription do not generally subscribe to the idea that non-medical usage is unacceptable and medical usage is acceptable, they do still draw lines of what they believe to be ethical, healthy, and acceptable usage. I will be further exploring what beliefs and practices may account for the discrepancy between their judgments and definitions versus the definitions and judgments of policy makers, doctors, and prescription users.

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228 Health Concerns of Young Adults and their Interaction with their Parents

Seungeun Lee
Faculty Advisor: Karrie Snyder, Ph.D.
Northwestern University

In this study, 51 emerging adults who are college students aged 18-25 are interviewed to examine their relationship with their parents in regards to health issues. Since the research is not yet complete, preliminary results and three hypotheses are discussed. First, while it was hypothesized that males discuss less with parents about their health issues than their female counterparts, interviews indicate that the level of parents' medical knowledge is a more significant factor than their own gender that causes them to seek information from parents. Second, it was also hypothesized that the mother is likely to be the parent with who young adults feel comfortable discussing their health. This hypothesis was based on the established notion of the mother's role as a caregiver. While this appears to be the case for females, males are more flexible in deciding what gender parent to turn to. Finally, it was hypothesized that young adults do not assume full control over all health decisions because they are financially dependent on their parents. Data confirms this to some extent, where college students make the ultimate health decisions but seek advice from parents before they do. Overall, emerging adults gain more freedom and move toward more egalitarian relationships with their parents.
Health communication between young adults and their parents has important implications for young adults' well-being. Since college students can no longer heavily rely on their parents for health decisions due to geographical distance, they learn to accept responsibility for personal safety and develop identities as independent adults by communicating with their parents. Without sufficient knowledge, however, we are limited to understanding how they deal with new health risks that they commonly face in college, including those resulting from their lack of knowledge of their health histories, inappropriate alcohol use and sexual behaviors, and work stress.

229 Making Place: Urban Planners' Perceptions of Feminism and Social Justice

Kristen Maddox
Faculty Advisor: Ann Russo, Ph.D.
Department of Women's and Gender Studies, DePaul University

During and after the Modernist architecture period, a feminist critique of the urban environment gathered strength to address the disconnect between architects and inhabitants. Critics were also instrumental in raising awareness for the gendered nature of urban space by viewing the city as a manifestation of society's inequalities and unfair distribution of resources. How do urban planners theorize these critiques today in light of the intersections of race, class, sexuality, and gender? When engaging in 'place-making' do they also make place for ideas of social justice? Personal interviews and surveys of urban planners, particularly those involved in the group Women in Planning and Development Chicago, resulted in insight into these questions. Many urban planners said they work towards establishing equity based on race and/or class, however gender is conceptualized somewhat differently. Based on the sample interviewed, it seems to work as a more latent or invisible force within social justice goals even as it is engrained in planners' work especially when working on community development. While most agreed that there is not much difference between the work done by male and female planners, those interviewed also stated that networking among women planners is beneficial. The sample had similar education levels but their exposure to social justice theories within planning school differed. Most cited past experiences or non-planning specific learning as the driving factors in their awareness of these ideas. Despite feminist theory's marginalization within 'mainstream' planning and academic disciplines, greater awareness of these themes is necessary because of the insights these theories give towards urban renovation.

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230 The Efficacy of Social Networks within Mixed-Income Communities, Spatially Mixed, but Socially Isolated?

Charles J. Barlow
University of Chicago

In US cities, public housing has come to exemplify concentrated urban poverty prompting policymakers to prioritize income integration. Federal support has shifted away from traditional public housing provision and is moving towards the increased provision of rental assistance through the Housing Choice Voucher program and the creation of mixed-income communities in an attempt to blend low-income households with more affluent neighbors.
The CHA's Plan for Transformation is considered the most ambitious public housing regeneration scheme in the US, yet whilst the physical impact of the Plan is evident with the demolition of fifty-one high-rises, the impact upon the families once living in these distressed developments is much less visible.
Based on extensive qualitative research in three mixed-income communities, this paper explores the dynamics of social interaction to gain a stronger understanding of the processes and factors that influence social interactions between residents from different socioeconomic classes, racial groups, and tenure types.
The nature and dynamics of social interaction that are emerging, and the meanings ascribed to them by residents, raise important questions about the ability of mixed-income communities to address the problems of concentrated poverty. In general, the intentional diversity has led to a population characterized by fairly extreme social distances resulting in limited, extremely casual

interaction.
Going further, there is little evidence to support expectations that interactions with higher-income

residents will lead to beneficial changes in aspirations and behaviors of low-income residents. Whilst low-income residents—particularly relocated public housing residents—have benefited from living in safer and healthier environments, the dynamics of social control are sometimes contentious, reflecting tensions between residents. It may be that additional, more fruitful relationships will develop over time, but early indicators suggest that divisions within the population may be ossifying, and that relationship building is likely to continue to be constrained by tenure type.

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1 Scenario Planning in Urban Design: New Visions for the Chicago Circle Interchange

Carolina Verdial
Faculty Advisor: Professor Marshall Brown
College of Architecture, Illinois Institute of Technology

I worked with Prof. Brown in one of his projects. He used scenario planning as a tool to generate plausible futures. One technique to explore the future is through narratives. Through the narrative technique urban designers are able to identify unforeseen challenges.
Daniel Burnham and Edward Bennett's 1909 Plan of Chicago envisions the center of Chicago as a center of the world. The site of the Circle Interchange is the proposed, but unrealized core of Burnham's plan, which was to be a new Civic Center for the city. Instead, it became the third most congested traffic interchange in the U.S.
I helped to document and build 9 models which are product from three narratives. Using three different factors such as socio cultural, economic and political changes we generated 9 models that portray the interrelationship from the three factors.
Narratives: The O Plan narrative is about the power which Oprah acquires in Chicago over the next 70 yrs. Oprah is able to give to the local people giving them power as well as improving their quality of life.
Chicago becomes the capitol of the country after it began to expand rapidly due to open immigration policy and after Washington D.C was no longer sustainable as the nation's capitol and becomes a vibrant center of social development and cultural production.
In conclusion, I believe that the same way scenarios are successful in corporations, it can be successful and effective even more in the field of urban design. After all, an urban designer is dealing with creating a vision of the future or increasing the quality of an urban space. Change is a big part of scenarios and with it a diverse alternative futures can exist. Scenario planning helps the designer to expand her or his view and consider uncommon plausible futures.

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