

NORTHWESTERN

**UNDERGRAD
RESEARCH
& ARTS
EXPO**
JUNE 1, 2016



TAKE THE LEAD IN YOUR EDUCATION!

THE OFFICE OF UNDERGRADUATE RESEARCH
OFFERS MANY OPPORTUNITIES TO GET INVOLVED:

.....

Undergraduate Language Grants

Get financial support
for intensive summer
language study -
abroad or at home,
take your language to
the next level!

Circumnavigators Travel Study Grant

A chance for Juniors to
travel around the world
studying the subject of
their choice - a truly
once in a lifetime
opportunity!

Undergraduate Research and Arts Exposition

Share your work at our
spring conference of
student projects - papers,
posters, creative art
showcases and more!

**Check out
our "Grant
Man" web
series!**

UndergradResearch.Northwestern.edu/OUR



Dear Members of the Northwestern Community:

Undergraduate research experiences at Northwestern continue to expand. We firmly believe that these experiences help our students prepare for the world outside of our University. They learn how to situate their ideas within existing literature and resources, how to develop a project that is both viable and compelling, how to write a successful grant proposal, and how to deal with the uncertainty and unpredictability of research. They do this work under the guidance and tutelage of dedicated faculty and staff who teach them how to explore the unknown.

We are proud that our Office of Undergraduate Research (OUR) saw increased applications and awards to all major programs, including record numbers of Undergraduate Research Grants, Undergraduate Language Grants, and Conference Travels Grants. We also saw another record increase in the number of faculty seeking to mentor students through our Undergraduate Research Assistant Program. These projects exist in environments around and beyond the University. Students are working in labs on the Evanston campus, down at the Feinberg School of Medicine, and out at places like Argonne National Laboratory and the Chicago Botanical Garden. More than 50 students have been funded to conduct projects internationally, as part of our overall University effort to increase our global reach. We have also made breakthrough progress in reaching out to, and funding, independent research and creative projects in the arts and humanities. We received 30% more applications this year in these areas and funded a record number, including a doubling of funded students from the Bienen School of Music. We have also increased funding across our social sciences, encouraging students to develop truly individualized, independent projects in anthropology, social policy, and sociology among others. Under the tutelage of our outstanding and committed faculty, students are experiencing for themselves what it is like to develop and create new knowledge that can truly impact the world.

To facilitate these developments, we continue to build support structures including the Global and Research Opportunities database, showcasing everything from lab openings to grant, fellowship, and experiential learning opportunities. To prepare students, the OUR staff worked with over 700 students in over 1,300 separate meetings this year. The OUR web site offers substantial online resources to help students get started, including our highly acclaimed YouTube page of video resources. The OUR Advisory Council, which includes an equal mix of students, faculty, and administrators, brings all the relevant voices together as we shape the future directions of undergraduate research experiences at Northwestern.

Finally, we are proud to showcase student discoveries through the Undergraduate Research and Arts Exposition and Creative Arts Festival. A research experience is not enough. Students must also learn the skills of successful communication, and as part of the preparation for the Expo, students attend presentation workshops. Together, we hope these experiences help launch students successfully into their post-undergraduate lives, whether that be in graduate school, on fellowships, or starting their career path. Experiential learning is a key part of the Northwestern experience, and the talents that you will see on display today make us optimistic for our future.

Sincerely,

A handwritten signature in dark ink, appearing to read "Daniel Linzer".

Daniel Linzer
Provost

2016 Program Front Cover Design

By

Elaine Shen

Weinberg College of Arts & Sciences, Class of 2016

Biology, Global Health Studies

Icons designed by Freepik

Exposition Logo Design

By

Taylor Barrett

Weinberg College of Arts and Sciences, Class of 2012

Sociology, Creative Writing: Non-fiction

The 2016 Undergraduate Research and Arts Exposition

Northwestern University's
fourteenth annual celebration of
undergraduate research and creativity

In conjunction with Chicago Area High School students
and teachers participating in the NU High School Project
Showcase

**Tuesday May 31, 2016
&
Wednesday June 1, 2016**

McCormick Auditorium and
Norris University Center



Contents

Program of Events	ii
Office of Undergraduate Research Advisory Council	iii
Exposition Planning & Organization	iv
Guide to Undergraduate Research Programs at Northwestern	v-vi
Next Steps for your Research	vii
Directory of Northwestern University Student Presenters	1-4
Poster Presentations	5
Guide to Poster Presentations	6-9
Faculty Judges for Undergraduate Poster Sessions	10-11
Poster Presentation Abstracts	12-48
Oral Presentations	49
Guide to Oral Presentations	50-53
Oral Presentation Judges	54
Oral Presentation Abstracts	55-77
Creative Arts Festival Exposition	79
Creative Arts Festival Abstracts in Order of Appearance	80-85
Creative Arts Festival Jury	86
NU High School Project Showcase	87
Guide to NU High School Poster Presentations	88-92
NU High School Poster Judges	93
NU High School Poster Planning & Organization	94

Program of Events

Tuesday May 31, 2016

7:00-8:30 PM **Creative Arts Festival:** McCormick Auditorium

8:30-9:30 PM **Post-Show Reception:** Wildcat Room
Open to all presenters and attendees

Wednesday June 1, 2016

10:00-11:30 AM **Northwestern University Poster Session One**
Louis Room (205)

11:00-12:30 AM **Northwestern University Oral Presentation Session One**
Lake Room (203), Arch Room (206), Rock Room (207),
Armadillo Room (208)

1:00-2:30 PM **Northwestern University Oral Presentation Session Two**
Lake Room (203), Arch Room (206), Rock Room (207),
Armadillo Room (208)

1:30-2:40 PM **NU High School Project Showcase Poster Session**
Wildcat Room (101), Big Ten Room (104)

2:30-4:00 PM **Northwestern University Poster Session Two**
Louis Room (205)

Office of Undergraduate Research Advisory Council

Neal Blair, Professor, McCormick School of Engineering and Applied Science, Chair of the
Undergraduate Research Grant committee

Ron Braeutigam, Associate Provost for Undergraduate Education

Vasili Byros, Assistant Professor, Bienen School of Music

Monica Cheng, Editor in Chief, Northwestern Undergraduate Research Journal

Elad Deiss-Yehiely, Student representative, Chicago Area Undergraduate Research Symposium

Renee Engeln, Professor of Instruction, Weinberg College of Arts and Sciences

Julie Friend, Director, Office of Global Safety and Security

Bill Haarlow, Director, Weinberg College – Admission Relations

Mary Beth Hawkinson, Advisor, Athletics

Jiaxing Huang, Associate Professor, McCormick School of Engineering and Applied Science

Daniel MacKenzie, Assistant Director for Student Life, Medill School of Journalism

Marina Micari, Associate Director, Undergraduate Programs, Searle Center for Advancing
Learning and Teaching

Jocelyn Mitchell, Assistant Professor, NUQ Liberal Arts Program

Kenny Mok, Student representative, Social Sciences

Eric Patrick, Associate Professor, School of Communication

Megan Powell, Program Coordinator, School of Professional Studies

Ken Powers, Advisor, School of Education and Social Policy

Monica Prasad, Professor, Department of Sociology

Jane Rankin, Associate Dean, School of Communication

Sarah Rappaport, Student representative, Natural Sciences

Danica Rosengren, Student representative, Arts and Humanities

Lauren Thomas, Student Representative, Northwestern University Associated Student
Government

Sara Vaux, Director, Office of Fellowships



Exposition Planning & Organization

Office of Undergraduate Research

Peter Civetta Director

Mary Leighton Assistant Director

Veronique Filloux Advisor & Student Outreach

Megan Novak Wood Advisor

Karen Chen Burchell Advertising and Communications

LaKeshia Buckner-Smith Administration



Guide to Undergraduate Research Programs at Northwestern University

Below is a partial listing of current Northwestern programs supporting independent undergraduate research and creative projects. More are available on the Office of Undergraduate Research web site. You can also search for research opportunities from across the university through the Global Research Opportunities database (gro.northwestern.edu). Many departments and programs have other opportunities that are not widely advertised. External agencies fund a number of programs, such as the National Science Foundation or the Fulbright IIE government grants. The Office of Fellowships (northwestern.edu/fellowships) can help students identify these external opportunities.

Office of Undergraduate Research Programs

Academic Year Undergraduate Research Grants (AY URG):

undergradresearch.northwestern.edu/ayurg

Summer Undergraduate Research Grants (Summer URG):

undergradresearch.northwestern.edu/summerurg

Conference Travel Grants:

undergradresearch.northwestern.edu/ctg

Undergraduate Language Grants:

undergradresearch.northwestern.edu/ulg

Circumnavigators Travel-Study Grant:

undergradresearch.northwestern.edu/circumnavigators

Undergraduate Research Assistant Program:

undergradresearch.northwestern.edu/urap

Other University-Wide Programs

Global Research Opportunities: gro.northwestern.edu

Northwestern Scholars: www.scholars.northwestern.edu/

Institute for Policy Research: www.northwestern.edu/ipr/ugradresearch.html

Center for Global Engagement: <http://gesi.northwestern.edu/apply/application/>

Office of International Program Development:

www.ipd.northwestern.edu/fellowships/index.html

Weinberg College of Arts and Sciences

WCAS Awards: weinberg.northwestern.edu/undergraduate/honors-awards

African Studies: www.africanstudies.northwestern.edu/funding/undergraduate/

Anthropology: anthropology.northwestern.edu/about/labs.html

Astrophysics: <http://ciera.northwestern.edu/Education/REU/>

Biochemistry-Morimoto Laboratory Undergraduate Research Seminars:

<http://groups.molbiosci.northwestern.edu/morimoto/morimotolab/murs.html>

Guide to Undergraduate Research Programs at Northwestern University, *continued*

Biological Sciences: biosci.northwestern.edu/undergraduate/research.html

Chemistry: chemistry.northwestern.edu/undergraduate/programs/index.html

Chicago Field Studies Program: wcas.northwestern.edu/cfs

History: Leopold Fellows of the Center for Historical Studies:
historicalstudies.northwestern.edu/leopold-fellows

Latin American and Caribbean Studies: wcas.northwestern.edu/lacs/grants/udggp.html

Mathematics: math.northwestern.edu/undergraduate/summer.html

Physics and Astronomy: physics.northwestern.edu/undergraduate/research.html

Political Science: polisci.northwestern.edu/undergraduate/ginsberg.html

Psychology: <http://www.psychology.northwestern.edu/undergraduate/research/>

School of Communications

Film & Theatre Projects: Rick Morris (r-morris@northwestern.edu)

Undergraduate Research Grants and Fellowships:
Jane Rankin (j-rankin@northwestern.edu)

School for Education and Social Policy

Research in SESP: sesp.northwestern.edu/ugrad/opportunities/research.html

McCormick School of Engineering and Applied Science

McCormick Opportunities: mccormick.northwestern.edu/undergraduates/research/index.html

Biomedical Engineering: mccormick.northwestern.edu/biomedical/undergraduate/research-opportunities/index.html

Chemical & Biological Engineering:
chem-biol-eng.northwestern.edu/undergraduate/current/research/index.html

Electrical Engineering and Computer Science:
eecs.northwestern.edu/2013-09-03-20-01-56/undergraduate-research

Materials Research Science and Engineering Center:
[mrsec.northwestern.edu/content/educational programs/index.htm](http://mrsec.northwestern.edu/content/educational%20programs/index.htm)

**McCormick Office of Corporate Relations, Corporate Partner Undergraduate Research
Grants:** mccormick.northwestern.edu/companies/index.html

International Institute For Nanotechnology: <http://www.iinano.org/northwestern-university-nanotechnology-reu>

Next Steps for your Research

The most important step in research, and often the most over-looked for undergraduate researchers, is sharing research findings. This final step allows for the vital process of peer review and contributes to the ongoing development of our knowledge about the world. Moreover, research is a cumulative process that grows from one project to another. It is also important to think about how your research can be transformed into new and related projects. Below are some examples of programs that have been developed at both Northwestern and nationally to help undergraduate researchers participate in and learn from the final step in the research process.

Present Your Research

Northwestern's Annual Undergraduate Research and Arts Exposition:
undergradresearch.northwestern.edu/expo

Chicago Area Undergraduate Research Symposium: caurs.com

Academic Conferences. Consult with your advisor for major conferences in your field and apply for funding through the Conference Travel Grant program:
undergradresearch.northwestern.edu/ctg

Undergraduate Awards: undergraduateawards.com

Publish Your Research

Northwestern Undergraduate Research Journal: <http://groups.northwestern.edu/nurj/>

Nanoscape (Journal of Undergraduate Research in Nanoscience): nanoscape.northwestern.edu

Directory of Undergraduate Research Journals (UNC Office for Undergraduate Research):
unc.edu/depts/our/students/students_publish.html

Transform Your Research

Apply for National & International Research Grants: northwestern.edu/fellowships

Apply for Graduate School. Consult with your advisor for the best programs in your field and apply for funding through the Office of Fellowships:
<http://www.northwestern.edu/fellowships/fellowships/for-graduate-study/index.html>

Directory of Northwestern Student Presenters

Last Name	First Name	Session	Time	Location
Antonopolis	Stephen	Seeing Ourselves Anew	11:00-12:30am	Lake
Anderson	Kim	Afternoon Poster Session	2:30-4:00pm	Louis
Angell	Megan	Morning Poster Session	10:00-11:30am	Louis
Arwah	Ifath	Morning Poster Session	10:00-11:30am	Louis
Bae	Katherine	Seeing Ourselves Anew	11:00-12:30am	Lake
Baker	Erik	Facing Life's Challenges	1:00-2:30pm	Arch
Baldwin	Emily	The Impact of the Arts	11:00-12:30am	Arch
Bennett	Steven	Cutting Edge Humanities	11:00-12:30am	Rock
Bennett	Erin	Engaging the World	11:00-12:30am	Armadillo
Brock-Wilson	Stephanie	Afternoon Poster Session	2:30-4:00pm	Louis
Broderick	Mackenzie	Cutting Edge Humanities	11:00-12:30am	Rock
Broderick	Mackenzie	Afternoon Poster Session	2:30-4:00pm	Louis
Brown	Scott	Activism and Politics	1:00-2:30pm	Rock
Buckfire	Annabel	Morning Poster Session	10:00-11:30am	Louis
Burg	Natalie	Afternoon Poster Session	2:30-4:00pm	Louis
Carlson	Spencer	Afternoon Poster Session	2:30-4:00pm	Louis
Carr	Gabriela	Afternoon Poster Session	2:30-4:00pm	Louis
Cawley	Miranda	Activism and Politics	1:00-2:30pm	Rock
Chan	Rosalie	Engaging the World	11:00-12:30am	Armadillo
Chin	Ping	How We Grow and Learn	1:00-2:30pm	Armadillo
Cho	Thomas	Morning Poster Session	10:00-11:30am	Louis
Clarke	Aaron	Afternoon Poster Session	2:30-4:00pm	Louis
Clinch	Kimberly	Cutting Edge Humanities	11:00-12:30am	Rock
Cohen	Jessica	Afternoon Poster Session	2:30-4:00pm	Louis
Crane	Molly	Engaging the World	11:00-12:30am	Armadillo
D'amato	Rachel	Afternoon Poster Session	2:30-4:00pm	Louis
Divine	Ninah	Morning Poster Session	10:00-11:30am	Louis
Dulin	Natalie	Morning Poster Session	10:00-11:30am	Louis
Eisenstein	Amy	Afternoon Poster Session	2:30-4:00pm	Louis
Fang	Tiffany	Morning Poster Session	10:00-11:30am	Louis
Feinstein	Brooke	Afternoon Poster Session	2:30-4:00pm	Louis
Geisendorfer	Nicholas	On the Forefront of Science and Engineering	1:00-2:30pm	Lake
George	Katie	On the Forefront of Science and Engineering	1:00-2:30pm	Lake
Gerez	Julian	Morning Poster Session	10:00-11:30am	Louis

2. Undergraduate Research and Arts Exposition

Glaser	Rebecca	Afternoon Poster Session	2:30-4:00pm	Louis
Griffiths	Nicholas	Afternoon Poster Session	2:30-4:00pm	Louis
Han	Sunhee	Morning Poster Session	10:00-11:30am	Louis
Han	Sunhee	Afternoon Poster Session	2:30-4:00pm	Louis
Hardiman	Kevin	Seeing Ourselves Anew	11:00-12:30am	Lake
Huang	Zong	Morning Poster Session	10:00-11:30am	Louis
Iger	Jordyn	Facing Life's Challenges	1:00-2:30pm	Arch
Jenkins	Kathleen	Morning Poster Session	10:00-11:30am	Louis
Johnson	Sarah	Seeing Ourselves Anew	11:00-12:30am	Lake
Jones	Halimah	Cutting Edge Humanities	11:00-12:30am	Rock
Kaliski	Paige	Afternoon Poster Session	2:30-4:00pm	Louis
Kim	Gregory	On the Forefront of Science and Engineering	1:00-2:30pm	Lake
Kim	Hayeon	Afternoon Poster Session	2:30-4:00pm	Louis
Kim	Lori	Afternoon Poster Session	2:30-4:00pm	Louis
Krchnavy	Katharine	Afternoon Poster Session	2:30-4:00pm	Louis
Kukla	Tyler	On the Forefront of Science and Engineering	1:00-2:30pm	Lake
Lee	Thomas	Afternoon Poster Session	2:30-4:00pm	Louis
Leighton	Nicolas	Morning Poster Session	10:00-11:30am	Louis
Leung	Amanda	Afternoon Poster Session	2:30-4:00pm	Louis
Li	Rachel	Morning Poster Session	10:00-11:30am	Louis
Li	Jennifer	Afternoon Poster Session	2:30-4:00pm	Louis
Lichtenberger	Taran	Afternoon Poster Session	2:30-4:00pm	Louis
Lim	Patrick	Afternoon Poster Session	2:30-4:00pm	Louis
Lin	Katherine	Afternoon Poster Session	2:30-4:00pm	Louis
Lindstrom	William	Afternoon Poster Session	2:30-4:00pm	Louis
Liquin	Emily G.	How We Grow and Learn	1:00-2:30pm	Armadillo
Liu	Patrick	Afternoon Poster Session	2:30-4:00pm	Louis
Luu	Norman	Morning Poster Session	10:00-11:30am	Louis
Lynch	Colin	Morning Poster Session	10:00-11:30am	Louis
Martini	Katherine	Afternoon Poster Session	2:30-4:00pm	Louis
Martins	Ralph	Morning Poster Session	10:00-11:30am	Louis
Massucco	Maria	The Impact of the Arts	11:00-12:30am	Arch
Matra	Julian	Facing Life's Challenges	1:00-2:30pm	Arch
Medrano	Fortunato	Morning Poster Session	10:00-11:30am	Louis
Mehl	Lindsey	Afternoon Poster Session	2:30-4:00pm	Louis
Moravek	Jessie	On the Forefront of Science and Engineering	1:00-2:30pm	Lake
Myaeng	Seo	Afternoon Poster Session	2:30-4:00pm	Louis
Naqvi	Shageaa	Morning Poster Session	10:00-11:30am	Louis

Noronha	Katelyn	On the Forefront of Science and Engineering	1:00-2:30pm	Lake
Palasz	Joseph	Afternoon Poster Session	2:30-4:00pm	Louis
Panton	Constance	Afternoon Poster Session	2:30-4:00pm	Louis
Park	Eugene	Morning Poster Session	10:00-11:30am	Louis
Peeples	Marie	Afternoon Poster Session	2:30-4:00pm	Louis
Perkovich	Paul	Morning Poster Session	10:00-11:30am	Louis
Qin	Johan	Activism and Politics	1:00-2:30pm	Rock
Reed	Casey	The Impact of the Arts	11:00-12:30am	Arch
Rhyan	Nicola	How We Grow and Learn	1:00-2:30pm	Armadillo
Rim	Katie	Morning Poster Session	10:00-11:30am	Louis
Ritz	Michaela	Afternoon Poster Session	2:30-4:00pm	Louis
Riverol	Bridgett	Afternoon Poster Session	2:30-4:00pm	Louis
Rodby	Kara	Afternoon Poster Session	2:30-4:00pm	Louis
Rucinski	Ethan	Morning Poster Session	10:00-11:30am	Louis
Sarette	Rachael	Morning Poster Session	10:00-11:30am	Louis
Sarwar	Sara	Facing Life's Challenges	1:00-2:30pm	Arch
Shavlik	Margaret	How We Grow and Learn	1:00-2:30pm	Armadillo
Shen	Elaine	Engaging the World	11:00-12:30am	Armadillo
Sherman	Robert	Afternoon Poster Session	2:30-4:00pm	Louis
Shin	Ji Min	Cutting Edge Humanities	11:00-12:30am	Rock
Shuttleworth	Clayton	The Impact of the Arts	11:00-12:30am	Arch
Star	Noah	Activism and Politics	1:00-2:30pm	Rock
Stern	Natalie	Seeing Ourselves Anew	11:00-12:30am	Lake
Suba	Silma	Activism and Politics	1:00-2:30pm	Rock
Subramani	Nishant	Morning Poster Session	10:00-11:30am	Louis
Swett	Nicky	The Impact of the Arts	11:00-12:30am	Arch
Thomas	Lauren	Activism and Politics	1:00-2:30pm	Rock
Todes	Jordan	Morning Poster Session	10:00-11:30am	Louis
Varelas	Eleni	Afternoon Poster Session	2:30-4:00pm	Louis
Walters	Ashley E	Facing Life's Challenges	1:00-2:30pm	Arch
Walwema	Angela	Morning Poster Session	10:00-11:30am	Louis
Wellman	Renee	Afternoon Poster Session	2:30-4:00pm	Louis
Williams	Bailey	Morning Poster Session	10:00-11:30am	Louis
Wu	Deborah	How We Grow and Learn	1:00-2:30pm	Armadillo
Wu	Deborah	Morning Poster Session	10:00-11:30am	Louis
Xie	Anne	Afternoon Poster Session	2:30-4:00pm	Louis
Xu	Troy	Afternoon Poster Session	2:30-4:00pm	Louis
Yang	John	Afternoon Poster Session	2:30-4:00pm	Louis
Yi	Ryan	Morning Poster Session	10:00-11:30am	Louis

4. Undergraduate Research and Arts Exposition

Yom	Kelly	Morning Poster Session	10:00-11:30am	Louis
Younkin	Gordon	Morning Poster Session	10:00-11:30am	Louis
Zaniker	Emily	Afternoon Poster Session	2:30-4:00pm	Louis
Zero	Odette	Engaging the World	11:00-12:30am	Armadillo
Zhao	Kevin	Afternoon Poster Session	2:30-4:00pm	Louis

∞ Guide to Poster Presentations

Poster Session One

10:00-11:30, Louis Room (205)

Humanities, Social Sciences, & Journalism

1. **Bailey Williams**, "CNN's Online Depictions of Women and ISIS: A Close Analysis in the Wake of the 2015 Paris Attacks."
2. **Ifath Arwah**, "Women Correspondents at War."
3. **Ryan Yi**, "Implications of Blockchain Technology for Retail Electricity Markets."
4. **Katie Rim**, "Anxiety Symptoms and Autonomic Functioning in Response to Happy and Sad Film Clips."
5. **Ralph Martins and Shageaa Naqvi**, "Desire for Cultural Preservation and Support for Censorship as Predictors of Conservative/Progressive Self-perceptions in Six Arab Countries."
6. **Sunhee Han**, "Attachment Themes in Early Childhood Narratives and Adult Self-Esteem."
7. **Nicolas Leighton**, "Blue Zone Projects: Neoliberal governance in public health and the construction of health in the United States."
8. **Annabel Buckfire**, "E-Commerce and Social Networks: Who Makes Product Successful?"
9. **Tiffany Fang**, "The Effect of Background Noise on Novel Word Learning."
10. **Deborah Wu**, "Emotional Coherence between Facial Expressions and Heart Rate is Associated with Well-Being."
11. **Zong Huang**, "First in the Family: Degree Attainment and Post-Baccalaureate Labor Market Outcomes for First-Generation College Students"
12. **Megan Angell, Thomas Cho, and Rachel Li**, "Leadership Granting in Multiteam Systems: A Social Network Perspective."
13. **Ninah Divine**, "Becoming a Callaloo: Multiracial Identity in Trinidad."
14. **Natalie Dulin**, "Sex Differences in Pragmatic Language in Individuals with ASD and their Parents: Group Differences and Predictions."
15. **Fortunato Medrano**, "Effects Reframing STEM Fields and SES on Belonging; Achievement; and Engagement."
16. **Ethan Rucinski**, "Handedness and a Competitive Selection Model."
17. **Julian Gerez**, "The Political Economy of Timber in Civil Wars: Geography; Production; Exports; and Patronage Politics."

Natural Sciences & Engineering

18. **Eugene Park**, "An Agent-Based Model of Task Switching in Astronaut Teams."
19. **Nishant Subramani**, "A Method to Transform a Partial Ancestral Graph to a Markov Equivalent Set of Acyclic Directed Mixed Graphs."
20. **Jordan Todes**, "Preferential Preservation of Biomarkers in Carbonate Concretions: A Case Study from the Holz Shale."
21. **Angela Walwema**, "How Extreme Site Locations Affect Fitness in *Echinacea angustifolia*."

Poster Session One, continued

22. **Gordon Younkin**, “Modeling the Effect of Prairie Fires on Reproductive Success of the Purple Coneflower.”
23. **Rachael Sarette**, “Flowering Schedule of Single Headed Plants Versus Multi-Headed Plants.”
24. **Norman Luu**, “Graphene-Stabilized Cathodes for Lithium Ion Batteries.”
25. **Paul Perkovich**, “Design of a Microfluidic Surface-Based Bioreactor.”
26. **Colin Lynch**, “A Gd(III) based magnetic resonance contrast agent for molecular imaging of hydrogen peroxide.”
27. **Kathleen Jenkins**, “Optimization of megakaryocyte platelet production in a microfluidic bioreactor.”
28. **Kelly Yom**, “Distribution of ExoU- and ExoS- Secreting Strains of *Pseudomonas aeruginosa* in the Environment.”

Poster Session Two

2:30-4:00, Louis Room (205)

Humanities, Social Sciences, & Journalism

1. **Katharine Krchnavy and Troy Xu**, “Ancient Rome in Chicago.”
2. **Aaron Clarke**, “Animate Entanglements: Black Feminism's Intra-Active Dialogue and Future.”
3. **Marie Peebles**, “Women of Ill Fame: Public Morality and Legalized Prostitution in Civil War Tennessee.”
4. **Hayeon Kim**, “Oral Histories of Contemporary Korean American Activism in Washington; D.C. and New York.”
5. **Rachel D'amato**, “Racial Navigation: Fitting in as Mixed-Race Black and White Young Women.”
6. **Stephanie Brock-Wilson**, “‘Prison Economies’ and Local Economic Development: Resident’s Opinions from Florence; AZ.”
7. **Sunhee Han and Paige Kaliski**, “Secondary Mathematics Teachers' Use of Causal Reasoning About Classroom Experiences to Change Teaching Practice.”
8. **Katherine Martini and Bridgett Riverol**, “The Impact of Media Exposure on Typically Developing Children's Language Skills.”
9. **Mackenzie Broderick and Amy Eisenstein**, “Preparing for Job Interviews: What Do They Really Want to Know?”
10. **Seo Myaeng**, “An Analysis on the Effect of Cultural Primes on International Asian and Asian American College Students? Job Attribute Preferences.”
11. **Renee Wellman**, “Religion and Valuing the Outdoor Environment.”
12. **Spencer Carlson**, “Challenges of scaling new practices in peer-led learning communities.”
13. **Natalie Burg and Jessica Cohen**, “Scaling Up Family Planning in Ethiopia.”

Poster Session Two, continued

14. **Anne Xie**, “Development of Social Relationships in Massively Multiplayer Online Role-Playing Games.”
15. **Thomas Lee**, “Accepted Social Stigma: A Study and Comparison of the Social Stigmatization of Niche and Mainstream Hobbies.”
16. **Constance Panton**, “Fitting into Beautiful Bodies: Ethnographic Examination of Mexican-American Young Adult Cultural Norms and the U.S. Obesity Epidemic.”

Natural Sciences & Engineering

17. **Eleni Varelas**, “Cerebrospinal Fluid Biomarkers for Detecting Non-Amnestic Presentations of Alzheimer’s Disease.”
18. **Amanda Leung**, “Dependency of DAC Morphology on Proper ipRGC development.”
19. **Taran Lichtenberger**, “Impact of Functional Trait Diversity on Prairie Ecosystem Restoration”
20. **Katherine Lin**, “Habitsourcing: Sensing the Environment through Immersive, Habit-Building Experiences”
21. **Patrick Liu**, “Inhibition of in vivo oxidation of native low-density lipoprotein by N-acetylcysteine is associated with decreased atherosclerosis.”
22. **Jennifer Li**, “Intrinsically photosensitive retinal ganglion cells are a source of photic input in the intergeniculate leaflet.”
23. **Brooke Feinstein**, “Maturation of voltage-gated sodium channel properties in the avian cochlear nucleus magnocellularis.”
24. **Patrick Lim**, “Molecular Mechanisms Linking Depression and Dementia Through a Genetic Rat Model of Depression.”
25. **Kara Rodby**, “Microbial uptake of mercury in aquatic systems.”
26. **Kim Anderson**, “Glycolysis Pathway in Cell-Free Metabolic Engineering of Isoprenoids.”
27. **Lori Kim**, “Mutagenesis of Paramyxovirus Hemagglutinin-Neuraminidase Membrane Proximal Stalk Region Influences Stability; Receptor Binding and Neuraminidase Activity.”
28. **John Yang**, “Novel Microtubule-Binding Anti-Cancer Compound Induces Apoptosis of U87 Glioblastoma Multiforme via Hyperploidy and Cell Cycle Arrest.”
29. **Joseph Palasz**, “Stabilization of perovskite solar cells using a polymer blended electron transport layer.”
30. **Nicholas Griffiths**, “Frizzled Genes Help Regulate Brain Size in *S. Mediterranea*.”
31. **Emily Zaniker**, “Mechanistic Study of a Novel Biodegradable PLGA Nanoparticles in the Therapeutic Modulation of Autoimmune Diseases.”
32. **Lindsey Mehl**, “Membrane derived microparticles released by tissue infiltrating PMNs are a novel mechanism for PMN-induced and myeloperoxidase-mediated epithelial injury.”
33. **Rebecca Glaser**, “Ruthenium Doped Strontium Titanate for Improved Solid Oxide Fuel Cell Anodes.”
34. **Michaela Ritz**, “Relationship between the consolidation phase and a refractory period in perceptual learning.”
35. **Gabriela Carr and Robert Sherman**, “Investigating the Effect of Soil Quality on Phylogenetic Diversity in Restored Prairies”

Poster Session Two, continued

36. **William Lindstrom**, “Characterization of the Effects of Granulocyte Macrophage Colony-Stimulating Factor on Oligodendrocyte Progenitor Cells.”
37. **Kevin Zhao**, “Chemical Probes for Drug Development and Target Identification in Amyotrophic Lateral Sclerosis.”

∞ Faculty Judges of Undergraduate Posters

Elisa Baena, Spanish and Portuguese

Greg Beitel, Molecular Biosciences

Christine Bell, Art History

Steve Carr, Materials Science and Engineering

Bernard Dobroski, Music

Adam Goodman, Center for Leadership

Benjamin Gorvine, Psychology

Tina Grieco-Calub, Communication Sciences and Disorders

Jie Gu, Computer Engineering

Stephen Hill, Anthropology, Office of Fellowships

Philip Hockberger, Physiology

Matthew Johnson, Anthropology

Rachel Lander, Molecular Biology

Mark McClish, Religion

SonBinh Nguyen, Chemistry

Fred Northrup, Chemistry

Laura Panko, Biological Sciences

Owen Priest, Chemistry

Ishwar Radhakrishnan, Biochemistry, Molecular Biology and Cell Biology

Andy Rivers, Physics

Cynthia Robin, Anthropology

Sarah Rodriguez, Medical Humanities and Bioethics, Global Health Studies

✂ Faculty Judges of Undergraduate Posters, continued

Fay Rosner, French, Weinberg Academic Advisor

Lilah Shapiro, Sociology

Nitasha Sharma, African American Studies, Asian American Studies

Mark Sheldon, Philosophy, Weinberg Academic Advisor

Karrie Snyder, Sociology

Jason Tait Sanchez, Communication Sciences and Disorders

Francesca Tataranni, English, Weinberg Academic Advisor

Paul Umbanhowar, Mechanical Engineering

Mark Witte, Economics

Brad Zakarin, History

Rachel Zucker, Philosophy, German



Poster Presentation Abstracts

Alphabetical by presenter's last name

Kim Anderson

Faculty Advisors: KC Anderson, Quentin Dudley, and Michael Jewett

Glycolysis Pathway in Cell-Free Metabolic Engineering of Isoprenoids

Sustainability challenges have increased the need for renewable chemical building blocks for the design of new materials, including fuels and pharmaceuticals. Advances in metabolic engineering allow the use of bacteria to convert sugars into these useful chemicals. However, metabolic engineering is limited by physiological needs of the cell which are contrary to the engineer's desire to overproduce a chemical. In cell-free systems, these limitations are removed as cell extracts (from organisms such as *Escherichia coli*) isolate the catalytic proteins involved in cell metabolism while removing cellular debris. The cell-free system in this project involves the pathway from glucose to mevalonate, a key isoprenoid intermediate. Isoprenoids are an appealing class of chemicals due to their flexibility for use in biofuels, medicines, and commodity chemicals. To increase the productivity of this pathway, this work identified the rate-limiting enzyme in the enzymatic cascade. This was done by combining a crude lysate of BL21(DE3) *E. coli* overexpressing the mevalonate pathway with each purified glycolysis enzyme, one-by-one, and using GC-MS to determine which enzyme increased production of mevalonate. After it was determined that hexokinase was rate-limiting, homologs of this enzyme from multiple organisms were overexpressed in *E. coli*. Extracts from these strains were then tested in cell-free reactions for mevalonate production. The reactions with overexpressed hexokinase had higher production of mevalonate, with the control strain producing 7.1 mmol/L/hr and overexpressed strain producing 19.3 mmol/L/hr. These efforts are another step toward improved yields of mevalonate and are broadly applicable to other chemical pathways for sustainable chemicals.



Megan Angell, Thomas Cho, and Rachel Li

Faculty Advisor: Noshir Contractor

Leadership Granting in Multiteam Systems: A Social Network Perspective

Multiteam systems (MTSs), teams of teams collaborating to accomplish a shared goal, play an increasingly important role in companies, government, and other organizations. Past research has demonstrated the influence of leaders on MTS performance. DeRue and Ashford (2010) propose that in single teams, leadership emerges through a claiming-granting process, where members claim and grant leadership to each other. Our study extends this model to the MTS level and identifies key attributes of members who grant leadership to others and members who are granted leadership. In each of 30 simulations, four five-person teams collaborated to execute a humanitarian aid response. We use social network analysis to determine how personality, formal leadership role, and team membership impact who grants and is granted leadership. On the dyadic level, we identify how homophily, or shared attributes, impacts leadership emergence. Further, we analyze how communication between members and overall network structure impact the leadership granting process. We then relate these leadership emergence mechanisms to team and MTS performance. We predict that 1) formal leaders and 2) extroverted individuals are more likely to be granted leadership. We also predict that individuals who are 1) in the same team and 2) similar in personality are more likely to grant leadership to each other. Furthermore, communication relationships among members

positively impact whether members grant leadership to one another. By examining the leadership granting process at individual, dyadic, and network levels, our results will contribute to research on leadership, multiteam systems, and the broader understanding of communication in teams.



Ifath Arwah

Faculty Advisor: Andrew Mills

Women Correspondents at War

The number of women in journalism has grown phenomenally in the past few decades. This trend can also be seen in the field of war journalism, a profession that is traditionally considered “macho.” Despite these changes in gender related prospects and women being a majority among journalism students, women are still in the minority in top journalistic roles, even in fields other than war journalism. Although women have continually proved their worth and importance in the field of war journalism, most female journalists still experience a considerable amount of difficulty in the field. This difficulty includes having to compromise between family and career, sexual harassment and abuse in the field, and sometimes even sexism. The reason this problem must be solved is because of the importance of women holding these job positions. Women are important in this field because of their unique advantage as females in patriarchal societies where men feel protective about women. This advantage sometimes saved them from harm, helped them gain access to news and navigate through checkpoints. Majority of women and children in these regions also felt more comfortable talking to a female journalist, as they weren’t allowed to speak to men outside of their families. I have written this paper to discuss these problems and bring solutions to these issues.



Steffi Brock-Wilson

Faculty Advisor: Mark Witte

“Prison Economies” and Local Economic Development: Resident's Opinions from Florence, AZ

In Southern Arizona, the political economy revolves around the construction of prisons, which are interrelated with the soaring immigration detention rates and the boom of the private prison industry. Nationally, prison construction is a result of many factors, including sentencing mandatory minimums, political lobbying by the private prison industry, and prison bed quotas. However, local town governments also tend to support the industry as an economic development boost and even compete to attract private prisons. The construction of prisons in rural, predominantly white communities across the country results in the redistribution of political representation and state funding away from urban centers. In my research, I asked local residents of Florence, AZ, which is home to 9 prisons, about the prisons’ impact on employment, housing prices, local business, and more. In the past, policymakers and economists used to promote prison construction as a local economic development tool, but now the literature on prison economies convey more mixed results. After talking with local business owners and the town’s local economic development official, I found that local residents also

have mixed opinions about the impact of prisons on their historic community. Although policymakers and private prison stakeholders tend to dominate this conversation nationwide, the opinions of local residents are important, especially as most communities hold a vote, or something similar, before welcoming a private prison into their town.



Annabel Hitchcock Buckfire

Faculty Advisor: Yun Huang

E-Commerce and Social Networks: Who Makes Product Successful?

Threadless is an e-commerce website founded in 2000 that is fueled by artists, voters, and buyers, some of whom overlap. Artists submit designs and any member of the community, including the artist, can vote on the design for a seven-day period. After the voting period, the Threadless staff reviews the top-scoring designs. The staff then selects ten designs to manufacture. On average, there are one thousand submissions per week and only ten designs are selected per week (1 percent). These designs are printed onto t-shirts and other products, and consumers can purchase them worldwide via the website. The crux of the company lies in its crowdsourcing platform: Threadless is a forum where artists, critics, and consumers can collaborate to generate products. The purpose of the research is to determine what factors cause online success or failure for community members. This entails exploring why some designs have low or high scores, if and how the voting process is manipulated, and what types of users there are. By determining if there are patterns to users' voting habits it can be possible to extrapolate whether or not this Threadless behavior is unique to the community or can be found mirrored in other social commerce websites or beyond that.



Natalie Burg and Jessica Cohen

Faculty Advisor: Noshir Contractor

Scaling Up Family Planning in Ethiopia

Global health research is crucial to understanding and aiding the developing world, and in this case, the fast-growing and dynamic region of Oromia, Ethiopia. Information about modern contraceptive methods (MCM) and use is typically collected through the administration of demographic and health surveys, which are very individualistic in nature. This project is instead creating egocentric network surveys with Social Network Analysis techniques to identify how individual usage of modern contraceptives is influenced by network contacts and community norms. A joint project between Science of Networks in Communications (SONIC) Laboratory at Northwestern University, Washington University, George Washington University, Jimma University in Ethiopia, and funded by the Bill and Melinda Gates Foundation, this research aims to discover what egocentric network surveys capture about need for modern contraceptives in Ethiopia, and if they can be used as a method for crafting future policies around distribution. So far, our team has completed a literature review about Ethiopian health policy, previous modern contraceptive efforts, and the current political and social climate of Ethiopia; developed a Social Network Analysis instrument to collect data and understand

how people learn about MCMs; and is currently conducting qualitative research in Ethiopia. This novel type of survey design could be used in the future as a more cost-effective way to study, understand and increase MCM usage in other underdeveloped regions around the world. If successful, social network analysis can transform the way we comprehend vast global health topics and the capacity for creating efficient change for health challenges worldwide.



Spencer Carlson

Faculty Advisor: Matthew Easterday

Challenges of scaling new practices in peer-led learning communities

For years, education researchers have known that the traditional approach to education is not giving students the real-world skills they need. To solve this problem, some researchers have advocated learning communities, a model of learning environment in which students collaborate to build knowledge. One version of this model, peer-led learning communities, has become a popular option for extracurricular programs — but it has some challenges. To identify these challenges, I studied one such 10-week program for 32 undergraduates working across six project teams, as the peer leadership struggled to share a new practice (a form of knowledge) throughout the community. I conducted qualitative data analysis on team instant messaging conversations and semi-structured interviews with students and leaders to understand what made it difficult to spread the practice. I found that spreading new practices in peer-led learning communities can be difficult for three reasons: (a) low awareness of peer leaders' competence makes it less likely that students will value leaders' suggestions to try new practices, (b) leaders' awareness of this makes them less likely to try sharing and advocating new practices, and (c) the cultural and curricular focus on working within project teams raises barriers to the kind of inter-team communication that helps to spread practices. This work identifies challenges for running peer-led learning communities and suggests possible solutions. By solving these challenges, we may realize the promise of learning communities at scale, enabling many more students to learn the complex skills they will need to make quality contributions to society.



Gabriela Carr and Robert Sherman

Faculty Advisor: Daniel Larkin

Investigating the Effect of Soil Quality on Phylogenetic Diversity in Restored Prairies

During the summer of 2015, 18 Chicagoland restored prairies were sampled to determine if soil characteristics correlated with plant phylogenetic diversity in these sites. The purpose of such a correlation was to demonstrate whether soil quality is related to the ability of a restoration to mimic a diverse remnant. Soil cores were taken from 20 plots per site, and at each plot the number and identities of native, non-native, naturalized, and invasive species were determined. Soil cores were analyzed for their gravimetric soil moisture (GSM), percent loss of organic matter on ignition (LOI), pH, and electrical conductivity. The phylogenetic diversity of each plot was determined from plant identifications, as well as the percentages of natives/non-natives/naturalized/invasives per site.

Correlations were run at both the plot and site levels between the metrics for soil and phylogenetic diversity, as well as for soil and natives/non-natives/naturalized/invasives. These analyses showed weak correlation between soil and these characteristics at both plot and site levels. The exception to this trend was a slight relationship between site level characteristics: LOI and mean phylogenetic distance (MPD), GSM and MPD, GSM and mean nearest taxon distance (MNTD), pH and percent natives, and pH and percent non-natives. These relationships had R^2 between 0.2 and 0.35, and although this is not a strong relationship nevertheless suggests some correlation between soil quality and plant community diversity at a site level. This relationship should be investigated more fully through further studies.



Aaron Clarke

Faculty Advisor: Michelle Wright

Animate Entanglements: Black Feminism's Intra-active Dialogue and Future

This paper will trace some important challenges to the temporal assumptions of dominant institutional understanding of futurity by outlining the intergenerational and epiphenomenal dialogue happening across black feminism. By reading work throughout black feminist theory, specifically the literature of Alexis DeVeaux and Toni Morrison, the poetry of Lucille Clifton and Audre Lorde, and the contemporary scholarship of Michelle Wright and Denise Ferreira Da Silva, I will argue for the entangled inseparability of black feminism's past, present, and future. This black feminist thought, as represented by the (dis)continuous exchanges of the writers above, theorizes time attuned to ghostly haunting and quantum forces, avoiding the classical notions of causality, linearity, and positivism that trap many hegemonic configurations of futurity. Rather than calling for a utopian tomorrow outside any of the world's limits, I contend that black feminist futurity must ground itself in, rather than transcend, its past and present. This future is one that must ceaselessly struggle with the ongoing effects of pasts that are never really past and learn from the invaluable work of those that struggled to make our present possible. Black feminist timespaces, and their futures, look less like the single line drawn by classical history and more like a constellation constituted by a multi-dimensional web of moments in relation, affecting other moments. I will situate this collective theorization of black feminism's entanglements as essential in understanding black feminist praxis, its analytics and its methodology. Black feminist futures, as interconnected and haunted spacetime, force us to embrace a poetic and haptic approach to thought that is always polyvalent, comprised of intra-active exchange. Against the assumptions of humanism that produce liberal individuals and professional intellectual subjects, black feminist work is not selfish and solitary. It happens together, while listening to animate archives and futures given presence through poem. The paper will conclude by arguing that a methodological commitment to futurity and dialogic entanglement as a generative approach to black feminist thought that can expand, destabilize, and reimagine ethical, political, and identitarian categories by thinking outside the confines of individualism and the liberal subject



Rachel D'amato

Faculty Advisor: Nitasha Sharma

Racial Navigation: Fitting in as Mixed-Race Black and White Young Women

Over the last thirty years, multiraciality has become a hot topic in ethnic studies circles and on social media outlets. As more people choose to identify as mixed-race, the need to better understand the experiences of multiracial individuals, especially mixed children, has increased as well. Identity development is crucial in one's adolescence, but in a nation built on racial segregation and hypodescent rules, it is often difficult for multiracial children to understand their identity and place in society. For this research project, I analyze how the mixed-race black and white young female protagonists in novels *The Girl who fell from the Sky* by Heidi W. Durrow and *Caucasia* by Danzy Senna employ aspects of their outer appearance in order to fit in and achieve what they understand as "authentic" blackness. Although this phenomenon fits under contemporary definitions of passing, I argue against the use of the term "passing" for such cases and suggest a new term, racial navigation. I argue instead that *racial navigation* more properly encompasses the experience of being raised as a mixed-race young woman, the experience of navigating how one identifies in different spaces and coming to a mixed-race identity or other racial identity that best represents oneself.



Ninah Divine

Faculty Advisor: Monica Russel y Rodriguez

Becoming a Callaloo: Multiracial Identity in Trinidad

This research hopes to contribute to an understanding of the mixed race experience within Trinidad and develop a dialogue of how it pieces into the wider picture of global mixed race. The deep multicultural history and wide range of ethnicities in Trinidad provide an ideal setting for studying multiracial identity formation. Trinidad has a unique political and social environment that has broad implications for understanding multicultural societies. Through interviews with 14 multiracial university students, I investigate how racial self-identification is constructed in Trinidad, as one component of a larger interdisciplinary study. I determined how environmental circumstances influence the development of racial identification using Renn's adapted Ecological Development Model. It was hypothesized that the factors influential to racial identity integration will be aspects of the individual's exosystem, macrosystem, microsystem and mesosystem, the most influential being external validation by mesosystem level interactions. Understanding multiculturalism in the context of Trinidad requires an analysis of the fluid definitions of culture, nationality and race within the Caribbean, which is deserving of further study as attitudes about race are changing as racial demographics become more complex within countries and a growing percentage of the global population identifies with multiple racial identities.



Natalie Dulin

Faculty Advisor: Molly Losh, Emma Adam, and Michelle Lee

Sex Differences in Pragmatic Language in Individuals with ASD and their Parents: Group Differences and Predictions

Impaired pragmatic language (language used for social interactions) is a core feature of autism spectrum disorder (ASD). Few studies have looked at sex differences in pragmatic language in ASD, and therefore, it is unclear whether males or females have stronger pragmatic ability and whether they may be drawing on different skills in their use of pragmatic language. The author used previously collected semi-structured and standardized assessment measures to characterize pragmatic language ability, and related abilities, of 15 females and 15 males with ASD, 13 female and 20 male control children, 85 mothers and 57 fathers of individuals with ASD, and 37 mothers and 23 fathers as control parents. Qualitatively, females in all groups had stronger pragmatic language ability. Individuals with ASD and their parents had more impaired pragmatic language compared to controls. Some different patterns emerged across what related ability was correlated with pragmatic language ability for each group. These findings have implications for ASD assessment and intervention for pragmatic language impairments, as well as for understanding the potential differences in strengths and weakness of females and males with ASD.



Amy Eisenstein and Mackenzie Broderick

Faculty Advisor: Barbara Shwom

Preparing for Job Interviews: What Do They Really Want to Know?

What do job interviewers really want to hear? As college students we are taught to approach the interview process as a formula we can crack, but the commonly accepted rules of interview behavior may not help us provide the best answers. This project examines the job interview process in order to identify the rationale behind many common interview questions. We have evaluated approximately 350 articles from The New York Times "Corner Office" column in which Adam Bryant interviews CEOs about their hiring practices. We compiled all of the questions that the CEOs identified, coded them based on type of question and rationale, and analyzed them. In addition, we interviewed Northwestern students about their own experiences in the job interview process and the advice they get about how to approach job interviews. Based on our current data set, it seems that job interviewers pose many more questions soliciting for indirect answers or cues, like self-awareness, than we may have originally expected. This project could help college career centers give better advice and guidance to college students interviewing for the careers of the 21st-century, especially as they imagine the entire trajectory of their career track.



Tiffany Fang

Faculty Advisor: Tina Grieco-Calub

The Effect of Background Noise on Novel Word Learning in 3- and 4-Year-Old Children

The toddler years are marked by rapid growths in language and cognitive skills. A growing body of work suggests that the rate of this growth is largely shaped by children's early experience with language. Because environmental, or "background" noise interferes with speech perception, it also has the potential to interfere with language acquisition. In this study, thirty 3- and 4-year-old children will watch two sets of animations that teach them the novel names of six novel clay objects. One set will be played with no background noise; the other set will be played in the presence of simulated babble noise. Afterwards, participants will engage in three-alternative forced choice tasks to gauge their learning of the novel names. Participants will also be administered the Flanker Inhibitory Control and Attention task and the ROW-PVT language measure in order to relate individual differences to ability to learn novel words. I predict that background noise will interfere with word learning, decreasing the number of novel words learned. Alternatively, young language learners may have strategies that negate the negative effects of noise. Findings have implications for optimal noise levels and environments for learning settings.



Brooke Feinstein

Faculty Advisor: Jason Sanchez

Maturation of voltage-gated sodium channel properties in the avian cochlear nucleus magnocellularis

Auditory neurons generate ultrafast and temporally precise action potentials (APs), a function critical for normal hearing. Fundamental to AP generation are voltage-gated sodium (NaV) channels, yet the functional maturation of these channels remains largely unexplored. To address this, we characterized the maturation of NaV channel properties (amplitude, density, conductance, kinetics, reliability, and inactivation) in the avian cochlear nucleus magnocellularis (NM) and compared these properties across developmental periods. In order to characterize these properties, we obtained voltage clamp recordings of isolated NaV currents from chicken embryos (E) at days E10-12, E14-16, and E19-21. Across the population of neurons tested, we found that the amplitude, rise rate, and fall rate of isolated NaV currents significantly increased with development. In parallel with these changes, the half width of NaV currents became significantly smaller, but reliability of NaV channels remained constant across development. From E10-16, the voltage dependent change in NaV current was found to be consistent with an increase in current density but not channel conductance, while in E16-21, channel conductance became considerably larger with minimal variation in current density compared to early developing neurons. Lastly, we found that in E19-21 neurons, NaV channels inactivate at more negative membrane voltages than early developing neurons. Taken together, the functional development of NaV current properties in NM are in agreement with developmental changes in NaV channel subtypes as previously reported by immunohistochemical experiments.



Julian Gerez

Faculty Advisor: Will Reno

The Political Economy of Timber in Civil Wars: Geography, Production, Exports, and Patronage Politics

Civil wars have played an increasingly important role in the global conflict map. The quasi-disappearance of interstate wars has led scholars specializing in the study of war to shift their focus to the one instance of war primarily practiced today, namely the intrastate war. This article follows substantial literature on the effects of natural resources on these kinds of wars by reviewing the relationship that timber plays in these kinds of conflicts by analyzing how percentage of forested area might play a geographic, physical role; and through an econometric analysis of total production of timber and exports of timber. It concludes with a qualitative review of illegal timber exports and patronage politics. This investigation reveals several underlying patterns when it comes to how timber affects the likelihood of onset of civil wars and the duration of these conflicts: percentage of forested area can play a significant role in increasing the total number of civil war days countries with at least one such previous conflict, in addition to increasing the average duration of these conflicts, especially conflicts fought over central control of the government; timber production can be a contributor to an increase in the frequency of civil wars fought over central control of the government; and timber exports, in the same kinds of conflicts can lead to increased frequency as well as an increase in the total number of civil war days. Illegal timber exports are related to funding for civil wars and timber exploitation plays a more significant role in countries with extensive patrimonial or neo-patrimonial rule.



Rebecca Glaser

Faculty Advisor: Scott Barnett

Ruthenium Doped Strontium Titanate for Improved Solid Oxide Fuel Cell Anodes

Current means of electricity production are inefficient and dependent on fossil fuels while energy storage options are inadequate for the rising demand. Solid Oxide Fuel Cells (SOFCs) are highly efficient devices for energy conversion which pair well with renewable energy sources. Ni/YSZ-based anodes are the current industry standard; however, Ni particle coarsening and sulfur and carbon deposition onto the anode at high operating temperatures (600-1000°C) decrease active surface area and reduce performance. Mixed conducting oxide materials are alternatives to obtain an efficient and chemically stable anode over time. $\text{SrTi}_{0.3}\text{Fe}_{0.7}\text{O}_3$ has shown moderate performance, but doping with Ru creates a similar network of particles to Ni. Ru has a lower melting temperature and is therefore more resistant to coarsening. The power density of Ru-doped $\text{SrTi}_{0.3}\text{Fe}_{0.7}\text{O}_3$ across temperatures (660-850°C) and H_2 partial pressures (10-100%) is improved over un-doped $\text{SrTi}_{0.3}\text{Fe}_{0.7}\text{O}_3$, particularly at low partial pressures. The formation of Ru nanoparticles influences hydrogen adsorption and the improved low-hydrogen performance has important applications in fuel cell stacks where the gas distribution is non-uniform. Future imaging studies are needed to determine the size and distribution of the Ru nanoparticles.

Nicholas Griffiths

Faculty Advisor: Christian Petersen

Frizzled Genes Help Regulate Brain Size in *S. Mediterranea*

The control of body proportion during development and regeneration is poorly understood. The flatworm *Schmidtea Mediterranea* is a good model to investigate this process due to its robust regeneration capabilities, which rely on a population of adult stem cells called neoblasts. We identified Wnt signaling components that regulate brain size in *S. Mediterranea* by investigating the expression and function of *frizzled* family genes (Wnt receptors). We characterized the expression of *frizzled* genes by using WISH and FISH staining techniques. Using RNAi, we identified 3 genes that control brain size during regeneration: *fzd5/8-1*, *fzd5/8-2*, and *fzd5/8-4*. Visualization of *centillo*-expressing neurons with FISH allowed us to quantify the size of the brain in each sample. The data suggest that *fzd5/8-1* and *fzd5/8-4* normally limit brain size, while *fzd5/8-2* promotes a larger brain size during both head regeneration and remodeling. Eye formation during remodeling was also disrupted, indicating a defect in positional identity in the head region. Staining experiments found that *fzd5/8-4* is expressed in neoblast populations, and that *fzd5/8-1*, *fzd5/8-2* and *fzd5/8-4* are expressed at the anterior commissure of the brain, an area known to be involved in brain size control. Further investigation of these regulatory networks will allow us to refine our understanding of body plans and size control.



Sunny Han

Faculty Advisor: Dan McAdams

Attachment Themes in Early Childhood Narratives and Adult Self-Esteem

In this study, we explore links between themes of attachment in early childhood memories and adult personality measures such as agreeableness and self-esteem. This attachment study is part of the Foley Longitudinal Study of Adulthood (FLSA), in which interviews are conducted on adults' life stories over time. Unlike Mary Main's Adult Attachment Interview, the interview questions in FLSA were not created intentionally to study themes of attachment, but rather were composed of open-ended questions asking for a positive and negative memory from childhood. A coding system was created to identify themes of trust, guidance, excitement, neglect, active malevolence, and conflict in the Early Childhood Memory section of the adult life narratives. These codes, compiled into positive and negative attachment measures, were correlated with the Parental Bonding Inventory, Rosenberg Self-Esteem Scale, and Agreeableness subscale of the NEO Five-Factor Inventory. These findings suggest that themes of attachment can be retroactively coded in life narrative interviews that need not be as extensive and intentional as Main's Adult Attachment Interview.



Zong Huang

Faculty Advisor: Terri Sabol

First in the Family: Degree Attainment and Post-Baccalaureate Labor Market Outcomes for First-Generation College Students

Over a third of all students attending American postsecondary institutions are the first in their family to attend college. This paper examines to what extent these first-generation college students differ from their peers with respect to degree attainment and post-baccalaureate income, employment, and occupation. I exploit the multigenerational structure of the Panel Study of Income Dynamics to draw comparisons across cousins in order to control for unobserved family characteristics. First-generation college students are significantly less likely to complete college and pursue an advanced degree. Furthermore, I find suggestive evidence that first-generation college graduates experience a disadvantage in terms of income and occupational status, but not employment.



Kathleen Annie Jenkins

Faculty Advisor: William M. Miller

Optimization of megakaryocyte platelet production in a microfluidic bioreactor

Current methods in platelet transfusions, possessing profound clinical importance in the clotting of blood and healing of wounds, are entirely derived from human volunteer donors. However, these methods are limited by a 5-day shelf life and differences in donor/recipient immunology. Additionally, methods in in-vitro platelet production have yielded less than 10 platelets/megakaryocyte (plts/Mk), compared to >1000 plts/Mk under physiological conditions. Thus, we are interested in the generation of ex-vivo platelets through the optimization of Mk maturation, following in the production of functional platelets through a human platelet bioreactor that utilizes shear forces on Mks to generate platelets. In addition, we are exploring the role of Rho-family GTPases: RhoA, CDC42, and RAC1, which have been implicated in cytoskeletal rearrangements of Mks during Mk maturation, proplatelet (PP) production, and platelet release. The investigation of Rho GTPase inhibitors will allow us to explore the mechanisms driving proplatelet formation necessary for platelet release and further maximize the quantities of ex-vivo platelets produced through our dual-flow bioreactor. Initial studies involved a screening of inhibitor conditions using PP quantification and characterization, as well as visualizing and quantifying PP production in the bioreactor. Specifically, our preliminary data indicated that our design of the bioreactor produces 20 ± 6 plts/Mk and washing out the RAC1 inhibitor with fresh media can regenerate PP formation in the Mks, and further produce greater numbers of plts/Mk through the bioreactor. Overall, these efforts will increase our understanding of the mechanisms surrounding proplatelet production and support our efforts to increase yields of ex-vivo platelets.



Paige Kaliski and Sunny Han

Faculty Advisor: Miriam Sherin

Secondary Mathematics Teachers' Use of Causal Reasoning About Classroom Experiences to Change Teaching Practice

We investigate secondary mathematics teachers' in-the-moment sense-making about their classroom experiences that are used as feedback to change instructional practices. Through the use of point-of-view observations and interviews, we identify the underlying causal reasoning about instruction used by teachers to understand why events happen the way they do in their classrooms, and examine how that causal reasoning is related to proposed changes to instruction. This project is part of a larger study on how high school mathematics teachers engage with student thinking and work to make changes in their instruction.



Hayeon Kim

Faculty Advisor: Ji-Yeon Yuh

Oral Histories of Contemporary Korean American Activism in Washington, D.C. and New York

What makes a political issue uniquely Korean American or Korea-specific? Within contemporary Korean American politics, the two most prominent and contentious debates are peaceful reunification of the two Koreas and U.S. immigration rights. My oral histories research offers insight into the personal history and motivations of first-, 1.5-, second-generation Korean Americans and Korean adoptees, who have dedicated their lives to addressing these areas of conflict. I conducted intensive interviews with eight Korean American activists living in the Washington, D.C. and New York metropolitan areas, representing six different regional and national Korean American organizations. My background research draws upon the scholarly work of Angie Chung, Richard Kim, and others to demonstrate the genealogy of Korean homeland issues from the 20th century to present. My analysis of the oral histories reveal that immigration experience, memories of political strife in Korea, Korean cultural ties, sense of belonging to the Korean American community, and geopolitics inform the narrator's activism and blend together Korean Peninsula issues and U.S. immigration politics. Using theories from Asian American Studies, I argue that connection to Korean homeland issues have constituted Korean American identity formation and remain relevant throughout the generations. I will argue that American imperialism have heavily influenced what is considered "Korean proper" issues, thus Korean Americans and Koreans alike are directly connected to homeland politics through legacies of war. Ultimately, I demonstrate that contemporary Korean American activists are looking beyond the Korean American and Korean-specific binary paradigm, creating a transnational space that calls American imperialism into question.



Lori (Somin) Kim*Faculty Advisor: Robert A. Lamb***Mutagenesis of Paramyxovirus Hemagglutinin-Neuraminidase Membrane Proximal Stalk Region Influences Stability, Receptor Binding and Neuraminidase Activity**

Paramyxoviridae are enveloped, negative-sense, single-stranded RNA viruses that cause diseases in humans and animals. Common examples include: measles, mumps, respiratory syncytia virus, human metapneumovirus and parainfluenza virus 1-5. These paramyxoviruses gain entry into their host cells by fusing with the host cell plasma membrane. This fusion depends on the concerted action of two glycoproteins, which are the receptor binding or attachment protein (HN, H, or G) and the fusion protein (F). The HN activates F to refold after binding to host cell. The crystal structure of PIV5 HN reveals a tetrameric receptor binding head group attached to a four-helix bundle stalk. But the membrane proximal stalk region (MPSR) of HN is not well understood. To understand the structure and the biochemical function of MPSR, triple alanine mutagenesis and subsequent point mutations on the headless HN was performed. We were able to determine that the residues T41, Q42 and I45 play a role in fusion promotion. On the other hand, these mutations in full-length HN did not affect fusion promotion, but resulted in ~5-9 fold increase in receptor binding and neuraminidase activity. Oxidative cross-linking of cysteine point mutations in both headless and full-length HN suggests that the MPSR influences HN stability. Our data suggests that the receptor binding head serves to stabilize the 4HB stalk to regulate fusion. The data from this research enhances our understanding of the factors that influence attachment glycoprotein stability and biological functions as well as well novel strategies on how to inhibit Paramyxovirus virus entry.

**Katharine Krchnavy and Troy Xu***Faculty Advisor: Francesca Tataranni***Ancient Rome in Chicago**

Although the ancient Romans never made it to the new world, their legacy in Chicago is reflected in architecture, the visual arts, and sites devoted to recreation, education, politics, and business. This presentation discusses the results of the research we conducted on the reception of Roman culture in Chicago, the quintessential American city, as showcased in two of the city's most iconic buildings. The Palmer House stands as a beacon of Chicago's aristocratic, cultural history. The first hotel perished in the Chicago fire just weeks after its debut. However, like a phoenix from the ashes, it immediately was rebuilt. The new hotel rose to become Chicago's cultural icon, a domus aurea proving the city's worth as a Rome of the New World. Soldier Field is Chicago's Colosseum. Built to be "a vast forum of the people," the original incarnation of Soldier Field combined the Parthenon's Doric columns with the form and function of an amphitheater. The stadium was an anachronism, revived through a 2003 renovation. As it currently stands, Soldier Field is an amalgamation of Classical tradition and modern technology — an entirely Chicagoan monument. Both buildings are featured in a virtual architectural tour illustrating the many ways in which Chicago's ongoing dialogue with Roman antiquity has shaped the city's look, identity, and reputation. The ultimate goal of this project is to show how the study of

modernity's engagement with the classical past can enhance our understanding of how Western cultures think about themselves, their history, and their future.



Thomas Lee

Faculty Advisor: Karrie Snyder

Accepted Social Stigma: A Study and Comparison of the Social Stigmatization of Niche and Mainstream Hobbies

The sociological understanding of hobbies is not only a topic lacking in comprehensive research, but also one that contains serious implications regarding the stigmatization of less socially accepted hobbies. The goal of this research is to make clear what social forces manipulate social acceptance of certain hobbies more positively than other hobbies. Using a qualitative research approach, I examined various online hobby forums, conducted ethnographic observations at a Chicago game shop and at select floor hockey intramural games at Midwestern University, and directed 20 in-depth interviews of hobby enthusiasts. Although choices and perceptions of hobbies wildly vary, four social forces are the main controlling factors that dictate the current course of hobby stigmatization: masculine dominance complex, respect for tradition and maturity, perceived notions of social participation, and the desire to “fit in.” The more socially accepted hobbies share many of these controlling social forces with the less socially accepted hobbies, proving that many of the naturally agreed negative aspects of less socially accepted hobbies are misconceptions. The conclusion of this study should help expand knowledge and interest in an often-overlooked sociological topic that may lead to more research into social stigma.



Nicolas Leighton

Faculty Advisor: Rebecca Seligman

Blue Zone Projects: Neoliberal governance in public health and the construction of health in the United States

Dan Buettner, an explorer and author for National Geographic, set out in 2000 to better understand why the populations of five regions on the planet exhibit significantly longer average life expectancies, terming them “Blue Zones.” From Italy and Greece to Japan, Costa Rica, and California, Buettner circulated multiple publications about his experiences in the Blue Zones detailing “lessons for living longer from the people who’ve lived the longest” (Slatalla 2008). These lessons of longevity were condensed into the “Power 9,” which outlines changes in the lifestyle of an individual to live longer, healthier and happier lives. A “modern Ponce de León” (Buettner 2013), Buettner traveled the nation to instigate a health revolution in certain cities by applying the lessons of longevity derived Blue Zones to populations within the United States in order to create healthier environments, cities, and people (McDermott 2013). Blue Zone Projects started materializing in Albert Lea, Minnesota, Iowa cities, and finally in Beach Cities, California to optimize health in each community. Although the Blue Zone team is determined to revolutionize health in the United States, this paper argues that Blue Zone

campaign further perpetuates health inequality in the United States through the dismissal of the determinants of health in disadvantaged individuals. As a case study, I specifically focus on the Blue Zones Project in Beach Cities, California to explore the effectiveness of the Blue Zone Projects in a place with a majority of advantaged individuals. Furthermore, I argue that because of the uneven distribution of resources necessary for coping with chronic stress and poor health, Blue Zone solutions strengthen the socioeconomic divide between those who can access resources to live a Blue Zone lifestyle and their disadvantaged counterparts who are subjected to chronic environmental and social stressors of the United States.



Amanda Leung

Faculty Advisor: Tiffany Schmidt

Dependency of DAC development on Proper ipRGC development

The photoreceptors of the retina are involved in two types of vision: image-forming and non-image forming. While the more well-known photoreceptors, rods and cones, are involved with image-forming vision, another photoreceptor, intrinsically photosensitive retinal ganglion cells (ipRGCs), are involved with non-image forming vision that deals with photoentrainment and pupillary light reflex. ipRGCs co-stratify with dopaminergic amacrine cells (DACs) in the inner plexiform layer of the retina. DACs, as their name suggests, produce dopamine, which is important for high-resolution, light adapted vision. DACs respond to light input even in the absence of rods and cones, suggesting that the DACs are receiving that input from ipRGCs. The dopamine released from DACs is used to attenuate the ipRGC photocurrent. Just as DACs regulate ipRGCs, ipRGCs control DAC function through the process of retrograde signaling. Past studies have shown that when DAC morphology is disrupted, ipRGC morphology is abnormal, indicating that proper ipRGC development depends on proper DAC development. To determine DAC's dependency on ipRGC development, we used immunohistochemistry of retinal sections and confocal microscopy to visualize and analyze the morphology of DACs in mouse models where ipRGCs are manipulated. We did not find significant changes in morphology in DACs in tissue where ipRGCs are ablated, suggesting that ipRGCs are not involved in DAC development.



Jennifer Li

Faculty Advisor: Tiffany Schmidt

Intrinsically photosensitive retinal ganglion cells are a source of photic input in the intergeniculate leaflet

For decades, rods and cones were thought to be the only photoreceptors in the retina. However, recently discovered retinal ganglion cells (RGCs) expressing the photopigment melanopsin have been found to be intrinsically photosensitive (ipRGCs), allowing these cells to respond directly to light signals even in the absence of rods and cones. Light detection is important not only for image-forming vision but also for influencing non-image forming functions such as pupillary light reflex and circadian

photoentrainment. Photic information is relayed from ipRGCs in the retina to various regions of the brain. One of these regions is the suprachiasmatic nucleus (SCN), the body's biological clock, which synchronizes circadian rhythms with the environment. A secondary pathway by which the SCN receives photic entrainment cues is via neurons in the intergeniculate leaflet (IGL). Although studies have shown activation of IGL neurons following retinal illumination, the exact source of the IGL's photic input has not been previously identified. Using an optogenetic mouse model expressing the light-gated ion channel channelrhodopsin in melanopsin-expressing cells to activate ipRGCs specifically, we recorded from/labeled neurons in the IGL to determine synaptic connectivity and characterize neuromodulator content. Anatomically, we measured a significant decrease in the number of neurons in the IGL of mice with genetically ablated ipRGCs. Here, we confirmed that ipRGCs are the source of photic input to a diverse population of neurons in the IGL. Identifying the role of ipRGC input in the IGL can help us better understand how secondary inputs to the SCN can influence circadian rhythms.



Taran Lichtenberger

Faculty Advisor: Andrea Kramer

Impact of Functional Trait Diversity on Prairie Ecosystem Restoration

The diversity of species' functional traits plays a key role in restoring ecosystem services. Unfortunately, ecological research on functional traits and ecosystem services often uses a single trait value for each species, despite the fact that values for functional traits may vary widely within a species. We hypothesized that traits will vary significantly among populations of a single species and that functional trait variation within-species will be as great as between-species. We used four species with at least two broadly distributed populations from the Dixon Prairie Grass Seed Bank and germinated them. We planted the germinated seeds in cone-tainers in a growth chamber simulating daylight and temperatures of early summer in a Midwestern prairie. After 35 days of growth, I measured seven above- and below-ground traits. We found differences in functional trait values between populations for six traits, although all traits were variable across species. The significant population level differences mean that a single trait value does not represent the full variability for each species. The trait variation likely results in changes in ecosystem services. Practitioners shouldn't assume that mixing populations of the same species will result in identical outcomes. Seeds used in a restoration from geographically distant sources results in highly variable traits that may not be suited to the new site. Planners should be cautious when using a single trait value for one species, as population choice impacts the success of a restoration. Therefore, understanding functional traits makes for a more successful restoration.



Patrick Lim

Faculty Advisor: Eva Redei

Molecular Mechanisms Linking Depression and Dementia Through a Genetic Rat Model of Depression

As the population ages, age related diseases such as dementia including Alzheimer's Disease (AD) will have an increasingly significant burden on the sufferers, their family and the society. Dementia, specifically AD, has been found to be associated with depression. Mid-life depression is a risk factor for late-life dementia, but the mechanism(s) linking depression and dementia are not known. Both AD and depression show greater prevalence in women. To investigate the molecular mechanisms common to some forms of depression and dementia, a genetic rat model of depression was used. The Wistar-Kyoto (WKY) rat strain has been established as an animal model for adult and adolescent depression due to their behavioral, hormonal and sleep characteristics. Selective breeding of WKYs resulted in two inbred strains. The more immobile WKY (WMI) rats consistently display depression-like behavior in the forced swim test compared to the control less immobile (WLI) strain. Testing female rats of these strains in hippocampus dependent contextual fear conditioning found that young, 5-7 month old WLIs and WMIs did not differ in their memory functions. In contrast, the aged, 11-13 months old female WMIs showed cognitive deficit compared to their same age WLI controls. Hippocampal expression of genes known to be associated with dementia such as Presenelin-1, Presenelin-2, and Insulin-like growth receptor 2, parallel the differences in cognitive measures and could be used to identify depression-related cause(s) of memory loss. Understanding these underlying processes may lead to prevention and perhaps treatment of the specific form of dementia that is associated with depression.



Katherine Lin and Hyung-Soon Kim

Faculty Advisor: Haoqi Zhang

Habitsourcing: Sensing the Environment through Immersive, Habit-Building Experiences

We present habitsourcing, an approach to citizen science that leverages people's daily habit-building practices to collect data about the physical environment that they encounter while practicing a habit such as going for a run or taking a walk. Citizen science applications allow everyday citizens to collect environmental data to benefit science and society. Yet despite successes, current approaches are limited to domain-interested volunteers. These limits are especially problematic in niche domains, for which a large population of motivated people may not exist. An opportunity for habitsourcing exists in the millions of people who are interested in practicing habits outside. By inserting immersive, data-collecting interactions within existing habit-building experiences, we can extract useful environmental data. We present ZenWalk and Zombies Interactive, two proof-of-concept iOS applications. ZenWalk is a walking meditation app that helps users practice mindfulness and collects locations of trees. Zombies Interactive is a running app that motivates users through a zombie apocalypse storyline and collects city infrastructure data, including fire hydrant locations. In our first study, participants used two versions of the app, one with data-collecting interactions and one without, and rated each in terms of enjoyability and likeliness of future use. In the second study, we locally recruited participants

to use versions of our apps with only the data-collecting interactions, after which we performed data validation. Our results show that the interactive, data-collecting versions of our apps compare favorably to their non-data collecting counterparts, and that we can effectively extract environmental data using simple classification techniques.



William Lindstrom

Faculty Advisor: Stephen D. Miller

Characterization of the Effects of Granulocyte Macrophage Colony-Stimulating Factor on Oligodendrocyte Progenitor Cells

Multiple sclerosis (MS) is a common neurological disease characterized by inflammatory lesions throughout the central nervous system (CNS) due to the body's attack via T cells on the myelin sheaths that surround nerve cells. Oligodendrocyte progenitor cells (OPCs) are responsible for replacing the degraded myelin, but for reasons that are not completely understood appear to diminish in effectiveness over time in MS lesions. T cells present in the MS lesions create the inflammatory environment in part through signaling molecules called cytokines.³ Little is known about the direct effects of cytokines on OPCs, and through this study I hoped to determine the effect of the cytokine granulocyte macrophage colony-stimulating factor (GM-CSF) on OPC viability, proliferation and differentiation, all indicators of OPC health and function, and thus effective remyelination. Remyelination continues to be a much sought after therapeutic strategy for MS, and learning more about how OPCs respond to T cells present in MS lesions through specific cytokines is of critical importance in understanding how remyelination is regulated in MS. Initial results using immunohistochemistry found that increasing levels of GM-CSF decreased OPC proliferation and differentiation while also limiting OPC death, placing them in a quiescent state. Further studies were conducted using flow cytometry and qRT-PCR to observe the effects of GM-CSF at the protein and genetic levels, respectively, and initial results found an increase in Hspa5 gene expression, a stress protein, suggesting a possible stress response in the OPCs could contribute to this quiescent state.



Patrick Z. Liu

Faculty Advisors: Qinghua Sun and Gangjian Qin

Inhibition of in vivo oxidation of native low-density lipoprotein by N-acetylcysteine is associated with decreased atherosclerosis

Low-density lipoprotein (LDL) is not atherogenic itself. Oxidized LDL (ox-LDL) is a potent oxidative agent, produces reactive oxidative species (ROS), and critical to the development of atherosclerosis. N-acetylcysteine (NAC) has anti-atherosclerotic effect. The mechanisms for its anti-atherosclerotic actions remain largely unknown. Therefore, the present study aimed to determine if NAC could attenuate in vivo oxidation of LDL and inhibit atherosclerosis. To test this, a single dose of human native LDL (50 µg) was injected intravenously into male C57BL/6 mice with and without NAC treatment. Human ox-LDL levels in the blood were measured at different time after LDL injection

using ELISA kit. Measurable serum level of human ox-LDL was detected 30 min after the injection, reached the peak in 3 hours, started to decline afterwards, and became undetectable in 12 hours. NAC treatment significantly reduced serum ox-LDL level with no detectable ox-LDL in blood 6 hours after injection. No difference in ox-LDL clearance was observed in NAC-treated animals. Intracellular and extracellular ROS production was significantly increased in the animals treated with ox-LDL and in hyperlipidemic LDL receptor knockout (LDLR^{-/-}) mice that was completely prevented with NAC treatment. NAC also significantly reduced atherosclerotic plaque formation in hyperlipidemic LDLR^{-/-} mice. Overall, native LDL was converted to ox-LDL in vivo. NAC attenuated in vivo oxidation of LDL and ROS formation from ox-LDL, which may contribute to decreased atherosclerotic plaque formation in hyperlipidemia.



Norman S. Luu

Faculty Advisor: Mark C. Hersam

Graphene-Stabilized Cathodes for Lithium Ion Batteries

Lithium-ion batteries (LIB) are vital as sources of power for emerging technologies such as electric vehicles or next-generation consumer electronics. The first LIB, introduced by Sony in 1991, contained a LiCoO₂ cathode and a graphite anode. These materials are still the most commonly used in commercial batteries due to their relatively high capacity and power density. However, emerging technologies demand across-the-board improvements in battery performance. A promising solution is to use cathodes made from lithium manganese oxide (LiMn₂O₄, or LMO) or lithium nickel manganese cobalt oxide (NMC). These materials offer improvements in power density, safety, and cost, but suffer from capacity fading attributed to manganese dissolution from the cathode material into the electrolyte. Moreover, there is also a need to improve the rate capabilities of LMO and NMC, due to their inherently lower conductivities as compared to LiCoO₂. Integrating graphene could resolve these issues due to its excellent electrical conductivity and its favorable interaction with the oxide surface. This integration not only provides a conductive network to electrically connect individual particles together; it also acts as a diffusion barrier to Li ion diffusion and changes the oxidation state of manganese such that it is no longer soluble in the electrolyte. We have made this approach more scalable by integrating graphene flakes with LMO or NMC to make a composite cathode structure. These batteries show good capacity retention and rate capability compared to cells made with traditional conductive additives. Moreover, we believe this approach can be used as a broad strategy to stabilize other cathode and anode materials, opening the door for improvements to previously uninvestigated lithium transition metal oxides.



Colin Lynch

Faculty Advisor: Thomas Meade

A Gd(III) based magnetic resonance contrast agent for molecular imaging of hydrogen peroxide

Hydrogen peroxide (H₂O₂) has been implicated in inflammation, Alzheimer's disease, cancer, and during immune response signaling, yet there are few probes capable of H₂O₂ visualization in vivo, none of which utilize ¹H magnetic resonance (MR). An MR agent capable of H₂O₂ molecular imaging would provide crucial insight into the role of H₂O₂ in disease processes due to MR's superior spatiotemporal resolution compared to other imaging modalities and unlimited penetration depth. I present a boronic acid functionalized gadolinium-(III) based MR contrast agent which shows increased relaxivity and MR contrast in the presence of H₂O₂. The Gd(III) center of the agent is initially seven coordinate, and is unable to bind water due to carbonate binding, yielding zero bound waters ($q=0$). In the presence of H₂O₂, oxidation of the boronic acid yields an eight-coordinate complex that binds water ($q=1$), increasing the relaxivity of the agent. This q -modulation was observed by phosphorescence luminescence. In phosphate-buffered saline, the agent showed an 81% increase in relaxivity when treated with 10 equivalents of hydrogen peroxide and was readily taken up by cells. In a 7 T MRI system, the difference in relaxivity was detectable with an appreciable increase in contrast. These *in vitro* results show promise for the success in vivo. Additionally, the modular nature of this self-immolative, q -modulating MR agent allows for incorporation of a wide variety of bioresponsive moieties, vastly increasing the possibility for molecular imaging with Gd(III) based MR contrast agents.



Katherine Martini and Bridgett Riverol

Faculty Advisor: Megan Roberts

The Impact of Media Exposure on Typically Developing Children's Language Skills

Children's time spent with media is an important variable that has been associated with positive and negative outcomes. Historically, researchers relied on video-taped observational data to validate parent report survey data of children's television use. As the media environment of children's homes has exploded with new devices, measuring children's media use with parent report survey data has become increasingly complicated and likely inaccurate. With developments in technology for children have come new technologies for measuring media use. The LENA Pro System is a recording technology that allows researchers to collect and analyze auditory data as well as a coding software that can organize and find specific audio segments. This study tests the impact of media exposure as measured by the LENA software on child receptive language development. Longitudinal data from 66 toddlers were analyzed using longitudinal multilevel modeling. Results showed that media exposure was positively associated with children's receptive language early in development, but that this relationship weakened over time. One key limitation of LENA software is that it selects only one code for any given audio segment. This may limit the validity of LENA-coded media exposure, and especially any relations to other LENA-coded variables, such as adult word count. We have developed an alternative way to code media exposure from LENA data which bypasses the problems of assigning

a single code for one audio segment. We will then code the content of children's media exposure and analyze what features might mediate the impact of media exposure on children's language.



Ralph J. Martins and Syeda Shageea Naqvi

Faculty Advisor: Justin Martin

Desire for Cultural Preservation and Support for Censorship as Predictors of Conservative/Progressive Self-perceptions in Six Arab Countries

This study examines predictors of self-reported cultural conservatism and progressivism among nationals in six Arab countries (n=4,529). Central research question: Are desire for cultural preservation and support for censorship predictors of identification as conservative or progressive by nationals in Arab countries? Research on liberal-conservative traits is often Western-centric, focused on indicators like religiosity and economic characteristics. Few studies examine correlates of conservative/progressive self-perceptions in Arab countries. "Conservative" and "progressive" mean different things in different places: "Liberal" in Europe often indicates support for unregulated financial markets, a position associated with conservatism in the U.S. This study examines what the terms "conservative" and "progressive" mean to Arab nationals. We use multiple logistic regression modeling—with separate models for each country—to examine predictors of conservative/progressive self-identification. This study is a secondary analysis of data from Northwestern University in Qatar's Media Use in the Middle East, 2016 survey of more than 4,500 citizens in Egypt, Lebanon, Qatar, Tunisia, Saudi Arabia, and UAE. NU-Q researchers only recently made the data, collection of which concluded in February, available for secondary examination, so results of the current study are forthcoming. Respondents were asked "Compared to most people in your country, how would you describe yourself?", and answered "Culturally very conservative," "Culturally conservative," "Neither," "Culturally progressive/not conservative," or "Culturally very progressive/not conservative." Authors recoded the variable as binary, excluding "neither" responses. Four blocks of variables are incorporated as predictors: 1) Variables assessing desire for cultural preservation; 2) Support for government censorship of entertainment media; 3) Media use variables, including social media activity; 4) Demographic variables like age, gender, education, and income, but also frequency of attending religious observances and having children in one's household.



Fortunato Medrano

Faculty Advisor: Mesmin Destin

Effects Reframing STEM Fields and SES on Belonging, Achievement, and Engagement

While the socio-economic status (SES) achievement gap (low-SES students tend to attain and achieve less than their peers) is well documented in education (Sirin, 2005), what is less understood, and thus what current research focuses on, are the underlying mechanisms of this gap (Destin, 2013; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012). My project aims to better understand the underlying mechanisms of achievement and motivation of low-SES students by re-framing outlooks on STEM

(science, technology, engineering, and mathematics) fields in order to foster a sense of greater belonging and identity congruence. The SES achievement gap of college students may be result of an institutional-level mismatch of interdependent versus independent outlooks; low-SES students tend to have an interdependent outlook (e.g. one is at college to help their family and community) which mismatches with collegiate institutions' promotion of an independent outlook (e.g. one is at college to be the best that they can be). This mismatch is also reflected specifically in STEM, where independent outlooks and motivations dominate initially. Using a novel outlook manipulation in which interdependent and pro-social aspects of STEM are emphasized, we aim to create a sense of identity match between STEM and low-SES students. Our study consists of an experimental two-wave survey design in which STEM students are presented with one of an independent or interdependent outlook manipulation followed by measure of belonging, beliefs, and engagement with STEM. Results will indicate the influence of outlook intervention on students' motivations and connection to the STEM fields.



Lindsey Mehl

Faculty Advisor: Ronen Sumagin

Membrane derived microparticles released by tissue infiltrating PMNs serve as a novel mechanism for PMN-induced and myeloperoxidase-mediated epithelial injury

Acute inflammation perpetuated by tissue infiltrating neutrophils (PMNs) is a hallmark of inflammation-driven disorders, such as Inflammatory Bowel Diseases. While PMN recruitment is critical for host defense, dysregulated PMN accumulation causes tissue injury. PMN-induced tissue injury is often associated with the release of intracellular granules containing active soluble mediators, including myeloperoxidase (MPO). MPO, which is abundantly expressed by PMNs can generate cytotoxic oxidants, which are effectively used to kill phagocytized bacteria; however, when released into tissues, they can cause tissue damage. We found that specific PMN activation with actin cytoskeleton disrupting agent, Latrunculin B (1 μ M) followed by formyl-methionyl-leucyl-phenylalanine (fMLF, 5 μ M) resulted in MPO secretion by PMNs and reduced total MPO levels, as measured by flow cytometry. PMN adhesion to epithelial cells induced by fMLF (100nM) activation was also sufficient to induce MPO release by PMNs. Intriguingly, MPO was found to be secreted in a soluble form, as well as associated with membrane-derived microparticles (MPs). MP-associated MPO was confirmed to exhibit high levels of enzymatic activity. Incubation of scratch-wounded epithelial cell monolayers with freshly isolated PMNs, PMN-derived MPs carrying active MPO, and recombinant MPO with hydrogen peroxide (an MPO substrate) significantly inhibited epithelial wound healing. These effects were MPO specific and were reversed with MPO inhibitor. The MPO-dependent inhibition of wound closure was found to result from impaired epithelial cell spreading and lamellipodia formation, both critical components of cellular migration. Thus, these findings provide new insights into PMN-induced tissue damage and may be used to improve therapeutic inflammation resolution.



Seo Young Myaeng

Faculty Advisor: Douglas Medin

An Analysis on the Effect of Cultural Primes on International Asian and Asian American College Students' Job Attribute Preferences

Job attribute preference is the desire for specific job qualities, which affect people's job selection, work values, and job satisfaction levels. Past research found that demographic qualities affect people's job attribute preference, but they failed to study these effects on international Asian students. This gap implies a lack of understanding on Asian students' job attribute preference even when they are a significant part of the US college system with their increased volumes and high academic achievements. Past cultural priming studies also show that cultural contextual cues affect people's values, but no studies found their effects on job attribute preference. Thus, the current study investigated the impact of cultural primes on job attribute preference of Asian and Asian American students of Chinese and Korean ethnicity. The studies primed 203 Chinese, Korean, Chinese American, and Korean American Northwestern University students with either Asian or US primes and measured their job attribute preferences. The results show that cultural primes do not have significant effect on job attribute preference of international Asian students. Possible explanations may be that international Asian students' racial and ethnic identities are stable and unaffected by primes, and that job attribute preference are not easily influenced by cultural cues.



Joseph Palasz

Faculty Advisor: Samuel Stupp

Stabilization of perovskite solar cells using a polymer blended electron transport layer

Perovskite solar cells are an incredibly promising field of energy and materials research which provide an extremely cheap alternative to silicone solar cells. The most common methods of making these solar cells utilize a gold contact to complete the electrical circuit of the solar cell. However since the appeal of these type of solar cells is their cheap cost, it would be ideal to use a cheaper material for the top contact, such as aluminum. The issue with is that aluminum, and other metals, react with the light absorbing perovskite layer. Between the light absorbing layer and the metallic contact there is a very thin layer containing a semiconducting organic small molecule, called the electron transport layer (ETL). We have discovered that the addition of a small amount of polymer into this top layer allows for the layer to be simultaneously thin, and uniform enough that it prevents the reaction between the aluminum and perovskite, allowing for functioning perovskite solar devices in ambient atmosphere, which relatively reasonable stability. This discovery allows us to produce perovskite solar cells using cheaper materials in the laboratory, and also could act as a valuable step towards making perovskites a commercial viability.



Connie Panton

Faculty Advisor: Rebecca Seligman

Fitting into Beautiful Bodies: Ethnographic Examination of Mexican-American Young Adult Cultural Norms and the U.S. Obesity Epidemic

Obesity has been named the largest and fastest growing public health “epidemic” in the United States. Key to defining obesity as an epidemic in this way has been its framing as a disease of certain marginalized populations, including Mexican-Americans. In this way, the Mexican-American cultural practices have come under increasing attack in the U.S. conversation surrounding obesity. While countless public health studies focusing on prevention and treatment of obesity exist, fewer studies have examined the lived experiences of this group’s culture as related to the epidemic. Furthermore, studies have focused largely on mothers and children, groups that are seen as particularly important in the management of obesity. This study brings Mexican-American young adults, between the phases of childhood and parenthood, into the conversation surrounding the culture-obesity interaction. It utilized open-ended interview questions to examine perceptions around the culture-obesity interaction in both the media, and their lived experiences. Results found that even while faced with questions directed at cultural norms, these young adults consistently brought the question of obesity back to larger systemic issues of control as low-income in the U.S. Mexican-American family gatherings were perceived as critically linked to health, but were largely as preventing obesity rather than contributing to it, as in media. Furthermore, while they felt that most media presentations of Mexican-American culture and obesity were inaccurate, many participants mentioned nonetheless a commitment to staying healthy in their families because of these very presentations. Bringing the lived experiences of young adults into the conversation around Mexican-American obesity has important implications for our understanding of defining this marginalized group as diseased in our country.



Eugene Park

Faculty Advisor: Noshir Contractor

An Agent-Based Model of Task Switching in Astronaut Teams

As human beings explore space beyond the International Space Station and towards near-Earth asteroids and Mars, the error-sensitivity of the operating environment within which astronauts will work poses significant challenges. Much research has been done on how individual performance changes upon switching from one task to another, but how these works can be applied specifically in the context of astronaut teams is yet to be seen. Based on the previous body of psychology literature on task switching, we design an agent-based model (ABM) that describes the dynamics of multiple autonomous individuals working within a system of groups with different compositions. These agents switch between different tasks as they perform their work, and make decisions on how to allocate effort in the pursuit of individual, team, and system-level goals in a multi-team system. The resulting model can be used to identify conditions where astronauts engaging in task-switching behavior can produce large performance costs to themselves and others, which allows us to explore potential mitigating factors to reduce the risk of mission failures due to performance decrements possible in NASA space exploration teams.

Marie Peebles

Faculty Advisor: Kate Masur

Women of Ill Fame: Public Morality and Legalized Prostitution in Civil War Tennessee

Between 1863 and 1865, the Union armies occupying Nashville and Memphis implemented systems of legalized, licensed prostitution in order to deter the spread of venereal disease. Although contemporary sources attest to their overwhelming success, these early experiments in legalized prostitution ceased concurrently with the Civil War in 1865. My project seeks to determine why these systems disappeared so suddenly at the end of the war despite their highly successful results. Building on the scarce and largely anecdotal scholarship surrounding this topic, I attempt to draw larger conclusions regarding the role of public morality in the brief but effective legalization of prostitution by examining the spectrum of opinions expressed in contemporary reports, letters, memoirs, and newspapers. These sources reveal a sense of public morality that, while able to acknowledge not only the enormous presence of prostitution in the cities but also the effectiveness of the licensing systems in addressing it, simultaneously demanded the moral condemnation of prostitution as an institution. I argue that, despite sustaining the licensing systems by balancing them with harsh moral judgments of prostitution itself, public morality ultimately thwarted the legalization of prostitution by rendering it irreconcilable with contemporary notions of sexual decency. The transition from military to civil authority at the end of the Civil War thus provided Nashville and Memphis with the opportunity to abandon the uncomfortable paradox of concurrently condemning and condoning prostitution, allowing both cities to fall on the side of moral condemnation.



Paul Perkovich

Faculty Advisor: Milan Mrksich

Design of a Microfluidic Surface-Based Bioreactor

Biochemical catalysis has been explored as a potential sustainable alternative to energy intensive and often wasteful industrial processes. However, present day technologies that attempt to utilize biocatalysis within cells are limited by physiological conditions that incur high recovery costs and yield low productivities. Cell-free bio-manufacturing could provide the level of control over biocatalytic systems necessary to achieve yields previously unattainable in vivo, but the resources and time required to determine optimal reaction conditions for enzyme activity can impede the development and implementation of useful cell-free systems. We present a surface-based dual enzyme system that takes advantage of microfluidics to achieve the precise control necessary for the efficient and rapid screening of reaction conditions while also reducing waste. The key component of our system is the utilization of fusion enzymes that retain their catalytic function and selectivity while immobilized on a gold-coated surface. Furthermore, by using 3D printing to create molds for the polydimethylsiloxane (PDMS) channels we are able to rapidly prototype various channel designs. These technologies combine to allow for the easy study of many parameters such as reactant concentration, residence time, and flow rate in order to efficiently identify optimal conditions for substrate conversion. In proof-of-concept experiments, we determined the appropriate binding conditions for the enzyme,

finalized the channel production process, and conducted preliminary surface reaction experiments. Our investigations have applications in industrial manufacturing, disease pathology, and drug design in addition to promoting the understanding of microfluidic systems and cell-free bioengineering processes.



Katie Rim

Faculty Advisor: Claudia Haase

Anxiety Symptoms and Autonomic Functioning in Response to Happy and Sad Film Clips

Emotional dysfunction is a core aspect of many forms of psychopathology, including anxiety. Links have been suggested between anxiety and autonomic dysregulation in particular; however, surprisingly few studies have examined anxiety and autonomic reactivity in response to happy and sad rather than fearful stimuli. The present study examined the relationship between anxiety symptoms and (a) heart rate at baseline and (b) heart rate reactivity in response to happy and sad film clips in a sample ($N = 41$) of healthy adults. Anxiety symptoms were measured using the Beck Anxiety Inventory ($\alpha = .93$). Participants watched two film clips, (a) a happy film clip depicting figure skater Sarah Hughes winning the 2002 Olympics gold medal and (b) a sad film clip depicting a woman learning of the death of her husband and two daughters, while their heart rate before (i.e., baseline) and in response to (i.e., reactivity) the film clips was measured using Mindware software. Results showed that greater anxiety symptoms predicted greater baseline heart rates before both the happy film clip ($b = .39$, $p < .05$) and the sad film clip ($b = .33$, $p < .05$). In contrast, when controlling for baseline heart rates, anxiety symptoms did not significantly predict heart rate reactivity in response to both the happy and the sad film clip. These results support accounts of chronic autonomic overactivation in anxiety and raise the possibility that impairments in autonomic reactivity in anxiety may be specific to some emotions but are not found for happy and sad emotional states.



Michaela Ritz

Faculty Advisor: Beverly Wright

Relationship between the consolidation phase and a refractory period in perceptual learning

Individuals can improve their performance on perceptual tasks with training, a process known as perceptual learning. Training on auditory tasks can benefit individuals with normal abilities seeking to improve their auditory processing skills, and can be especially valuable for those with auditory pathologies, such as hearing loss. However, previous studies have shown that additional training is useful only when presented a considerable time after initial training. This phenomenon suggests that a refractory period exists following initial learning, during which additional training does not improve perceptual ability. This project examines whether this refractory period arises from consolidation of initial learning from short term to long term memory. Participants with normal hearing were trained on an auditory task (Interaural Level Difference discrimination) in three bouts, wherein the second bout was presented at a variable time after the first, and their performance was assessed in a

behavioural paradigm. Significant improvement on the task was taken as evidence that learning from the previous training had been consolidated to long term memory. Participants demonstrating consolidation in the second training session showed more next-day improvement than those who did not, suggesting that this refractory period follows the same timecourse as consolidation, and that additional acquisition can only occur once previously trained information has been consolidated. Understanding the mechanisms underlying perceptual learning could lead to the development of more time-and-cost effective training programs for both healthy and impaired populations, increasing compliance with rehabilitative training and allowing individuals to improve their skills more efficiently.



Kara Rodby

Faculty Advisor: Jean-Francois Gaillard

Mercury Biouptake in Aquatic Systems

Mercury is released in dangerous amounts during our extensive burning of fossil fuels. In water, microbes convert mercury to methylmercury that bioaccumulates in the fatty tissue of fish and biomagnifies in aquatic food webs. Human exposure from methylmercury occurs due to fish consumption, and can lead to detrimental health effects. Bacteria are only able to convert mercury to the neurotoxic methylmercury after mercury's internalization into the cytoplasm. Thus, it is crucial to study the processes by which mercury is transferred across the cell's membranes. The focus of my research is the mechanisms of mercury transport across *E. coli*'s outer membrane. It is widely believed that mercury crosses the outer membrane via passive transport, meaning the mercury simply diffuses through small pores in the membrane. This premise hypothesizes that whole cells should not be able to internalize mercury bound to bulky ligands due to a size exclusion effect occurring in the outer membrane pores. Likewise, spheroplasts – cells with the outer membrane removed – should see no effect on the uptake of mercury bound to bulky ligands. Using bioassay techniques and genetically modified *E. coli* cells that detect intracellular mercury, I compared mercury biouptake in whole cells and spheroplasts. My findings contradicted my hypotheses: both the spheroplasts and whole cells internalized the same amount of mercury that was initially bound to bulky ligands outside the cell. This implies the existence of additional barriers to mercury biouptake other than the outer membrane and that the outer membrane may have little effect on mercury uptake.



Ethan Rucinski

Faculty Advisor: Daniel Abrams

Handedness and a Competitive Selection Model

Tracking evolutionary dynamics in nature is a daunting task, as even the smallest changes take generations to occur. Developing selection models for sports often gives an insight into how permanent or selected traits yield advantages or disadvantages in competitive or cooperative contexts. People who are left-handed make up about 10% of the human population as far back as history will allow us to see. In many competitive sports, however, left-handed players are dramatically over-

represented in top ranks. This is due to a bias in selection, where minorities have a “surprise” advantage. In tennis, there is both a minority advantage (due to this surprise factor), as well as a majority advantage due to slightly more points being played on one side of the court, where left-handed people have a disadvantage. Through gathering and analyzing data from the Association of Tennis Professionals, we are seeking to quantitatively test our theory for the effects of left-handedness in this artificial context. We compare our prediction to a dataset of over four decades of tennis, and find preliminary support for the model. We hope to be able to not only help tennis players understand their own weaknesses, but also to explain why about 10% of the human population is left-handed.



Rachael Sarette

Faculty Advisor: Stuart Wagenius

Flowering Schedule of Single Headed Plants Versus Multi-Headed Plants

The unimodal flowering schedule of *Echinacea angustifolia* can be modelled using an exponential sine function where function parameters act as proxies for relevant phenological features such as start date, duration, intensity, skewness and length of the tails. These characteristics impact the reproductive success of *Echinacea*, but it is not known how these characteristics vary between heads on *Echinacea* plants with one head and multiple heads. Therefore, we tracked the daily flowering phenology of heads from *Echinacea* plants with a varying number of heads in an experimental plot with randomized planting location. Then, we fit exponential sine functions to the data and analyzed the variance in the function parameters using a bootstrap resampling technique. Preliminary results indicate no difference in the flowering phenology between heads on plants with one head and multiple heads.



Nishant Subramani

Faculty Advisor: Peter Civetta

A Method to Transform a Partial Ancestral Graph to a Markov Equivalent Set of Acyclic Directed Mixed Graphs

Many different graphs can be learned from data and different types of graphs as well as different structures of graphs of the same type can describe the same relationships between the same set of random variables. There are well-described methods to learn graphs such as directed acyclic graphs (DAGs) and partial ancestral graphs (PAGs) (Spirtes et al., 1993). On the other hand, there are no well-documented methods to learn acyclic directed mixed graphs from data, so methods to transform a model that can be learned from data into a set of acyclic directed mixed graphs is valuable. In this work, a provably correct method for converting the structure of any PAG P into the list of ADMGs A that describe the same dependencies and independencies between the same set of random variables provided in P given no selection variables.



Jordan Todes

Faculty Advisors: KC Anderson, Quentin Dudley, and Michael Jewett

Preferential Preservation of Biomarkers in Carbonate Concretions: A Case Study from the Holz Shale

Concretions are isolated, often ellipsoidal mineral masses precipitated during the early lithification of some sediments. Because carbonate concretions form early in the process of marine diagenesis, they have the potential to preserve biomarkers related to their depositional paleo-environment and the processes of concretion formation. To investigate this hypothesis, samples from carbonate concretions and their surrounding bedrock were taken from the Holz Shale, a late Cretaceous shale succession in Southern California. Organic matter was extracted, separated via silica gel columns, and analyzed via gas chromatography/mass spectrometry. Despite high organic carbon content, extractable organic matter yields were low; only 10 of 29 samples produced usable qualitative data. The richest concretion interior preserved a prominently bimodal alkane distribution with no even/odd preference, indicating high thermal maturity and the incorporation of organic residue from both planktonic sources and vascular plants. The presence of 7-methyl pentadecane in 3 of 4 concretion samples supports the existence of sulfate-reducing bacteria in the concretions. In addition, low concentrations of short chain n-fatty acids with a marked even over odd distribution were observed both within concretions and the host rock, suggesting that immature organic matter was present on or within the samples. Intriguingly, intact porphyrin ring structures were preserved in both the concretions and host rock. Porphyrins found within the concretion have undergone limited aromatization; by contrast, those outside of the concretion are heavily aromatized. These findings illustrate that carbonate concretions may, under certain depositional circumstances, preferentially preserve organic compounds relative to the host rock.



Eleni Varelas

Faculty Advisor: Carly Oboudiyat

Cerebrospinal Fluid Biomarkers for Detecting Non-Amnesic Presentations of Alzheimer's Disease

Objective: Cerebrospinal fluid (CSF) for phosphorylated-tau (p-tau) and beta amyloid is increasingly used to identify underlying Alzheimer Pathology in patients with cognitive impairment, and a profile has been described for amnesic patients. However in non-amnesic clinical presentations, very few studies have confirmed the accuracy of CSF to identify AD pathology upon autopsy. Here we evaluate the performance of clinically obtained CSF p-tau and beta amyloid to predict Alzheimer pathology in patients presenting with the clinical syndromes of Primary Progressive Aphasia (PPA), Frontotemporal Dementia (FTD), and Progressive Supranuclear Palsy (PSP) with autopsy confirmed pathology. Methods: We performed a review of 161 patients who came to autopsy in the Neuropathology Core of the Northwestern University Alzheimer's Disease Center with non-amnesic clinical presentations for CSF results, and found 19 cases with clinically obtained CSF analyzed for p-tau and beta amyloid. All CSF results were analyzed using Athena Diagnostics ELISA assay. Results: All patients with values in the clinically accepted Alzheimer range had Alzheimer Disease confirmed

at autopsy, and all patients with values in the ranges of not-consistent with AD in fact did not have AD pathology at autopsy. Conclusions: CSF biomarkers of beta amyloid, and p-tau can reliably identify Alzheimer pathology in non-amnestic presentations of dementia in this autopsy confirmed sample, and may be useful for allocation of these patients into clinical trials. The options for treatments and clinical trial enrollment in this population of patients may be significantly expanded by using biomarker data.



Angela Walwema

Faculty Advisor: Stuart Wagenius

How Extreme Site Locations Affect Fitness in *Echinacea angustifolia*

Seed set and fecundity of prairie species like *E. angustifolia*, narrow-leaved purple coneflower, depend on the spatial location and the phenology of the plant. Generally speaking, we expect seed set to be higher when populations are in large areas and plants are in dense clusters. This is because a larger area can support more species, increasing species richness and thus increasing the community's general fitness. Larger population sizes many also attract more pollinators. Plants that flower at certain times and for a certain length of time also tend to have a higher chance of being pollinated. But, these trends do not mean that smaller populations are bound to wither out. It doesn't mean that individual plants that don't flower at the most optimal time will not get pollinated. Additionally, extreme plants are defined as those who are isolated from potential mates both spatially and temporally. In this experiment, I looked at plants located from a variety of sites that form a population gradient as well as plants at extreme phenological and spatial locations in order to see how dependent the fitness of *angustifolia* is on these factors. Preliminary results indicate that flowering effort varies substantially among plants. I will present results based on seed set, which I have not assessed yet.



Renee Wellman

Faculty Advisor: Doug Medin

Religion and Valuing Outdoor Environments

Individuals and cultures use a variety of stories and belief systems, like religion, to help understand the world and their roles within it. Similarly, people view environmental issues from diverse viewpoints and are motivated by different social, scientific, and moral reasons. Scholarly works in the humanities have discussed the relationship religion and behavior toward the environment, while other psychological research has demonstrated that certain viewpoints correspond with environmentally friendly behavior. This research seeks to supplement the limited social science research addressing both religion and environmentalism. In this priming study, 115 Northwestern students were asked to complete an open ended survey about the reasons they value different aspects of Northwestern's outdoor environment. Participants were also given an opportunity to act on their values by volunteering at a bird sanctuary before answering questions about their personal religious practices and what their belief system says about environmental issues. Participants with higher religiosity scores were more likely to be influenced by the religious prime and express higher pro-environment values

than students with lower religiosity scores. Additionally, students with higher pro-environment scores were more likely to be interested in learning more or volunteering at the bird sanctuary. Those same students also justified their attitudes about Northwestern's outdoor environment with biocentric and ecocentric values more than participants with lower pro-environment scores. Understanding how people value the environment and the factors that shape those values can inform future attempts to motivate people to protect the environment.



Bailey Williams

Faculty Advisor: Jillana Enteen

CNN's Online Depictions of Women and ISIS: A Close Analysis in the Wake of the 2015 Paris Attacks

As a Gender & Sexuality Studies and Video/Broadcast Journalism double major, I wanted to study a phenomena involving gender, sexuality, ethnicity, religion, terrorism, the internet, and media coverage. I wanted to blend my two majors in a way that offered something to each. I eventually found the perfect subject--a CNN webpage detailing who were the women of the terrorist group ISIS. Upon close-reading of the webpage alongside scholarly articles, I soon realized some grandiose problems. Instead of analyzing all of the webpage, I focused on a video prominently displayed on the webpage. I analyze this video through a filmic, video journalism lens, pulling out the nondiegetic music, voiceover, banner, and shots. I read these elements against scholarly literature from gender & sexuality studies, Islamic studies, and sociology. Through my close analysis, I found that although CNN worked to produce a coherent narrative, the video's narrative is ultimately rendered incohesive. The video's discrepancies produced an account with unproven danger, naivety, and conflation of Islam and ISIS that then work to promote off-screen violence. My research was situated right after the November 13th Paris attacks. The parallels between 9/11 and the Paris attacks led me to look closely at the hate crimes committed against those perceived and actualized as Muslim in relation to media portrayals. I ultimately concluded that online media portrayals of gendered, ethnic, and religious subjects deserve more attention, calling for better journalism and consideration of off-screen violence resulting from misconstrued media portrayals on terrorist subjects linked to Islam.



Deborah Wu and Katherine Bae

Faculty Advisor: Claudia M. Haase

Emotional Coherence between Facial Expressions and Heart Rate is Associated with Well-Being

Affective science has long been interested in the coherence between different emotion response systems (e.g., subjective emotional experience, behavior, physiology). Although evolutionary-functional accounts of emotion hold that emotional coherence should be related to greater adaptation, few studies have analyzed links between emotional coherence and well-being. Thus, in this laboratory-based study, we examined the link between emotional coherence (specifically the coherence

between behavior and physiology) and dispositional well-being in a sample of 41 adults (22 females). During the study, participants' heart rate (physiology) and facial expressions (behavior) were collected while watching a sad film clip where a woman discovers that her family has been killed in a car accident. Sad facial expressions were objectively coded using Emotion Expressive Behavior coding on a second-by-second basis, while heart rate was calculated based on R-R intervals and converted into second-by-second data. Dispositional well-being was measured using the Positive and Negative Affect Schedule and the Big Five Inventory. Participants' heart rate tended to decrease while they watched the sad film clip; thus, emotional coherence was indicated by a negative link between sad facial expressions and heart rate. Statistical analyses revealed that greater emotional coherence was associated with lower negative affect, lower neuroticism, and greater extraversion. Follow-up analyses showed that emotional coherence was not significantly associated with gender. In sum, our findings show that greater emotional coherence between facial expressions and heart rate in response to a sad film is associated with greater dispositional well-being, supporting a central tenet of evolutionary-functionalist accounts of emotion.



Anne Xie

Faculty Advisor: Noshir Contractor

Development of Social Relationships in Massively Multiplayer Online Role-Playing Games

Teams are an integral part of the online world of Massively Multiplayer Online Role Playing Games (MMORPGs). In these games, millions of players role-play as virtual characters with specific "classes" (e.g. magician, warrior, priest, thief). Players explore a virtual world complete with monsters, computer-generated characters, and other characters controlled in real-time by people playing the game worldwide. The strong social component built into these games adds a layer of complexity to the experience. Collaboration provides the quickest path to success; in-game mechanisms such as combat teams and guilds support this notion. Teams are primarily self-managed and often begin as loose, temporary affiliations. Over time, successful players form stronger relationships with peers and form close-knit organizations that tackle complex challenges together. In this study, I explore player-to-player relationships of players who were originally strangers before meeting each other in Sony's popular EverQuest II game. Using unobtrusively collected server-side game log data, I conducted a logistic regression which outputs the probability of any two players to be in an immediate circle of in-game friends who demonstrate at least two instances of synchronized co-play. Synchronous activity (e.g. similar login times) provides evidence of coordination outside of the game - which in turn hints at a strong social relationship. [Results are pending, as analysis has not yet finished.] By tracking the nature of how initial strangers form social relationships in EverQuest II, I hope to bring some insight on how to facilitate this bond-strengthening process in the real world where teamwork often starts out with acquaintances working together.



Jeong Yun (John) Yang

Faculty Advisor: Thomas V. O'Halloran

Novel Microtubule-Binding Anti-Cancer Compound Induces Apoptosis of U87 Glioblastoma Multiforme via Hyperploidy and Cell Cycle Arrest

Microtubules are dynamic proteins that have many key roles, such as in cell trafficking, migration, and shape. Most importantly, microtubules are essential in mitosis as they make up mitotic spindles that divide the chromosomes and allow the cell to pass through the cell cycle check points. Thus, microtubules are important therapeutic targets in cancer cells. Microtubule-binding drugs, such as Doxil and taxane-family drugs, have shown clinical successes in solid tumors; however, glioblastoma multiforme (GBM) remains as the most common and detrimental in central nervous system tumors. Side-effects and resistances to frontline treatments of GBM demand a design and development of drugs with bioavailability while maintaining effective therapeutic index. Piperazine-derived drugs have shown promising anti-tumor effect in animal models. However, its potential is limited due to toxicity. In this study, we introduce a promising antitumor drug candidate called nanobin. This nano-liposomal drug is an attenuated form of a piperazine-derived parent drug and it retains its potent antitumor activity after liposomal encapsulation. We showed that the parent drug and nanobin induce cell cycle arrest at G2/M and hyperploidy. After an in vitro study of the effect of parent drug and nanobin on tubulin polymerization, the result established the parent drug and nanobin as microtubule destabilizers that have a differing mechanism of inhibition compared to colchicine. Our future studies include Annexin V assay, BrdU cell proliferation assay, and drug binding studies to deepen our understanding of the mechanism of nanobin action.



Ryan Yi

Faculty Advisor: Lynne Kiesling

Economic Implications of Blockchain Technology for Retail Electricity Markets

History has repeatedly shown that technological developments with distributive properties, such as the Internet and telecommunications, have had massive implications for businesses and their cost structures. One recent distributive innovation is blockchain, which is the underpinning technology for the much publicized cryptocurrency Bitcoin. Dubbed “the Internet for Transactions,” blockchain is particularly interesting given its capability of minimizing transaction cost and its disintermediary forces. This paper applies an economic lens to explore blockchain’s disintermediary forces in relation to Coase’s theory of transaction costs, ultimately arguing that this technology can change traditional businesses models and introduce new business structures. While there has been much discussion of blockchain and its effect on the financial services industry, our argument deep dives into the retail electricity industry, which has been relatively stale for the past 30 years and is positioned to face massive disruption. We argue that blockchain can serve as a tool with real economic value proposition in the retail electricity space, paving the way for new business models, reshaping current electricity markets, and enabling new market designs in underdeveloped electricity economies.

Kelly Yom

Faculty Advisor: Alan Hauser

Distribution of ExoU- and ExoS- Secreting Strains of *Pseudomonas aeruginosa* in the Environment

Pseudomonas aeruginosa is a robust bacterium that is found ubiquitously in the environment. It is also a common pathogen that is able to cause severe disease in immunocompromised patients. A large part of *P. aeruginosa*'s pathogenicity is due to its type III secretion system, which it uses to inject effector proteins into host cells. These effector proteins are of clinical relevance because the types of effectors secreted during infection can change the severity and characteristics of the infection. Interestingly, two of the effector protein genes – Exo U and ExoS – are almost always mutually exclusive, and both are rarely found in the same strain. The reason for this dichotomy is unknown, and the distribution of ExoS vs. ExoU secreting strains in the environment is poorly characterized. A catalogue of *P. aeruginosa* strains (n = 26) was collected from a variety of environmental sources (water, soil, plant, substrate) in the Chicagoland area. Using whole-genome sequencing, the effector genes present in each strain were identified. Among these strains, ExoU-secreting strains were found exclusively in man-made environments, while ExoS-secreting strains were found in more natural environments. These results suggest that differing selective pressures exist between environmental niches that encourages *P. aeruginosa* to harbor different combinations of effector protein genes, creating genotypic groupings.



Gordon Younkin

Faculty Advisor: Stuart Wagenius

Modeling the Effect of Prairie Fires on Reproductive Success of the Purple Coneflower

Prairie fires have traditionally been understood to shape prairie communities by exerting selective pressures, but changes in flowering patterns caused by fires may have large impacts on year-to-year reproductive success of prairie plants. This observational study examines the reproductive success of purple coneflower (*Echinacea angustifolia*) growing in a prairie preserve over several years, including both burn and non-burn years. First, this study creates a data-based quantitative model of the mating scene, which is the availability and proximity of compatible mates for any individual plant. The most important aspects of the mating scene are found to be spatial isolation and flowering phenology, or the timing of flowering. Isolation is measured by distance to the kth nearest flowering neighbor, and the model predicts that more isolated plants have diminished reproductive success. Phenology is measured by start date and flowering duration, with longer flowering times indicating increased co-flowering, leading to greater reproductive success. Second, this study examines the impact of prairie fires on the quality of the mating scene by comparing model predictions based on mate availability and reproductive success on the scale of individual plants between burn and non-burn years. The quality of the mating scene changes from year to year based on the number and density of flowering plants as well as the flowering synchrony of the population. A thorough understanding of the impacts of prairie fires is crucial to informing best practices for grassland conservation and restoration efforts.

Emily J. Zaniker

Faculty Advisor: Stephen D. Miller

Mechanistic Study of a Novel Biodegradable PLGA Nanoparticles in the Therapeutic Modulation of Autoimmune Diseases

20% of Americans suffer from one of more than 80 clinically distinct autoimmune diseases including rheumatoid arthritis, multiple sclerosis, and lupus. Work in Miller lab has focused on modulation of immune responses using nanoparticles made of FDA-approved biodegradable poly(lactic-co-glycolic acid) (PLGA) biopolymer as a novel treatment for immune-mediated diseases in the absence of serious side effects of current steroid treatments. Intravenous delivery of PLGA nanoparticles reduces leukocyte accumulation at the inflammatory foci, alleviates disease symptoms, and promotes tissue repair in mouse models of many immune-mediated diseases. This study seeks to understand the cellular mechanism by which PLGA nanoparticles dampen immune responses at the acute site of inflammation. This study consisted of two experiments using cell culture systems: 1) identification of the type of immune cells that can uptake the PLGA particle using flow cytometry and confocal microscopy; and 2) characterization of the alteration of functions and phenotypes of the immune cells post-particle engulfment using flow cytometry and enzyme linked immunosorbent assay. Preliminary studies indicate that several subsets of phagocytes, particularly inflammatory monocytes, dendritic cells, and neutrophils, uptake PLGA nanoparticles. About 50% of the uptake is mediated by a scavenger receptor MARCO with collagenous structure. We hypothesize that particle uptake alters the function of the phagocytes and triggers apoptosis. Results of this study aid in the understanding of how a potentially life saving treatment works on a cellular level. Previous research has demonstrated the efficacy of particle treatment in vivo, but this project seeks to identify the treatment's underlying processes.



Kevin T. Zhao

Faculty Advisor: Richard B. Silverman

Chemical Probes for Drug Development and Target Identification in Amyotrophic Lateral Sclerosis

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease that results in death shortly after diagnosis. There is currently only one FDA approved drug for treating ALS, but it merely extends life by 2-3 months. This research aims to identify better therapeutics for ALS. To drive future drug development efforts, target-identification studies were performed to understand the mechanism of action behind our lead compounds. From high-throughput studies, we previously identified arylsulfanyl pyrazolones as a lead drug scaffold for alleviating cell death caused by mutations in Cu-Zn superoxide dismutase 1 (SOD1), which is known to be linked to ALS. Past studies with an optimized compound has shown that replacing the sulfur atom with a nitrogen atom significantly increases pharmacokinetic and pharmacodynamic properties. The research that will be presented is concerned with the lead arylazanyl pyrazolone scaffold and further modifying this compound to identify better treatments for ALS. Additionally, we designed a probe compound utilizing this lead scaffold to serve as a covalent marker to identify cellular targets. Certain requirements were followed

when designing this probe, such as comparable activity, selective activations, and capability to engage in pull-down affinity. These experiments have identified heat shock protein 27 (Hsp27) as a target for this drug scaffold. Biophysical methods, such as Surface Plasmon Resonance (SPR) and Isothermal Calorimetry (ITC), were used to study this drug-protein interaction. Immunofluorescence assays were used to visualize and support the interaction between this compound and Hsp27.



∞ Guide to Oral Presentations

Oral Presentation Session One 11:00-12:30

Seeing Ourselves Anew Lake Room (203)

Moderator: Claudia Haase, Human Development and Social Policy Department

Stephen Antonopolis, “Effects of Communicative and Consumptive Facebook Use on Well-Being and Self-Concept Clarity”

Katherine Bae, “Emotional Coherence between Facial Expressions and Heart Rate is Associated with Well-Being”

Kevin Hardiman, “Selfie Society: Deciphering our Propensity for Sharing our Lives”

Sarah Johnson, “Gender Misperceptions of the Ideal Female Body”

Natalie Stern, “Note to Self: Compassionate Letter Writing Increases Body Satisfaction”

The Impact of the Arts Arch Room (206)

Moderator: Rives Collins, Theatre Department

Emily Baldwin, “The Aesthetics of Inclusion: Exploring the Field of Theatre By, With, and For Individuals with Developmental Differences”

Maria Massucco, “A Village to Raise a Voice: The Role of Arts in an Alternative Education and Upbringing”

Casey Reed, “Broadway and Academia: Bridging the Gap between the Professional and Academic Worlds of Theatre Music Direction in New York City”

Clayton Shuttleworth, “Intimate Spacing: The Body in Space as Revealed through Performance”

Nicky Swett, “A Theory of Musical Translation”

Oral Presentation Session One, *continued* 11:00-12:30

Cutting Edge Humanities Rock Room (207)

Moderator: Wendy Wall, English Department

Steven Bennett, “Predictability Is Insufficient for Blameworthiness”

Mackenzie Broderick, “Dangerous Humor and Female Empowerment in Austen’s Emma”

Kimberly Clinch, “The Physics of Free Will”

Halimah Jones, “Analyzing Problems in Agency and Communion in Life Story Interviews”

Ji Min Shin, “Rise of the *Competent Mother*: Motherhood as a Social Norm in South Korea’s Educational Culture”

Engaging the World Armadillo Room (208)

Moderator: Rebecca Seligman, Anthropology Department

Erin Bennett, “Urban Agriculture: Revolutionizing Health and Communities in Cuba”

Rosalie Chan, “Hakka Youth Identity and Hakka Language Decline in Taiwan”

Molly Crane, “Social Determinants of Mental Health: Hazardous Consumption of Alcohol in Lusaka, Zambia”

Elaine Shen, “An Ethnographic Study of the Dynamic Role of Family Support within Diabetic Communities in Beijing, China”

Odette Zero, “Cultural Perception of Diabetes in San Miguel Dueñas, Guatemala”

Oral Presentation Session Two

1:00-2:30

At the Forefront of Science and Engineering

Lake Room (203)

Moderator: Haoqi Zhang, Electrical Engineering and Computer Science Department

Nicholas Geisendorfer, “Design and Fabrication of Many-Layered Solid Oxide Fuel Cells via Multi-Material 3D-Printing of Liquid Inks”

Katherine George, Gregory Kim, Nikhil Pai, “Action Plans: Personalized Online Plans to Facilitate Web Development in Learners”

Tyler Kukla, “A Tale of Two CIEs: The Mid-Cenomanian Event and Ocean Anoxic Event 2 as a Model for Sea Level Forcing on Climate Dynamics”

Jessie Moravek, “The Influence of Salmon Recolonization on Riparian Communities in the Cedar River, Washington, USA”

Katelyn Noronha, “Development of Intrinsically Photosensitive Retinal Ganglion Cells”

Facing Life’s Challenges

Arch Room (206)

Moderator: Steven Epstein, Sociology Department

Erik Baker, “*Ex Africa Semper Aliquid Novi*: Consensus, Credibility, and Concern in the History of HIV/AIDS Origins Research”

Julian Matra, “Social Dynamics of Young Athletes”

Nicola Rhyan, “The Relationship Between Organizational Cultural and Employee Engagement”

Sara Sarwar, “Religious Tolerance in Qatar”

Ashely Walters, “The Effects of Neuroscience Evidence in a Civil Court Case”

Oral Presentation Session Two, *continued* 1:00-2:30

Activism and Politics

Rock Room (207)

Moderator: Brent Huffman, Journalism Department

Scott Brown, Miranda Cawley, “The Heirs of Climate Change: Youth Activism at COP21”

Johan Qin, “Chinese-American Attitudes Toward Mental Illness: How Culture, Family, and Experience Influence Perceptions of Stigma”

Noah Star, “This Land Is My Land: Bridging the Republican and the Parochial ‘Two Alaskas’”

Silma Suba, “The Orenda Project: Bringing Education to Pakistani Slums”

Lauren Thomas, “A Shot of Politics: How Vaccine Mandates are affected by Political Institutions”

How We Grown and Learn

Armadillo Room (208)

Moderator: David Uttal, Psychology Department

Ping Chin, “Are You What You Eat? Investigating Dietary Acculturation among East Asian International College Students in the United States”

Jordyn Iger, “Aid Mates and Crisis Contestants: Cross Sector Coordination and Competition in the Humanitarian Sphere”

Emily Liquin, “Children’s Increasing Symbolic Competence and Touchscreen Use”

Margaret Shavlik, “Furnishing the Mind: Understanding How Children Learn Adjectives”

Deborah Wu, “Emotional Coherence between Facial Expressions and Heart Rate is Associated with Well-Being”

Oral Presentation Judges

Fabian Bustamante, Electrical Engineering and Computer Science

Jaime Dominguez, Political Science

Deborah Douglas, Journalism

Jillana Enteen, Gender Studies

Miriam Sherin, Learning Sciences

Ceci Rogers, Journalism

Ozge Samanci, Radio/TV/Film

Harvey Young, Theatre



Oral Presentation Abstracts

Alphabetical by presenter's last name

Stephen Antonoplis

Faculty Advisor: Mesmin Destin

Effects of Communicative and Consumptive Facebook Use on Well-Being and Self-Concept Clarity

Facebook and Social Network Sites form the heart of Web 2.0 communications. For the last decade, psychologists have studied these sites' effects on the self and well-being, but with too little consensus. Most of this research has focused on self-esteem and affect; little work has examined self-knowledge and other self-aspects. Self-knowledge is gained, in part, through social interactions, social media's main activity. Self-concept clarity—how stable and consistent people's self-beliefs are as part of a larger self-concept—is one aspect of self-knowledge that may improve understanding of these sites' psychological effects. Like self-esteem, self-concept clarity has been positively linked to well-being and other psychological outcomes. In this study, we hypothesize that communicative Facebook use (talking to other people) improves self-concept clarity and well-being and that consumptive Facebook use (reading posts, statuses, etc., without talking to other people) reduces self-concept clarity and well-being. Using correlational and experimental studies, we assess this hypothesis. Results are discussed in the context of social media's cultural meaning and place.



Katherine Bae

Faculty Advisor: Claudia Haase

Emotional Coherence between Facial Expressions and Heart Rate is Associated with Well-Being

Affective science has long been interested in the coherence between different emotion response systems (e.g., subjective emotional experience, behavior, physiology). Although evolutionary-functionalist accounts of emotion hold that emotional coherence should be related to greater adaptation, few studies have analyzed links between emotional coherence and well-being. Thus, in this laboratory-based study, we examined the link between emotional coherence (specifically the coherence between behavior and physiology) and dispositional well-being in a sample of 41 adults (22 females). During the study, participants' heart rate (physiology) and facial expressions (behavior) were collected while watching a sad film clip where a woman discovers that her family has been killed in a car accident. Sad facial expressions were objectively coded using Emotion Expressive Behavior coding on a second-by-second basis, while heart rate was calculated based on R-R intervals and converted into second-by-second data. Dispositional well-being was measured using the Positive and Negative Affect Schedule and the Big Five Inventory. Participants' heart rate tended to decrease while they watched the sad film clip; thus, emotional coherence was indicated by a negative link between sad facial expressions and heart rate. Statistical analyses revealed that greater emotional coherence was associated with lower negative affect, lower neuroticism, and greater extraversion. Follow-up analyses showed that emotional coherence was not significantly associated with gender. In sum, our findings show that greater emotional coherence between facial expressions and heart rate in response to a sad film is associated with greater dispositional well-being, supporting a central tenet of evolutionary-functionalist accounts of emotion.

Erik Baker

Faculty Advisor: Steven Epstein

Ex Africa Semper Aliquid Novi: Consensus, Credibility, and Concern in the History of HIV/AIDS Origins Research

Since the beginning of the observed AIDS epidemic in the early 1980s, practically every community with a stake in understanding the disease has engaged in speculation, storytelling, rigorous investigation, and controversy about its origins. In this work, I investigate the history of scientific theorizing about the genesis of HIV, from the time of the discovery of the virus in the mid-1980s to the twenty-first-century emergence of an articulated “consensus” about how it arrived in human beings. I argue that the central event driving the emergence of this consensus was the 1999 publication of a book called *The River* by British journalist Edward Hooper, which argued that HIV was initially introduced to humans through oral polio vaccination campaigns in the Belgian Congo in the late 1950s. By showing how the scientific consensus on HIV origins arose as a result of mainstream scientists encountering and attempting to refute Hooper’s claims, I argue for the importance of acknowledging that “social” factors like struggles over credibility are constitutive of, rather than incidental to, scientific practice, and conclude that scientific facts are thus inextricable from the network of human concerns in which they are embedded.



Emily Baldwin

Faculty Advisor: Rives Collins

The Aesthetics of Inclusion: Exploring the Field of Theatre By, With, and For Individuals with Developmental Differences

In summer 2015 I set out to research the field of inclusive theatre in the U.K. and Ireland. I became passionate about this field as a member of Seesaw Theatre, Northwestern’s student organization that creates theatre for audiences with developmental differences. We at Seesaw believe that access to the arts is a human right and that the current state of inaccessibility in American theatre is unacceptable. With my Undergraduate Research Grant I traveled to the U.K. and Ireland to observe companies that work at the intersection of performance and neurodiversity, in the hope of expanding Seesaw’s programming and of bringing the conversation around this work to the U.S. While I’d expected to find connections between artists making theatre for neurodiverse audiences and neurodiverse artists making their own work, I found that these two communities were fairly separate. While the theatre being made by artists with different abilities may be more likely to have a political bent, the theatre for audiences with differences falls more within the creative realm of Theatre for Young Audiences. One common thread across these practices is the ongoing question of neurotypical artists and arts administrators’ roles in this work. Each of the 13 companies I observed contributed differing insights into what lies at the intersection of arts and inclusion. All these perspectives conclude that when theatre accounts for the myriad ways individuals perceive the world, the conversation around artistic excellence must shift. Expanding the discourse around inclusive theatre pushes us towards redefining human dignity and worth.

Erin Bennett

Faculty Advisor: William Leonard

Urban Agriculture: Revolutionizing Health and Communities in Cuba

This research examines the effects of the Special Period, a serious food crisis that threatened Cuba from 1989 to 1995, and subsequent urban agriculture reform on the health of the urban Cuban population. After the fall of the Soviet Union in 1989, Cuba experienced large food shortages, and the government installed urban farms to augment the domestic food supply. These *organoponicos* have expanded drastically in the past 20 years, and Havana is now a model for urban agriculture worldwide. It is crucial to analyze the effects of the establishment of *organoponicos* on communities and the population's health to thoroughly understand the many benefits of urban agriculture. This research integrates a large range of data taken from the Cuban population, including mean caloric intakes, body mass indexes (BMIs), and rates of nutrition-related diseases from 1960 to 2005. These data are synthesized with anthropological and environmental literature analyzing the establishment of *organoponicos* to understand the role of urban agriculture in the changes in Cuban diet, health, and community engagement. Following the Special Period, *organoponicos* were producing enough fruits and vegetables to satisfy the FAO's per capita nutritional requirements, and rates of nutrition-related diseases and obesity had plummeted. Urban agriculture programs also helped connect farmers to their communities and instill a sense of community empowerment in urban areas by giving farmers autonomy over their work, connecting them to educational opportunities, and requiring *organoponicos* to engage with local social services. These social aspects may help sustain positive health outcomes in the urban Cuban population.



Steven Bennett

Faculty Advisor: Stephen White

Predictability Is Insufficient for Blameworthiness

If a person could not have avoided performing some action, many would intuitively argue that this absolves her from blameworthiness for said action. But if a person *could* have avoided performing some action, is blame justified? In this paper, I argue that predictability is a necessary condition for avoidability, then explore the previous question in an attempt to develop further sufficient conditions for blameworthiness given the avoidability of an action. After considering and revising possible sufficient conditions for blameworthiness, I show where this account fails: it leads to victim-blaming and is too “wide”. I conclude by arguing that we should discard predictability as a useful avenue for identifying sufficient condition given real-world circumstances.



Mackenzie Broderick

Faculty Advisor: Shauna Selig

Funny Lady: Dangerous Humor and Female Empowerment in Austen's Emma

Emma can be considered the funniest novel in the Austen cannon — both its characters and narrator employ wit and broad humor, but to what end? Contemporaries like Sir Walter Scott praised *Emma* for its moral message and delicate subject, but ignored the wit that flows through the novel. We must now ask *why* Austen's humor was not only glossed over, but ignored. This presentation would be a bite-sized sample of the longer one I will be giving at the Annual General Meeting of the Jane Austen Society of America, celebrating 200-years of *Emma*. I characterized the different approaches to humor and comedy in *Emma*: basic, broad humor, such as Harriet's blessed simplicity, to the middling humor of ridiculous characters like the Eltons and Mr. Woodhouse, to the more complex humor of situational and dramatic irony and the observations of an all-knowing narrator. Each type serves a different purpose in the narrative. The modern implication of all this is — are women funny? From playwright William Congreve to Jerry Lewis to Christopher Hitchens, men have long argued that women cannot be funny. Think of how daring we view female comedians even now. Both Emma herself and Austen are funny, and that is just as disturbing now as it was in the 19th-century. Humor is the opposite of sentimentality and sincerity — Austen is explicit in how cruel humor can be. Humor therefore represents exactly how a woman shouldn't behave.



Scott Brown and Miranda Cawley

Faculty Advisors: Brent Huffman

The Heirs of Climate Change: Youth Activism at COP21

This past December, we won an Undergraduate Research Grant to make a documentary at the COP21 climate negotiations in Paris. By embedding ourselves in the community of youth climate justice activists, we aimed to create a record of the young people who are taking climate action into their own hands. We discovered the Malaysian Youth Delegation, who were the first group of young people from their still-developing country to come to a COP, and who face potentially severe climate impacts. We followed them through street protests and negotiations, and we conducted interviews with over one dozen activists and government negotiators. We were not surprised to find that the young activists we met were motivated by human stories, and they advocated for the most-vulnerable people to have a greater say in negotiations. What did surprise us was that, despite this message, the large majority of them were from the West. The inherent privilege of activism was clear: because people from developing nations don't have the money or time to attend these negotiations, those with the loudest voices are not the ones hurt most by climate injustice. The Malaysians we followed were helping shift the voice of the youth movement, bringing a developing nation's perspective that could help Western activists give more space to the people they claimed to stand with.



Rosalie Chan

Faculty Advisor: Jill Blackman

Hakka Youth Identity and Hakka Language Decline in Taiwan

The Hakkas are a minority population in Taiwan who migrated from Hakka-speaking areas in south China. Due to past government suppression of the Hakka language, as well as a smaller population proportion of Hakka people, the Hakka language and culture has been on rapid decline. However, in the 1980s, Hakkas demanded mother tongue education in Taiwan, the implementation of Hakka media and the establishment of a Hakka Affairs Council. Now, mother tongue education is required in primary schools, and today's college students are the first to receive it. In this research, I interview Hakka youth from age 18 to 25 about their perspectives on Hakka language and cultural preservation. While most Hakka youth do not know the language, there are some who are passionate about reviving the language and culture, making use of social media to spread awareness. With this research, I pitched and published feature articles in three publications: *Narratively*, the *Taipei Times* and the *China Post*.



Ping Chin

Faculty Advisor: William Leonard

Are You What You Eat? Investigating Dietary Acculturation among East Asian International College Students in the United States

Acculturation among Asian immigrants and their exposure to a Western diet have important health consequences such as higher prevalence of overweight and obesity. Studies of nutritional change among Asian immigrants have generally only used standard questionnaires to document changes in diet and nutritional status, rather than exploring the deeper socio-cultural factors that are driving the changes in diet. Additionally, research on Asian immigrants has generally considered a wide age-range and not on young adult populations. This study used both qualitative and quantitative methods to understand how aspects of the immigrant experience affect dietary patterns and nutritional health in 16 male and 14 female Northwestern University students of East Asian ancestry. The mean body weights and BMIs were significantly higher in men than women (Wt: 71.1 vs. 54.8 kg; $p < .001$; BMI: 23.0 vs. 20.6 kg/m²; $p < .05$). Rates of obesity were low in both men and women (6.3% vs. 0%). Daily energy consumption averaged 2412 kcal/day in men and 1905 kcal/day in women. These levels are similar to those recently reported for adult men and women from the US (Ford & Dietz, 2013. *AJCN* 97:848). Western norms of body image were consistent themes discussed in interviews with women. The research provides insights into the changing immigrant landscape within the US and implicates policies related to nutrition and health programs for international students and immigrant populations. This research was supported in part by an Undergraduate Research Grant from the Office of Undergraduate Research at Northwestern University.



Kimberly Clinch

Faculty Advisor: Fabrizio V. Cariani

The Physics of Free Will

Modern cosmological research addresses questions about the nature of matter, spacetime, our universe, and its beginning. These questions are inherently interdisciplinary, lying at the intersection of physics, philosophy, and mathematics. Looking at the historical figures of these fields, one finds significant overlap. Aristotle, Descartes, Leibniz, Newton, and Einstein all engaged in at least two of the three fields. Today, though, these subjects are often taught and researched separately. Thus, I set out to determine whether today's search for cosmological answers could benefit by returning to the integrated model. Specifically, I aimed to assess whether philosophy could provide guidance on or held implications for multiverse theories proposed in the physics community. I studied a curriculum of key works written by interdisciplinary authors – Aristotle, Newton, Einstein, Hawking, and Maudlin – which I intended to follow with studies of physics publications about the multiverse. However, I found that philosophic research, like scientific research, can yield unexpected findings worthy of pursuit. My unexpected findings were the implications held by modern physics and mathematics for the philosophical debate of free will. Determinism is one of the classical positions, in this debate, that uses physics to oppose free will. However, my research revealed that determinism conflicts with modern physics and mathematics. This conclusion does not settle the free-will debate, but it moves the focus of the conversation to the nature of symmetry, quantum mechanics, relativity, and their relationships.



Molly Crane

Faculty Advisor: William Reno

Social Determinants of Mental Health: Hazardous Consumption of Alcohol in Lusaka, Zambia

Early alcohol use can be a predictor of impaired health status and increased risk for long-term alcohol dependence and abuse; the detrimental effects are particularly acute for youth, who may be more vulnerable to alcohol-related harm than any other age group (WHO, 2014). In Zambia, 45.1% of students exhibit problematic drinking and 42.4% report drunkenness (Swahn et al., 2011). Utilizing the framework of the Social Determinants of Health, this research explores the linkages between social inequalities and mental health challenges. 5 spheres of Social Determinants emerged from this exploration; these spheres intersect, and both shape hazardous consumption and shaped by these behaviors. The 5 spheres include (1) gender inequalities, (2) stigmatization, (3) historical injustices, (4) gaps in healthcare service and delivery, and (5) educational inopportunities. Supported by quantitative data on the prevalence and correlating social factors of alcohol abuse, interviews with key stakeholders, focus group perspectives and observational findings in Lusaka, Zambia, this research serves as a case study in the embodiment of social inequalities. First, this research displays that the hazardous consumption of alcohol emerges from and generates mental health challenges. Second, the social inequalities inscribed upon bodies in hazardous consumption provide a broader framework for the

social determinants of mental health. Third, these findings offer data for understanding and responding to the social determinants, and thus for structuring interventions. Through examining the manifestations of a particular health outcome within a specific temporal, geographic, and social context, this research illuminates new linkages between the social sphere and mental health.



Nicholas R. Geisendorfer

Faculty Advisor: Ramille Shah

Design and Fabrication of Many-Layered Solid Oxide Fuel Cells via Multi-Material 3D-Printing of Liquid Inks

The fabrication and assembly of solid oxide fuel cells (SOFCs) - including both support and functional layers- remains one of the primary challenges preventing the widespread adoption of SOFCs as an energy conversion technology. SOFC structures produced using traditional manufacturing techniques are inefficient due to processing and fabrication constraints, precluding use of SOFCs in practical applications. We present an efficient and highly scalable multi-material process for fabricating SOFC constructs using a combination of room-temperature, liquid extrusion-based 3D-printing and dip-coating of particle-laden, liquid-based 3D-inks. 3D-printing is used to sequentially deposit anode and cathode functional layer materials allowing unprecedented control over electrode geometries. The same inks designed for 3D-printing are repurposed for the production of mechanically robust, controllably thick, multi-material films via dip-coating to be used as electrolytes and interconnect bilayers. Due to identical solvent and polymer content between dip-coated and 3D-printed components, layers fuse seamlessly with one another, meaning that dip-coated electrolyte and interconnect films can be placed manually and will instantly fuse to preceding and successive 3D-printed layers, ensuring excellent inter-layer/material integration and mitigating the risk of delamination prior to firing. The microstructural and electrochemical characteristics of fired cells are analyzed, and compared with cells produced entirely using tape-casting techniques. This new, simple and highly versatile technique will form the foundation for improved SOFC manufacturing and function and enable the exploration of complex, non-traditional SOFC designs not compatible with established fabrication processes in order to increase their adoption across industries and improve their prospect for providing reliable, carbon-free power.



Katie George, Gregory Kim, and Nikhil Pai

Faculty Advisor: Haoqi Zhang

Action Plans: Personalized Online Plans to Facilitate Web Development in Learners

Every day online classes, tutorials, and college courses attempt to teach beginning programmers how to code. Learning how to code is becoming commonplace, and a working knowledge of programming is now expected in many jobs. Many of these beginning programmers either finish their online tutorial and do not know where to go next (because many times, these tutorials are quite basic), or are

interested in starting their own personal project but do not know how to go about it. Our project, referred to as “Action Plans,” is a platform designed to help these beginning programmers (learners) learn to build their own web applications using personalized action plans written by an experienced programmer. Experienced programmers (experts) can quickly compose high-quality action plans for project queries submitted by beginners, which will guide them through both high-level goals and subtasks. Our future goals are to improve our current design through prototyping and user research. We will be able to improve the design and technology of the platform through bi-weekly user feedback. We also hope to generalize this learning platform to other areas in addition to programming. In general, we want for people, with the use of algorithms, to quickly generate action plans from isolated sources to accomplish complex learning goals.



Kevin Hardiman

Faculty Advisor: Gail Berger

Selfie Society: Deciphering our Propensity for Sharing our Lives

With the emergence of online social media as a means of expression, the public has expressed widespread concern over the government’s access to private sector collection of personal data. Yet, we have long since known about companies like Google and Amazon keeping “cookies” on our search history to make suggestions based on our preferences, but there was little uproar with the revelation that this data was being commercialized. On social media sites like Facebook and Twitter, we consciously share our lives and opinions with a select audience. These platforms for self-expression occupy a unique position at the intersection of the public and private spheres, social sphere which embraces aspects of both the public and the private. The onset of social media has led to an unprecedented level of sharing within our individual social spheres. This study aims to decipher how we respond when told that those outside our spheres have access to our information. Does knowledge of the proverbial all-seeing eye change our behavior? Do we act differently online if we think we are being watched?



Jordyn Iger

Faculty Advisors: Peter Locke

Aid Mates and Crisis Contestants: Cross Sector Coordination and Competition in the Humanitarian Sphere

The international community has long lamented its chronic inability to address humanitarian crises and the conflicts behind them, while taking little action to solve these problems. While there is robust discussion of how to address the inability to coordinate aid distribution, the literature is not as extensive in terms of how organizations’ histories and cultures create an institutional unwillingness to address these problems. This project focuses on coordinating delivery of relief in emergencies caused

by conflict. I divided my paper into chapters: a history of the “humanitarian emergency”; the role of state, multilateral, and regional actors; of private and nonprofit actors; and a case study comparing relief coordination in Darfur to coordination in the Democratic Republic of Congo. Within each, I reviewed scholarly articles and books; organization websites, manuals, reports; and some news articles. From this review I found that one reason humanitarianism cannot address its issues is the incentives that each type of organization has to compete with each other, rather than coordinate. Further, these incentives to compete are rooted not in the haphazard way humanitarianism worked to address emergencies since the 1970s, but in the creation of each type of organization, and in humanitarianism’s roots in Christian charity. Simply put, it is important to understand how sectors work in order to work with them. Cross-sector competition in humanitarian relief severely hinders the ability of public and private actors to reach mutual understanding in pursuit of common goals, exactly what we expect of parties to conflict in forging peace.



Sarah Johnson

Faculty Advisor: Renee Engeln

Gender Misperceptions of the Ideal Female Body

Women represented in the media are substantially thinner than the average woman, and often dangerously thin (Katzmarzyk & Davis, 2001). Compared to men, women feel more pressure (both from the media and from peers) to conform to these body size ideals (Thompson et al, 1999). One reason women may want to emulate the thin ideal is because they believe this body type is most attractive to men. For years, researchers have claimed that the body ideal internalized by women is actually *thinner* than men’s preferences for women’s body size (e.g., Fallon & Rozin, 1985, 1988). This misperception may be contributing to body dissatisfaction in women. This study served as a conceptual replication of previous research on this topic with an emphasis on media images. 397 men and 370 women completed an online survey containing 13 images of models collected from popular fashion magazines. Each participant rated each model’s thinness on a 7-point scale ranging from “way too skinny” to “way too fat.” They also rated how attractive each model’s body was. In addition, participants indicated how they thought the other gender would rate each image using the same two scales. Results were consistent with the possibility that some women may internalize the media-promoted thin-ideal because they erroneously believe men prefer this body shape. Even among these very thin models, both genders saw those who were rated as heavier as more attractive. Changing women’s perceptions about men’s preferred body type could help to reduce the impact of thin-ideal images.



Halimah Jones

Faculty Advisor: Dan McAdams

Sharing Our Own Story: Analyzing Problems in Agency and Communion in Life Story Interviews

Stories are an important part of human culture. There is the psychological idea of a "narrative identity", which is the story that a person constructs and internalizes to integrate past, present, and future and to give life meaning and purpose (McAdams, 2001). One way to measure the narrative identity is through the Life Story Interview. In the life story, participants share memories of what has occurred throughout their life, and in particular, memories of events that are particularly salient in relation to whom they are as a person. As one can imagine, the person we portray through stories is often complex and interrelated with positive and negative themes throughout. In this research we examine the relationship between problems in agency, the ability to control and initiate action, and communion, positive relationships and interactions with others through the Life Story Interview (McAdams et al., 1996). Specifically, I propose that problems in agency and communion in life stories is related to the measures of Social Well-being and Psychological Well-being. I am currently analyzing on this data received through the Summer Undergraduate Research Grant of 160 participants. To quantify the ideas of agency and communion, we read 11 different key scenes in each interview, annotating when a specific sub-themed code within agency and communion was present. These codes were based on previous research and presented an innovative approach to the coding schemes. This research would provide foundational knowledge as to how our own negative interred stories interacts with our well-being.



Tyler Kukla

Faculty Advisor: Bradley Sageman

A Tale of Two CIEs: The Mid-Cenomanian Event and Ocean Anoxic Event 2 as a Model for Sea Level Forcing on Climate Dynamics

Although rising sea level is one of the trends predicted with future climate change, the consequences of sea level rise on climate feedbacks are seldom discussed. Future climate change dynamics related to sea level rise may be constrained by studying comparable climatic events in earth history. The Cretaceous period, known for its greenhouse climate, presents useful paleoclimate analogs for the future. Here, we examine two Mid-Cretaceous climate perturbations identified through the sedimentary carbon isotope ($\delta^{13}\text{C}$) record: the Mid-Cenomanian Event (MCE) and Ocean Anoxic Event 2 (OAE2). Sea level reconstructions suggest that a 50-60m sea level rise occurred between these events. Sulfur isotopes ($\delta^{34}\text{S}$) in pyrite (FeS_2) and carbonate associated sulfate ($\text{CaCO}_3\text{:SO}_4$), used in conjunction with the $\delta^{13}\text{C}$ record, allow the study of linked carbon-sulfur cycle behavior; the $\delta^{34}\text{S}$ data indicate that these cycles behaved quite differently during the two events. To explore the difference we developed organic carbon and pyrite burial efficiency models with a Mid-Cretaceous bathymetric map to quantify the effect of sea level on observed isotopic signals. Preliminary results suggest that sea level rise explains about 10% of the change in magnitude of the $\delta^{13}\text{C}$ signal from the

MCE to OAE2, and also plays a role in the dissimilar $\delta^{34}\text{S}$ signals between the two events. This suggests that, while factors other than sea level were critical in driving the events, sea level rise may have escalated organic carbon and pyrite burial, and therefore improved the effectiveness of the oceanic sink in moderating earth's climate.



Emily G. Liquin

Faculty Advisor: David Uttal

Touchscreen Devices and Young Children: Symbolic Understanding, the Video Deficit, and Increasing Symbolic Competence

Screen media, such as televisions and touchscreen devices, can be considered symbolic representations because entities onscreen stand for entities in the world (for example, a video or picture of a person represents an actual person). However, young children often fail to use screen media as a symbolic source of information. In this study, we investigated whether this deficit is merely a result of failed symbolic understanding, or whether specific features of screen media hinder children's transfer from these devices. Additionally, we proposed that children's increasing exposure to media may have engendered a trend towards earlier symbolic understanding. Thirty-two 2.5-year-olds were randomly assigned to use either an iPad map or a paper map to find a toy in a room. Information about children's prior use of touchscreen devices was also collected. We found that children in the paper condition were slightly more successful than children in the iPad condition, and only children in the paper condition performed at a rate significantly higher than the rate expected by chance responding. This finding reveals that screen media are in fact particularly difficult for children to understand compared to other symbols. Importantly, children's success rate in the paper condition was higher than children's success rate in an identical task from previous research (Marzolf & DeLoache, 1994), supporting our hypothesis that children's symbolic competence may have increased within recent decades. Future research must seek additional evidence that children have become more competent using symbols and investigate why screen media is especially difficult for children to understand.



Maria Massucco

Faculty Advisors: Richard Bouldrey and Theresa Brancaccio

A Village to Raise a Voice: The Role of Arts in an Alternative Education and Upbringing

Our current education system focuses on skills acquisition and a standardized test-based progress trajectory. I recognized from my own experience growing up in a low-income community and attending a poorly-funded, low-tier school system that my and my peers' ability to compete at the collegiate and post-collegiate level was and would be drastically fettered by the poor quality of our early education. My own course was altered and unfettered by my action and success within the world of the performing arts. This project combines work completed during an undergraduate research grant

working with middle school students on music history lessons, and a Davis Foundation Project for Peace Grant during which I founded and ran my own summer arts camp for underprivileged students. It also includes observations and feedback from a trip assisted by a Conference Travel Grant during which I visited the Bagamoyo College of Arts in Tanzania to participate in an exchange of ideas: I learned about the way that art takes precedence in the education and society of one poverty-stricken community and I shared my own findings on the effectiveness of art in transforming the trajectory, self-esteem, creativity, and global mentality of low-income American students. This presentation evidences the importance of the arts in closing the economic-based education gap and offers several examples of camp and class participants transforming from low-performing “problem cases” to motivated and invested students.



Julian Matra

Faculty Advisor: Benjamin Gorvine

Social Dynamics of Young Athletes

The main focus of this research was to determine the extent to which socially anxious traits are present in junior tennis players as well as, hopefully, determine promising methods (i.e., changes to the social and competitive structure of junior tennis) to prevent development of these traits. The primary hypothesis was that junior tennis players would score higher on scales designed to measure the extent to which the participant exhibits socially anxiety. I further hypothesized that these higher scores will correlate with high intensity and time-intensive training, which would prevent junior tennis player from having sufficient time to socialize with peers outside of competition. I and my partner Tyler Scaletta collected data from 69 participants, 47 tennis players and 22 baseball players (who served as our control group, due to the more collaborative, team-oriented nature of the sport in comparison to tennis). The surveys used were the Liebowitz Social Phobia Scale and the Social Interaction Anxiety Scale, both of which are empirically validated. These scales allowed us to determine the extent to which these players possess traits that correlate to the social interaction component of social anxiety disorder. While more thorough data analysis is still required, an initial review of the data seems to suggest a higher distribution of socially anxious youth in tennis, though interestingly, those who scored as socially anxious in the baseball-control group displayed higher levels of social anxiety.



Jessie Moravek

Faculty Advisor: Neal Blair

The Influence of Salmon Recolonization on Riparian Communities in the Cedar River, Washington

Although salmon and salmon derived nutrients have been shown to be linked to riparian habitats adjacent to salmon streams, no studies have quantified these effects within the context of natural

salmon recolonization. Therefore, the purpose of this study is to explore relationships between salmon and aquatic and riparian taxa in the Cedar River, Washington, where salmon recolonization is currently underway. To do so, we used salmon biomass inputs as a predictor for the density and diversity of aquatic insects and riparian spiders. Based on prior observations in the Cedar River and prior studies that have connected salmon to riparian habitats, we hypothesized that salmon biomass inputs would be a significant predictor for trends in aquatic insect and spider communities. We found that salmon biomass inputs were significantly related to aquatic insect density and riparian spider diversity, although these relationships were also moderated by other habitat variables. Aquatic insect density increased with salmon biomass inputs, while spider diversity decreased. We suspect this pattern was partially driven by increases in the availability of aquatic insect prey due to increased salmon inputs, which may have shifted spider community composition towards aquatic specialists and reduced spider diversity. However, we also found evidence that aquatic insect and riparian spider communities were influenced by periphyton biomass and channel slope. This suggests that the effects of salmon inputs on aquatic-riparian exchange may be moderated or enhanced by heterogeneity in other physical or biological stream characteristics. Our results provided enough evidence to motivate a follow-up study using stable isotopes to investigate the exact nature of the relationship between salmon, aquatic insects, and riparian spiders in the Cedar.



Katelyn Noronha

Faculty Advisor: Tiffany Schmidt

Development of Intrinsically Photosensitive Retinal Ganglion Cells

In addition to rod and cone photoreceptors of the outer retina, intrinsically photosensitive retinal ganglion cells (ipRGCs) constitute a third class of inner retinal photoreceptors that play roles in both image and non-image forming vision. There are distinct subtypes of ipRGCs (M1-M5 cells); M1, M2, and M4 cells make up the majority of the ipRGC total population. All ipRGCs express melanopsin, a photopigment that gives the cells their intrinsic photosensitivity. Each subtype has been characterized by distinct morphology, physiology, and their dendrite stratification in the inner plexiform layer during adulthood. Increasing evidence indicates that ipRGCs not only participate in visual behavior, but also have a role in retinal development. To date, there have been many studies detailing the properties of ipRGCs in adult retina, but very few on how ipRGC subtypes develop and how each subtypes affects the developing retina. We sought to describe ipRGC number and subtype proportion in three different mouse lines at different time points in postnatal development as a first step toward understanding how individual ipRGC subtypes develop.



Johan Qin

Faculty Advisor: Albert Hunter

Chinese-American Attitudes toward Mental Illness: How Culture, Family, and Experience Influence Perceptions of Stigma

My thesis explores the critical intersection between psychological research on Asian- American mental health and the sociology of mental illness. It seeks to both investigate the impact of culture, family, and experience on Chinese-American attitudes toward mental illness and contribute to existing literature on Chinese-American mental health. My study was conducted at a midwestern university where I interviewed 21 Chinese-American undergraduate students on their attitudes toward mental illness and their perceptions of mental illness stigma. I found that while all three factors influence mental illness attitudes, personal experience has the strongest impact. My research marks an important step towards a more qualitative approach to studying Asian-American mental health. Future studies should look to expand on such qualitative methods to garner a more accurate and in-depth understanding of the complexities facing the field of Asian-American mental health.



Casey Reed

Faculty Advisor: Ryan Nelson

Broadway and Academia: Bridging the Gap between the Professional and Academic Worlds of Theatre Music Direction in New York City

During the summer of 2015, I spent eight weeks in New York City studying music direction for the Broadway stage. I observed eight Broadway pit orchestras, conducted interviews with working music directors, researched at the New York Performing Arts Library, and had email correspondence with music directors currently working outside of New York. I came to the city to answer two main questions: What are the distinctions between formal training and the professional world in music direction for the stage? How can this gap be bridged? I have come to conclude that while many Broadway music directors have formal music degrees, the kinds of skills that music directors need are accumulated through lifelong experience in music, drama, and other disciplines. There is discrepancy between formal training and the professional music direction world because the job is a utilitarian, show-specific venture that cannot be taught entirely in a classroom. After completing this research, I see that a music director's education *must* continue after college informally. Music directors are constantly learning throughout their life as technology changes, the tasks they are asked to do change, and the art form of musical theatre changes. I hope with my research to provide a kaleidoscopic view of the field of music direction for the stage while narrowing my focus on the benefits of different kinds of training for students seeking a career in this field.



Nicola Rhyan

Faculty Advisor: Mindy Douthit

The Relationship Between Organizational Cultural and Employee Engagement

This research depicts the correlation between cultural characteristics within an organization and the extent to which employees feel and show signs of engagement. As employee engagement becomes a more common measurement tool within organizations to assess commitment, it is vital for companies to understand how elements of their culture influence employee engagement. The purpose of this research is to recognize that companies can have dramatically different cultures, but consistencies in terms of cultural characteristics can be identified as they relate to employee engagement. In developing this assessment tool, this research leverages the OCAI and OCI cultural assessments to identify cultural elements as well as the UWES, a work engagement tool. The primary outcome of this research is to identify the relationship between cultural characteristics such as company mission and values, leadership styles, and underlying assumptions, and key aspects of employee engagement including vigor, dedication, and absorption. Together these approaches will allow organizations to develop an understanding as to how elements of their organizational culture relate to their company's ability to foster an environment where employees feel and show sign of being engaged.



Sara Sarwar

Faculty Advisor: Christina Paschyn

Religious Tolerance in Qatar

In the Islamic country of Qatar, open displays of any other religion are prohibited under law. The government, however, does permit the existence of places of worship such as churches for the country's Christian population. Out of curiosity and a personal relation that my partner Jueun Choi, a South Korean devout Christian, had towards this community of Qatar, we decided to report on the Korean Church of Qatar. Interviewing members of the Church was not out of our territory as there were no language barriers nor elements of strangeness between them and my partner and I. Our results, according to those interviewed, was that followers of the Korean Church and so arguably the general group of Christians in Qatar, had mixed feelings towards the level of tolerance in the country. While they praise Qatar for being a place that grants them freedom to perform their religion and a society that is accepting of their faith, there is skepticism towards the physical space or lack thereof that they are given for worship. The implications my partner and I found in completing this project included a need to further improve the freedom of religion in terms of placing importance on the practical aspects. Another was that the tolerance overall in the country is one that is generally accepted and approved of.



Margaret Shavlik

Faculty Advisor: Sandra Waxman

Furnishing the Mind: Understanding How Children Learn Adjectives

Infants gain the skill to distinguish between different grammatical categories (nouns, verbs, etc.) not long after speaking their first words – and long before they start using them in sentences. An intuition-based theory of adjective learning is that it is a perceptually-based process. A child hears a word, sees the property being described, and thus, is able to use the adjective to describe other instances of that same property. However, it seems to be the case that children are not forming mere associations between a word and a perceptual experience, but are in fact incorporating reference from their holistic knowledge of the world. For my thesis project, we put this to the test. We showed children books of ambiguous shapes (e.g., a shape that could be interpreted as just some spilled paint, or as a painting of a tree), introducing the books as “full of pictures of things” or “full of blobs of stuff.” On each page, we described one shape using a made-up English-sounding adjective (e.g., “*blickish*”), and as we showed two more shapes (one of which matched the first in color), we asked the child if they could find “another one that is “*blickish*.” We found that this difference mattered: children who thought the shapes were “blobs of stuff” were much more accurate at indicating a color match than those who thought that *the exact same shapes* were “pictures of things.” Thus, conceptual information, not just perceptual information, seems to play a role in how children understand adjectives.



Elaine Shen

Faculty Advisor: Noelle Sullivan

An Ethnographic Study on the Dynamic Role of Family within Diabetic Communities in Beijing, China

The prevalence of diabetes in China has increased dramatically in recent years, from 1% in 1980 to 11.6% of the adult Chinese population in 2013. Diabetes management permeates every aspect of every life. Every time a diabetic patient has a meal, snacks, or exercises, considerations of the disease must take place. Critical to diabetes management in China is family support and care. Through ethnographic interviews and participant observation, I explored the dynamic role of family support for diabetic patients and families of Beijing. Members for the ethnography were recruited from the Beijing Diabetics Association (BDA). The goal was to identify how patients take charge of their health and inform their families of their conditions, in addition to how family members interpret and use such knowledge to support the patient. I found that many diabetics were motivated to stay healthy and combat their disease in order to be capable of caring for generations above and below them (children and parents). Additionally, older diabetics had powerful influence over family members’ lives to make healthier lifestyle choices. This brings to light the value of the patients’ expertise with their disease. The traditional perception of patients who are seen as recipients of care is inverted, as the BDA patients in this study were found to be caretakers and leaders within their social and familial networks.



Ji Min Shin

Faculty Advisor: Kate Baldwin

Rise of the *Competent Mother*: Motherhood as a Social Norm in South Korea's Educational Culture

In recognizing current limitations in the ways that motherhood as a social construction has been studied and conceptualized, this study investigates South Korean motherhood in the context of the country's educational culture as a case study through which to understand how a specific set of social, cultural, and structural circumstances shape normative motherhood as well as how individual mothers interact with and respond to it. To this end, 34 semi-structured interviews with South Korean mothers and field observation of 11 different education-related sites were conducted in Seoul in the summer of 2015. Based on these data, this study argues for the emergence of a new model of intensive mothering—*competent motherhood*—and explains its development as the interaction of structural factors, such as economic strains, policy changes, and failures of the educational system; cultural factors, such as gender roles and the legacy of traditional forms of motherhood; and social and individual factors, such as competitive yet interdependent relationships between mothers and their responses to normative motherhood as guided by their personal beliefs and individual situations. In doing so, this study contributes to the necessary refining of the current understanding of normative motherhood as a social construction and a cultural model.



Clayton Shuttleworth

Faculty Advisor: Joshua Chambers-Letson

Intimate Spacing: The Body in Space as Revealed through Performance

This honors thesis project was conceptualized in an independent study conducted fall quarter on the performing body and further developed in a graduate performance studies class on the body and the archive during the winter quarter. Through my research I mobilize a performance studies perspective to put forward a conceptualization of bodies as always in intimate relation. The word “intimate” comes from the Latin “*intimus*,” which is the superlative form of “*in*” meaning effectively “*inmost*.” Intimate relationships are thereby relationships in which one or more bodies has worked its way *into* another. This paper investigates how a body “gets into” another, while remaining always already outside. I argue for an understanding of intimacy that is not the breaking down or undoing of limits between bodies but instead the active recognition of irreconcilable space separating bodies along with a process of moving in necessarily imperfect synchronicity—navigating the “between space.” Developed through close readings of three performance art pieces (Eiko & Koma, Marina Abramović, and Ron Athey) and heavily influenced by interdisciplinary engagement with scholars including Jean-Luc Nancy, Jennifer Doyle, and Lauren Berlant, this theorization of intimacy offers a productive analytic framework for understanding and engaging with bodies—in writing, in theory, in the flesh. Together, these artists and theorists expose the unfathomable strangeness of bodies and force a reconceptualization the ways in which we exist with (alongside, inside, outside, against) each other.

Such a performance-based framework seeks to elucidate how one can effectively and meaningfully navigate this world of bodies.



Noah Star

Faculty Advisor: James Farr

This Land Is My Land: Bridging the Republican and the Parochial “Two Alaskas”

The scale of Alaskan land, natural resources, and wilderness present a legislative quagmire of who owns what land and how the land should be managed. This paper identifies a trend in American land use policy called the environmental institutional order. American republican political theory explains the formation of the environmental institutional order where two mutually inclusive institutions of land development and land stewardship compete for policy influence. Elected representatives arbitrate the policy outcomes emergent from the environmental institutional order. By sectioning American frontier history starting into three legislative regimes, this paper shows how land development dominates American land use policy, with land stewardship stuck as a latent republican and romantic value. By the 20th century, land stewardship begins to reach for parity in policy influence. In Alaska, the history of the American frontier comes to bear with greater charge. Thus, the focus of this paper is how the legislative history and deliberation over Alaskan land navigated the environmental institutional order. In Alaska, land stewardship transitioned from a latent value to potential policy outcome. Elected representatives justified land stewardship as a national interest issue and assumed local Alaskans supported land development, ultimately ignoring parochial support for land stewardship and eschewing potential legislative compromise.



Natalie Stern

Faculty Advisor: Renee Engeln

Note to Self: Compassionate Letter Writing Increases Body Satisfaction

Women’s dissatisfaction with their bodies is so prevalent that it has been described as *normative discontent*. Although a number of interventions have been designed to reduce body dissatisfaction, many have met with limited success. Additionally, the most successful programs are often time-intensive. The development of more efficient interventions to address body image struggles among women is essential, especially because body dissatisfaction can lead to the development of eating pathology. Self-compassion is a practice developed from Buddhist psychology that involves a non-judgmental acceptance of one’s flaws. Multiple studies have found that self-compassion is associated with body satisfaction, yet most research has been correlational. The goal of the current study was to test whether a self-compassionate letter writing intervention could mitigate body dissatisfaction among college women. No studies have investigated the relationship between self-compassionate letter writing and

body satisfaction specifically. Two-hundred fifty-one college women were randomly assigned to one of four letter writing conditions: a general self-compassionate letter; a self-compassionate letter directed toward the body; a letter about body functionality; and a control group who wrote about their day. Participants wrote for ten minutes, followed by five minutes of re-reading and reflection. Participants in all three active letter writing conditions reported significantly higher scores on state self-compassion and body satisfaction compared to the control group. Consistent with previous research, self-compassion and body satisfaction were significantly correlated. A follow-up study successfully replicated these findings. These studies suggest that self-compassionate letter writing may be an effective tool in combatting women's body dissatisfaction.



Silma Suba

Faculty Advisors: Tom Hundley and Kem Sawyer

The Orenda Project: Bringing Education to Pakistani Slums

My project is a journalistic piece that I wrote during my Journalism Residency at Pulitzer Center on Crisis Reporting. The story is about four students who came up with a project to build a portable school in a slum in Pakistan, which is mostly populated by Afghani refugee families. I have always been interested in writing feature and human-interest stories, and I'm very passionate about youth development and education. Therefore, I was really excited to write this story. This story involved a lot of research because I couldn't go to Pakistan and report as I was interning in D.C, so all my interviews were done via Skype. Most of my research involved learning about various Pakistani government regulations and policies regarding refugee slums, learning about the slums and the people who lived in them.



Nicky Swett

Faculty Advisors: Reginald Gibbons and Susannah Gottlieb

A Theory of Musical Translation

Music in the Western Classical tradition can be seen as a continuum of styles much like the continuum of one language. The styles of composers in the eighteenth and nineteenth centuries feature a great number of common patterns and elements. This means that listening to music written by one composer during these centuries can help an audience to understand the work of this composer's contemporaries. However, at the start of the twentieth century, composers began developing mutually exclusive styles that were not shared with their contemporaries. Listening to Schoenberg's work does not help us understand Stravinsky's work in the same way that listening to Mozart can help us understand Haydn. This lack of shared stylistic elements makes acclimating oneself to modern and contemporary music harder. It also partially explains why many find twentieth and twenty-first century classical music harder to understand than eighteenth and nineteenth century classical repertoire. As a

cellist and avid performer twentieth-century music, this difficulty is of particular importance to me. So, as a means of making modern music easier to understand and efficiently teaching modern audiences the idiosyncratic musical languages of twentieth-century composers, I have developed a process of “musical translation.” In a manner similar to translations along the continuum of one language, for example from Chaucer’s English to our own, I translated a piece from the eighteenth century—a “gigue” from J.S. Bach’s Third Solo Cello Suite—into a musical style, or language, of a Modernist—that of Hungarian composer Gyorgy Ligeti in his Solo Cello Sonata. In concert, I would perform first my translation, interlocked with Bach’s original, and then the Ligeti Sonata in full. This re-composition could have the effect of translating a text in a familiar language into a more foreign one in order to teach that language. My translations could help audiences to more quickly prepare their ears for the musical languages of twentieth- and twenty-first-century composers—ironically by relating their pieces to the more familiar music of the past.



Lauren Thomas

Faculty Advisor: Charles Manski

A Shot of Politics: How Vaccine Mandates Are Affected by Political Institutions

Vaccines, which are highly regarded both in the medical community and among laymen, provide a positive externality; not only do they prevent their recipient from getting ill, they also prevent others from getting ill as well. Therefore, U.S. state governments have required citizens to receive them for decades; the governments use both the legislative and executive branch to mandate vaccines. However, parents can apply for religious, medical or personal exemptions, depending on the state they live in. In my study, I looked at both how vaccine mandates affect vaccine coverage (i.e. how many people are vaccinated for a certain vaccine) and how the method by which governments pass mandates (i.e. legislative, executive, or a mixture of the two) affects whether a mandate exists in the first place. To do this, I created a dataset with the following variables: coverage rates (obtained from the CDC’s National Immunization Survey), what type of exemptions exist, if any (and when they were created), method of enacting a mandate, and as control variables. I modeled the effect on the dependent variables through an OLS regression. Unsurprisingly, the existence of a mandate had a large effect on coverage rates; personal exemptions did not seem to have an effect at all. The existence of a mandate is negatively affected if the government only uses legislative methods to pass a mandate; there is no significant effect of using the executive branch or a mixture. This research will help public health advocates better understand how to improve vaccination rates.



Ashley Walters

Faculty Advisor: Shari Diamond

The Effects of Neuroscience Evidence in a Civil Court Case

When deciding whether to allow neuroscience testimony at trial, judges must consider its reliability and if it is unduly biasing. While initial research suggested that neuroscience information and neuroimages could be overly persuasive, follow-up studies did not find this bias carrying over to a legal setting. However, previous research only studied criminal cases; the effects in civil cases remain largely unknown. The present study aims to examine how neuroscience evidence and neuroimages relate to jurors' perceptions of liability and compensation in a civil case, and if those perceptions differ based on a claim of post-traumatic stress disorder (PTSD), which is associated with well-documented neurological changes, versus chronic pain, which is viewed with more skepticism. Using an online survey with a summary of a civil case, participants (N = 335) were randomly assigned to one of eight conditions in a 2 (PTSD; chronic pain) X 4 (neuroimage/neurologist/psychologist; neurologist/psychologist; psychologist; no evidence) experimental design. Overall, chronic pain was seen as significantly less credible than PTSD, regardless of evidence presented. However, for the PTSD diagnosis, the neuroscience/psychology evidence condition was rated as less credible than the other evidence types. It is possible that the neuroscience evidence was too abstract, but the addition of a neuroimage makes the information seem more concrete. While the results suggest that neuroimages may help supplement and clarify neuroscience information, at least for a PTSD diagnosis, further research is needed to fully understand the persuasiveness of neuroscience evidence and how it should be applied in the legal system.



Deborah Wu

Faculty Advisor: Wendi Gardner

Impressions of Gender Nonconforming Appearances and Behaviors in Children

The presence of gender nonconformity in children leads to greater risks of bullying and lower well-being. Since previous gender nonconformity research has mostly focused on behaviors or appearance separately, these studies examined whether appearance or behavior has a greater impact on people's opinions of gender nonconforming children. In pilot studies, 100 participants rated children's faces and behaviors in masculinity and femininity. In Studies 1 and 2, 271 participants on MTurk rated how concerned they were for 8 bullied children in a 2(gender)x2(conforming/nonconforming appearance)x2(conforming/nonconforming behavior) experimental design. People were concerned for boys if they acted feminine, but not if they looked feminine. However, participants were the most concerned for girls who looked masculine regardless of their behaviors. Thus, people based their opinions off of the child's gender, as people were the most concerned when boys' behaviors and girls' appearances were gender nonconforming. In Studies 3 and 4, we tested how adults stereotyped the same children by asking them to rate how much the children represented gendered personality traits. 317 participants found boys who acted feminine to be less masculine and more feminine regardless of appearance, corresponding to the higher worry for feminine-acting boys in the previous studies.

However, participants found girls who acted masculine (rather than those who looked masculine) as more masculine and less feminine. Thus, participants found behavior rather than appearance to be more indicative of personality, revealing that only nonconforming personality/behavior leads to worry for boys, while only nonconforming appearance but not personality leads to worry for girls.



Odette Zero

Faculty Advisor: Rebecca Seligman

Cultural Perception of Diabetes in San Miguel Dueñas, Guatemala

The World Health Organization has estimated that prevalence of diabetes has increased from 8% to 14% in Guatemalan women over the last three decades, a higher rate than in most developed countries. Untreated Type 2 Diabetes is endemic to San Miguel Dueñas, Guatemala. The present study involved collection of diabetic illness narratives (n=21) and semi-structured interviews with health workers (n=5) over the course of 11 weeks in Dueñas. The women interviewed were housewives who frequented a free diabetic clinic organized by local 501(c)(3) Open Windows Foundation. Themes were coded into four categories: perception of how diabetes has affected their lives, barriers to care and treatment, perception of medicine and insulin and dietary challenges and choices. It was found that many women became depressed following diagnosis of diabetes because they understood this disease to be a fatal, life-changing condition due to its chronic nature and their lack of access to proper treatment. A major risk factor for diabetes was soda consumption, a cultural commodity that trumped water intake in this population. Low-income diabetic women in Dueñas are unable to pay for transportation to check-ups or medicine, which has led to unmanaged diabetes, a negative perception of pharmaceuticals and fatal outcomes. Interviews re-affirmed findings about Guatemala's insufficient and under-resourced public healthcare system, where the only option for treatment is through the costly private system. Public and civic sector support is needed to control this rising chronic illness.

Guide to Creative Arts Festival

In scheduled order of appearance

Creative Arts Festival

7:00-8:30pm, McCormick Auditorium

In scheduled order of appearance



Lisa Qi

Through the Eyes of the Photographer: A Parody of Orientalist Photography

Even now, some 170 years after the invention of photography, we tend to view photographs as objective images of the world, however, as viewers, we often fail to realize the extent to which a photographer has manipulated their subjects and environment to suit their needs, or to create an aesthetically pleasing shot. Though John Thomson claims to present a fair representation of China through *Illustrations of China and Its People*, it becomes clear through both his descriptions and photographs that his work is heavily influenced by his belief in British imperialistic superiority, and the language he uses to describe the Chinese people treats them as an inferior. His purpose is not to show an “accurate impression” of China and its people, but rather his photographs are a series of contortions and manipulations of reality, the ultimate function of which is to entertain the British people. In this project, I wish to reveal Thomson’s true agenda by focusing on one of his photographs and pointing out the fact that instead of acting as a medium to convey truth and reality, Thomson acts as a manipulator who treats his subjects as objects. I digitally painted a parody of one of Thomson’s photographs and the original size is ~6”x6.5”, 300dpi. It would probably be best to display the work projected rather than printed, but the later can be done.



Samantha Spoll

It Burns: A Theatricalization of the 2011 London Riots

This past summer, I lived in London for eight weeks to research the 2011 London riots. The riots were, and still are, a topic of controversy amongst Londoners, since no one knew quite where to place the blame. The rioting began in Tottenham during a peaceful protest after a young black man was shot by a police officer. Quickly, people from all over the city came to participate in the looting and destruction. The riots devastated certain areas of London, while other wealthier boroughs were entirely untouched. I planned to write a play with my findings, and I hoped that my interviews would capture the varying perspectives on the riots. I wanted the play to reveal insight into why certain people were involved and others uninvolved. I stayed in a flat in Tottenham, sat in on meetings for campaigns/grassroots organizations, went to community organizing workshops, attended protests and demonstrations, and interviewed Londoners of different economic classes. For the characters in the play, I chose a group of teenagers who participated in the riots, a wealthy couple, and an elderly disabled woman who recently had her disability benefits cut. Each of the characters was inspired by a

combination of people I met, and each has a different opinion about the riots. I found the mainstream media in London to have a conservative bias. If you were to read about the riots on the internet, you would read that they were solely driven by greed and opportunism. I hope that the play can complicate this argument and bring untold stories from the riots to light. Performed by Jenna Levin and Noah LaPook. Directed by Joan Sergay.



Olivia Peace and Ethan Senser

Pangaea

Pangaea is a short film written and directed by Olivia Peace and produced by Ethan Senser. The film aims to comment on the lives of the children whose lives were drastically changed by the aftermath of Hurricane Katrina and the flooding that followed it, as well as on the role of those who experienced the events on television from the safety of their own living rooms. *Pangaea* was shot by a group of Northwestern University students over the course of a week in New Orleans, LA.



Michaella Cipriani

The Nymph's Lament

This piece was written around 1638 by the Italian composer Claudio Monteverdi as part of his 8th book of madrigals. This piece is one of the most theatrical among his madrigals and shows his style drifting away from traditional a cappella polyphonic madrigals towards a new genre he pioneered: opera. This piece is also one of the earliest known examples of “Lamento bass.” This chord progression (I – VII – VI – V) is popular in a wide range of musical genres. You might recognize it from Nina Simone’s “Feeling Good,” The Beatles’ “While My Guitar Gently Weeps” or Led Zeppelin’s “Stairway to Heaven.” These madrigals aren’t usually performed with dance nowadays, but often were around the time of their premiere. Performed by Michaella Cipriani, Arpan Doshi, Cristina Gallo, Alexander Martin, Kyle Walcott, and Cami Goldstein. Choreographed by Vatsala Kumar.



Marisa Shimano

More Than I Can Say

I find that the most genuine human interactions often occur through actions instead of words. With this piece of choreography, I wanted to show that although we may not always know the perfect words or how to voice them, we show our love in our small, simple, everyday actions. Dance, in all its physicality, was the ideal way, and for me, the only way, to express this idea. Since the eyes and the hands are the most communicative of the body parts, I looked to sign language as inspiration for my movement. By researching American Sign Language, I learned how to sign various words and phrases associated with every day love, such as “how are you,” “we,” and “thank you,” and created gestural

sequences from them. My dancers start in remote corners of the stage to show the isolation of experiencing emotions without knowing how to express them, and then gradually convene and establish eye contact as they discover connection through the “daily actions” of sign language. The volta occurs when the dancers first collide; for a few beats, the dancers pause in a position of vulnerability to show how we have to open ourselves up in order to achieve genuine connection. My hope was for the piece to culminate with the dancers interacting through a series of shared, expository movements, just as we, in life, communicate by developing and exchanging our own languages of love. Danced by Camille Goldstein, Annalissa Hartsell, Jenny Halpern, and Marisa Shimano.



Alya al Harthy

On the Meaning of the Word Knickerbocker: It was his Way of Laughing at the British

This poem is an exploration of my memories regarding my grandfather, who in my childhood was a primary influence in my learning English, and fostering a love for reading and writing. It is a study of memory, and how fading memory can reduce even the greatest of individuals into ghosts of themselves.



Clayton Shuttleworth

Intimate Inter/Actions

Jean-Luc Nancy writes of bodies as being “singular plural.” Bodies are indeed always in relation, simultaneously pushing up against and distancing themselves from each other. It is in this world of bodies that we construct and are subject to meaning. It is this understanding of bodies that I explore through this performance. Based on research funded through the Office of Undergraduate Research, *Intimate Inter/Actions* presents a body—my body—to the audience. It stands without affect, seemingly devoid of subjectivity, an object. It is through other bodies’ interactions with my own that my body is re-imbued with subjectivity. Their “actions” are revealed to be “interactions”, reciprocal rather than unidirectional. The distinction between audience and performer—between body and body—breaks down. I become more than myself as my body is constructed and defined by the bodies, surfaces, and spaces I come up against. Audience members discover their bodies’ own limits as they touch upon mine. These reciprocal touches, far from objectifying either body, reveal themselves as unexpectedly intimate exchanges, creating and affirming space for both. I perform this piece for audience members to consider their own bodies by investing in another. *Intimate Inter/Actions* is an extension of my thesis research on the body as revealed through performance, which was presented in April at University of Pittsburgh’s Undergraduate Research Conference on Gender and the Body. Performed first as a final class performance and most recently as part of Northwestern’s 2016 Queergasm, this performance asks spectators to invest themselves in the collective maintenance of a body, imbuing it with a unique multiplesubjectivity. Where does one body end and another begin? How does intimacy operate? What possibilities does it open up? *Intimate Inter/Actions* exposes audience member’s own bodies to themselves as they negotiate the way their bodies fit into the performance, alongside and against each other.

Elizabeth Baker

Defined Lines

A spoken word poetry piece addressed to a brother about sexual violence and how to stop it. It is spoken by over 70 girls from Evanston Township High School from where I have recently graduated. I started to write this poem because I was angry. I was angry at a situation that seemed impossible to solve. The rape culture that appears in our society today is founded on ignorance and the objectification of women. *But no one knows this.* I realized nothing could be solved by being angry but it could be solved by teaching. That anger turned into a passion to educate and enlighten people because sexual violence is something we are unbelievably uneducated on. People think that sexual violence is an issue happening 500 miles away and it's not. It's in our city, schools, and classrooms. Right now, we don't take this issue personally, and we need to. We need to stand together just as the 70 women who have helped me to create this film have, and put a stop to this culture. And education is the first step.



Hayeon Kim

Not Forgotten: Performing Oral Histories of Contemporary Korean American Activism

Over the summer, I conducted intensive interviews with eight Korean American activists and community leaders who are heavily involved in the political movement of Korean reunification and U.S. immigration politics. *Not Forgotten* is a performance work of these oral history interviews and is designed to give voice to individuals who are often not recounted in American history. I feature the stories of some of these individuals and use only their words in order to depict a fragmented sense of belonging to Korea yet an assumed responsibility to address homeland issues. In particular, I am interested in how legacies of war and American imperialism pivots Korean Americans at the center of the political debates, including Korean reunification and immigration rights. The narrations of the selected interviews reveal that Korean Americans disrupt the political binary of Korean-specific and Korean American issues by informing their activism with their immigration experience and cultural ties to Korea. In particular, I will feature activists who advocate for peaceful settlement of the two Koreas, remembrance of the Korean War Armistice Day, and immigration rights. By performing these monologues, I seek to bring legacies of the Korean War, dubbed the "Forgotten War," in conversation with contemporary Korean American activism.



Caroline Spikner

Scaffolding

"Scaffolding" explore the ways in which the body may imitate the shapes and lines created by our physical surroundings. The project was created as a challenge to create a piece of art inspired by a single word. Each dancer was asked to choose a structure on campus to embody, and then used these on-site studies to create the choreography featured in the video. Throughout the process it has become

evident that each person views their surroundings from contrasting points of view. Although in many cases dancers were filmed moving in reaction to the same structure, each dancer's material is extremely unique. While the discoveries made throughout the creative process fit into the extensive history of postmodern movement explorations, the camera the choreography highlights the dancers and their surroundings equally. Instead of using dancers as the dominant component of the piece, this project aims to illustrate movers and structures (human, natural, and man-made) as equal parts in a co-dependent system.



Daniel Stromfeld

Two Shakespeare Arias

1. "Come dal ciel precipita" from MACBETH by Verdi
2. "Our Revels Now Are Ended" from THE TEMPEST by Hoiby

Both of these arias are adapted from Shakespeare plays, and they will be featured in my senior recital, which is titled "O Fortuna." Each set of music in my recital will consist of music that depicts universal emotions, such as love, anguish, joy and sadness; all of which illustrate life's "Wheel of Fortune." "Come dal ciel precipita" describes a character's frightening confrontation with betrayal and death, while its following piece, "Our revels now are ended," describes one's celebration of life and acceptance of unfortunate situations. I enjoy performances that include a moral that inspires positive change. The moral of my recital is that there is beauty and a lesson to be learned in all circumstances. We humans are a product of our experiences; therefore if we can channel these experiences into positive self-reflection, there is a hidden positive quality in misfortune. The world always continues to revolve, which is something to be celebrated. Assisted by Chuck Foster, piano.



Martin Downs, Shea Lee, and Jonathan Mathias

The Panini Players Commedia dell'Arte Troupe

We represent the Panini Players, Northwestern's Commedia dell'Arte troupe, who have been active on campus for five years. Commedia dell'Arte is a form of theatre that developed in Italy in the fifteenth century. It utilizes many characters, each with a mask and a distinct physicality, to represent archetypes such as a young lover, a bumbling servant, a mysterious foreigner, or a miserly old man. Many of these same stock characters are easily recognizable in media today. It was the first form of theatre to allow women onstage (and to pay actors), so although female characters had distinct physicalities, they rarely wore masks like the male characters. Although Commedia dell'Arte evolved into many different styles over the centuries, the Panini Players practice a very early form. We develop the underlying structures of amusing physical bits called lazzi, and then layer scenarios on top for the characters to play out. The physical comedy and jokes are often bawdy and irreverent, and the scenarios ascribe loosely to the societal standards of fifteenth century Italy. Our resulting performances are improvised within this set structure, and we mount an hour-long show in this format once every quarter. Additionally, Commedia dell'Arte performances historically included

food - with that tradition in mind, audience members at our full-length shows can create their own paninis to enjoy during the performance.



Elio Bucky

Le Dernier Poème

“Le Dernier Poème” is a new musical setting of a translation of Robert Desnos’s poem of the same name. I first came across the poem in French, written on the walls of the Mémorial des Martyrs de la Déportation, the Holocaust Memorial in Paris. As we live through a new era of global terror, where terrorist groups are threatening the ability of people to live out their lives peacefully, Desnos’s melancholy words are as timely as ever. This setting of Desnos’s poem is truly motivated by the text. The song is mostly homophonic, and is meant to sound like a multilayered yet single voice. The range between the bottom and top notes expands at the most powerful moments, yet the majority of the piece lies in fairly close harmonization. Desnos’s poem speaks about the shadow of his loved one that he misses, and the latter half of the piece uses hums, drones, and repetition to create the impression of a shadow cast by the text. The piece ends on hummed repetition of the first phrase, and ends unresolved. Written by Elio Bucky. Performed by Alexander Rothfield, Anna Piparo, Anna Ucik, Ben Perri, Cassidy Cottle, Drew Tanabe, Grace Bobber, Henry Koch, Ian Clark, Jack Reeder, Joe Badion, Joon-Sung Choe, Kandise LeBlanc, Phoebe Glowacki, Russell Pinzino, and Will Fandek.

Creative Arts Festival

Jury

Tara Mallen, Rivendell Theatre

Mickie Pascal, Pascal-Rudnicke Casting

Jennifer Rudnicke, Pascal-Rudnicke Casting

Joe Zarrow, Playwright and Actor



Stage Manager

Sam Garrott



Master of Ceremonies

Nathaniel Kier



**∞ Guide to High School Showcase
Presentations**

NU High School Project Showcase

Poster Presentations, 1:30 - 2:40

Wildcat Room (101), Big Ten Room (104)

Adlai E. Stevenson High School

1. **Aman Grover**, “The Effect of Ethanol on the Efficacy of SAHA to Inhibit Proliferation and H3K9 Deacetylation in Breast Cancer Cells” Advisor, Christina Palffy.
2. **Christie Kang**, “The Effect of the Protein Ribbon on Stem Cell Differentiation in the Testes of *Drosophila melanogaster*.” Advisor, Christina Palffy.
3. **Aaron Kennerley**, “The Effect of Sleep Mode on Current Consumption.” Advisor, Christina Palffy.
4. **Srikar Rapaka, Sannidhi Sarvadhavabhatla** “Effect of DMT (Dimethyltryptamine) on *Leishmania tarentolae* Cells.” Advisor, Christina Palffy.
5. **Shreya Sriram**, “The Antibacterial Effects of Honey on the Growth of E. Coli.” Advisor, Christina Palffy.
6. **Cindy Yao**, “Mycorrhizal Associates of Forest Trees of the Yucatan Peninsula.” Advisor, Christina Palffy.

Al Raby School for Community and Environment

7. **Desean Franklin, Andria Johnson, Deangelo Jones, Alexis Lewis, Arionna Walker**, “Al Raby Grow Lab.” Advisor, Michael Kosko.

Buffalo Grove High School

8. **Karina Palffy**, “A Comparison of the Reliability of Blood Glucose Monitoring Systems.”

Chicago Math and Science Academy

9. **Yared Melesse**, “Generation and Properties of Ozone.”
10. **Bizimungu Obedi**, “Automobile CO2 Emission and Greenhouse.”

Downers Grove South High School

11. **Mahima Patel**, “The Effect of BPA Released from Heated Plastic Bottles on Fruit Fly Functionality.” Advisor, Jacklyn Naughton.

NU High School Project Showcase

Poster Presentations, *continued*

Glenbrook South High School

12. **Isabella Del Muro**, “The Study of Chitin Decomposition.” Advisor, Jennifer Friedmann.
13. **Nicholas Ermolov, Matthew Moran**, “Raspberry Pi Remote Presence Robot.” Advisor, Michael Sinde.
14. **Nicole Kretekos**, “The Physics Behind Timbre.”

Glenbrook North High School

15. **Kevin Xing**, “Wind Farm Optimization.” Advisor, Jacklyn Naughton.

Illinois Math and Science Academy

16. **Adrian Bebenek**, “Development of an Antibody-Targeted PET Probe for the Early Diagnostic Imaging of Alzheimer's Disease.”
17. **Jyotsna Bitra**, “Use of a Novel Magnetic Resonance Imaging Compatible Head-Positioning Device for Three Dimensional Kinematic Analysis of the Cervical Spine in Axial Rotation.” Advisor, Robyn Fischer.
18. **Felicia Chen**, “Understanding Ultrasonic Propagation in Ablative Materials.”
19. **Krishi Korrapati**, “Analysis of High Throughput Gene Array Data Identifies Common Cellular Pathway to Treat Hearing Loss.” Advisor, Debashree Mukherjea.
20. **Lisa Lin**, “A Comprehensive Look at Nucleon Decay Modes for the DUNE Experiment.”
21. **Amy Liu**, “The Influence of Daoist Principles on Chinese Traditional Medicine, With Regards to Acupuncture and Herbal Remedies.”
22. **Soomin Park**, “FPGA Implemented on TDC: Improving its Resolution.” Advisor, Jinyan Wu.
23. **Shyam Sai**, “The Generalized Collatz Conjecture.”
24. **Snigdha Sharma**, “The Effects of Neonatal Alcohol Exposure on Cerebellar Lobules in a Mouse Model of Fetal Alcohol Spectrum Disorder.”
25. **Aspen Wheeler**, “Inferences of Subglacial Processes under the West Antarctic Ice Sheet from Grain Surface Textures.”

James B. Conant High School

26. **Aditi Katwala**, “A Meta Analysis of the Chemical Makeup of Sodas and its Effects on Bones.”

NU High School Project Showcase **Poster Presentations,** continued

Kankakee High School

27. **Celeste Shea**, “Infrared Photon Absorption and Emission in Paper.” Advisor, Jacklyn Naughton.

Lincoln Park High School

28. **Jorge Jaimes**, “Drawing Robot.” Advisor, John Caby.
29. **Kyla Kennedy-Wiilis, Cameron Feiler, Whisper Franklin, Iyanna Buford-Brooms, Tykiese Clemons**, “Genetically Modified Foods” Advisor, John Caby.
30. **Nathaniel Mohill, Evannah Vernon**, “Electrical engineering for musical instruments” Advisor, John Caby.
31. **Kira Ramirez, Andrew Walker, Sandra Zambrano**, “Computer Aided Design and 3D printing.” Advisor, John Caby.
32. **Benjamin Wax**, “3D Printing.” Advisor, John Caby.

Lindblom Math and Science Academy

33. **Anthony Bartley**, “D. discoideum discoidin Relevance to Human Cell Interactions.” Advisor, Elizabeth Copper.
34. **Lorri Spaulding**, “Vapor vs. Tobacco, Which Is Less Harmful?” Advisor, Elizabeth Copper.

Neuqua Valley High School

35. **Manasvi Tatineni**, “The Effect of Psychological Conditions on Gastrointestinal Symptoms.” Advisor, Jacklyn Naughton.

Niles North High School

36. **Sara Siddiqui**, “The Mycoremediation of Polychlorinated Biphenyls using Pleurotus Ostreatus in a Soil-like Medium.”

Pheonix Military Academy

37. **Alejandra Olaguez**, “Cheating with Dice.” Advisor, Beatrice Jaji.

NU High School Project Showcase **Poster Presentations,** *continued*

- 38. **Jeffrey Ren**, “The Efficiency of Propellers.” Advisor, Beatrice Jaji.
- 39. **Octavio Sanchez**, “Modeling Space-time.” Advisor, Beatrice Jaji.

Prospect High School

- 40. **Lauren Beauban**, “Exoplanet Exploration.” Advisor, Katie Page.
- 41. **Lizzie Fanslow, Nicole Brzys**, “The Effect of Ibuprofen on Plants.” Advisor, Katie Page.
- 42. **Meredith Nyborg**, “Denaturing Proteins.” Advisor, Katie Page.
- 43. **Elisa Paul, Cameron Kelly**, “The Effect of Store Bought Products and Home Remedies on Acne.” Advisor, Katie Page.

St. Francis High School

- 44. **William Ong**, “Vacuum Aerodynamics.” Advisor, Jacklyn Naughton.

University School of Milwaukee

- 45. **Arundhati Pillai**, “Next Generation Surgical Tool using Three-Dimensional (3-D) Printing for Cerebral Aneurysm Treatment.”
- 46. **Irene Keselman**, “The Effect of Ambient Lighting on Mood.” Advisor, Barry Hanrahan.
- 47. **Jacob Sweetow**, “The Effectiveness of Video Learning versus Direct Teaching.” Advisor, Barry Hanrahan.

Von Steuben Metropolitan Science Center

- 48. **Erika Anderson**, “Poop to Power!” Advisor, Emmanuel Aldana.
- 49. **Mohammed Chisti**, “Wind Power: Greener Future.” Advisor, Carrie Kaestner.
- 50. **Ali Colak**, “Cleaning Hazardous Waste with Robots.” Advisor, Carrie Kaestner.
- 51. **Colette Conway**, “Which Fabric Moves the Fastest Through Water?”
- 52. **Angelica Rose Galvan**, “The Structural Integrity of Platonic Solids.” Advisor, Jennifer Rodan.
- 53. **Hazel Rose Galvan**, “Polyaniline Synthesis.” Advisor, Carrie Kaestner.
- 54. **Malia Gehrenbeck**, “Dissolution Time of Enteric Aspirin Brands.”

NU High School Project Showcase **Poster Presentations,** continued

Walter Payton College Prep

55. **Nova Xu**, “Combating Dust Storms with Wiper Mechanism.”

Waubonsie Valley High School

56. **Kareena Garg**, “Dietary Supplements Affect on Pancreatic Lipase Inhibition.” Advisor, Jacklyn Naughton.

Judges for the NU High School Project Showcase, Poster Presentations

Shiva Ashari, Northwestern University – Civil Engineering
Katie Breivik, Northwestern University – Physics and Astronomy
Adam Dempsey, Northwestern University – Physics and Astronomy
Schnaude Dorizan, Northwestern University - Neuroscience
Justin Finkle, Northwestern University – Interdisciplinary Biological Sciences
Zachary Hafen, Northwestern University – Physics and Astronomy
Jessica Lenoir, Northwestern University – Molecular Biosciences
Angang Li, Northwestern University – Civil and Environmental Engineering
Alane Lim, Northwestern University – Materials Science and Engineering
Qingyuan Lin, Northwestern University - Materials Science and Engineering
Binbin Luo, Northwestern University – Chemical and Biological Engineering
Alicia McGeachy, Northwestern University - Chemistry
Saoirse McSharry, Northwestern University – Molecular Biosciences
Y'Shanda Rivera, Northwestern University – SESP – Learning Sciences
Jennifer Schoborg, Northwestern University – Chemical and Biological Engineering
Niharika Sravan, Northwestern University – Physics and Astronomy
Nicholas Thornburg, Northwestern University – Chemical and Biological Engineering
Rachel Watson, Northwestern University – Chemical and Biological Engineering
Victoria Weidner, Northwestern University - Chemistry
Thomas Wytock, Northwestern University – Physics and Astronomy
Albert Xue, Northwestern University – Chemical and Biological Engineering
Khalid Zeineddine, Northwestern University – Electrical Engineering

NU High School Project Showcase Planning & Organization

Office of STEM Education Partnerships
Amy Pratt, Michelle Paulsen, Emily DePalma



NU High School Mentors

Ebony Calloway, Jonathan Cohen, Victoria Larsen, Nick Medrano,
Will Oestreich, Grace Phelps, Carrie Willis



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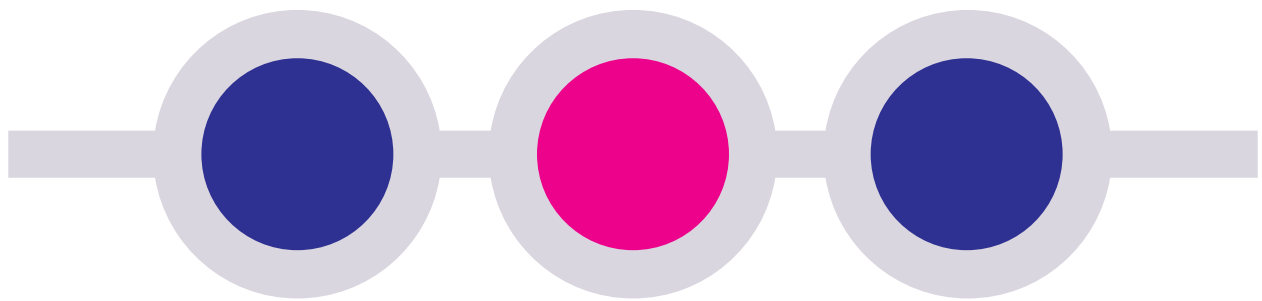
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