Office of the Provost Northwestern University
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NORTHWESTERN
UNIVERSITY

Dear Members of the Northwestern Community:

Undergraduate research experiences at Northwestern continue to expand. We firmly believe in the impact of these experiences on our students, helping them to 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. All of these experiences help them channel their education into the practices that will guide their lives.

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 and Conference Travels Grants. We also saw a doubling of 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 Gardens. We have also increased funding across our social sciences, encouraging students to learn to develop truly individualized, independent projects in anthropology, social policy, and sociology among others. We are also proud of our efforts to engage students in the humanities and arts in research experiences, funding a record number of creative projects this year. Under the tutelage of our outstanding and committed faculty, students are getting to experience 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 help prepare students, the OUR staff worked with over 500 students in almost 1,000 separate meetings this year. The OUR also upgraded its web site to create more online resources, including our highly acclaimed YouTube page of video resources. The OUR recently created an Advisory Council which includes half a dozen students as well as representatives from every school. The goal is to bring all the relevant voices together as we shape the future directions of undergraduate research experiences at Northwestern, including the creation of a new Peer Research Mentors program to help students during their summer research process.

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,

Daniel Linzer
Provost

2015 Program Front Cover Design
By
Julia Watson
Weinberg College of Arts & Sciences, Class of 2015
Political Science, Middle East and North Africa Studies

Exposition Logo Design
By
Taylor Barrett
Weinberg College of Arts and Sciences, Class of 2012
Sociology, Creative Writing: Non-fiction

The 2015 Undergraduate Research and Arts Exposition

Northwestern University's
thirteenth 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

Monday, June 1, 2015

Norris University Center

℘ Contents

Program of Events

10:00-11:30	**Northwestern University Poster Session One** Louis Room (205)
11:00-12:30	**Northwestern University Oral Presentation Session One** Lake Room (203), Arch Room (206), Rock Room (207), Armadillo Room (208)
1:00-2:30	**Northwestern University Oral Presentation Session Two** Lake Room (203), Arch Room (206), Rock Room (207), Armadillo Room (208)
1:30-2:40	**NU High School Project Showcase Poster Session** Wildcat Room (101), Big Ten Room (104)
2:30-4:00	**Northwestern University Poster Session Two** Louis Room (205)
8:00-9:30	**Creative Arts Festival**: Theatre and Interpretation Center Struble Theatre
9:30-10:30	**Post-Show Reception**: Theatre and Interpretation Center Struble Theatre; Open to all presenters and attendees

Office of Undergraduate Research Advisory Council

Beth Bennett Assistant Professor, Medill School of Journalism

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

Steve Carr Associate Dean, McCormick School of Engineering and Applied Science

Monica Cheng Editor in Chief, Northwestern Undergraduate Research Journal

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

Alex Heller Student representative, Arts and Humanities

Olive Jung Student representative, Chicago Area Undergraduate Research Symposium

Gina Livecchi Student representative, Northwestern University Associated Student Government

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

Kristen Omara Student representative, Natural 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

Jane Rankin Associate Dean, School of Communication

Sara Vaux Director, Office of Fellowships

Exposition Planning & Organization

Office of Undergraduate Research

Peter Civetta Director

Mary Leighton Assistant Director

Emily Hittner Advisor, Student Outreach, and Administration

Gretchen Oehlschlager 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 program 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
Institute for Policy Research: www.northwestern.edu/ipr/ugradresearch.html
Center for Global Engagement: http://www.cge.northwestern.edu/grant-opportunities
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: northwestern.edu/african-studies/undergraduate-studies/awards.html
Anthropology: anthropology.northwestern.edu/about/labs.html
Astrophysics: ciera.northwestern.edu/Research/undergraduate_research_opportunities.php
Biochemistry-Morimoto Laboratory Undergraduate Research Seminars:
biochem.northwestern.edu/ibis/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: wcas.northwestern.edu/psych/undergraduate_studies/research_opportunities

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

McCormickOpportunities: mccormick.northwestern.edu/undergraduates/research/index.html
Biomedical Engineering: bme.northwestern.edu/undergraduate/research.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
McCormick Office of Corporate Relations, Corporate Partner Undergraduate Research Grants: mccormick.northwestern.edu/companies/index.html
Nanoscale Science and Engineering Center: nsec.northwestern.edu/REU.htm

Medill School of Journalism

Eric Lund Global Reporting and Research Fund: medill.northwestern.edu/experience/bsj/exclusives/eric-lund-global-reporting-research-grant.html

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: northwestern-urj.org

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: northwestern.edu/fellowships

☙ Directory of Northwestern Student Presenters

Last Name	First Name	Session	Time	Location
Abdullah-Smith	Hazim	Oral Presentation Session One	11:00-12:30	Rock
Agbeh	Antonia	Morning Poster Session, Poster #1	10:00-11:30	Louis
Ali	Syed Owais	Oral Presentation Session Two	1:00-2:30	Arch
Amrofell	Matt	Afternoon Poster Session, Poster #1	2:30-4:00	Louis
Ardeleanu	Katherine	Morning Poster Session, Poster #20	10:00-11:30	Louis
Aunins	Thomas	Afternoon Poster Session, Poster #2	2:30-4:00	Louis
Baker	George	Oral Presentation Session Two	1:00-2:30	Lake
Barmore	Lauren	Afternoon Poster Session, Poster #10	2:30-4:00	Louis
Baum	Alexander	Morning Poster Session, Poster #21	10:00-11:30	Louis
Benjamin	Alex	Oral Presentation Session Two	1:00-2:30	Rock
Benjamin	Alex	Creative Arts Festival	8:00-9:30	Struble Theater
Bernstein	Ben	Morning Poster Session, Poster #22	10:00-11:30	Louis
Bluth	Carly	Afternoon Poster Session, Poster #34	2:30-4:00	Louis
Boxerman	Josh	Oral Presentation Session Two	1:00-2:30	Arch
Bridgewaters	Sarah	Oral Presentation Session Two	1:00-2:30	Armadilo
Brockman	Aozora	Oral Presentation Session Two	1:00-2:30	Arch
Calloway	Ebony	Morning Poster Session, Poster #2	10:00-11:30	Louis
Cassell	Anna	Oral Presentation Session One	11:00-12:30	Armadillo
Cavanaugh	Robert	Oral Presentation Session Two	1:00-2:30	Lake
Chan	Rosalie	Afternoon Poster Session, Poster #18	2:30-4:00	Louis
Chen	He	Afternoon Poster Session, Poster #38	2:30-4:00	Louis
Chen	Sharon	Morning Poster Session, Poster #9	10:00-11:30	Louis
Cheng	Larry	Morning Poster Session, Poster #24	10:00-11:30	Louis
Chon	Danbee	Oral Presentation Session One	11:00-12:30	Armadillo
Cleary	Peter	Morning Poster Session, Poster #25	10:00-11:30	Louis
Cobb	Kate	Afternoon Poster Session, Poster #19	2:30-4:00	Louis
Cohen	Jonathan	Afternoon Poster Session, Poster #20	2:30-4:00	Louis
Collins	Maya	Afternoon Poster Session, Poster #21	2:30-4:00	Louis
Conger	Elizabeth	Oral Presentation Session Two	1:00-2:30	Lake
Coukos	Robert	Afternoon Poster Session, Poster #11	2:30-4:00	Louis
Dalvie	Neil	Morning Poster Session, Poster #3	10:00-11:30	Louis
Dickey	Austin	Afternoon Poster Session, Poster #3	2:30-4:00	Louis
Du	Matthew	Morning Poster Session, Poster #10	10:00-11:30	Louis
Ejzak	William	Oral Presentation Session One	11:00-12:30	Rock
Ferber	Michelle	Afternoon Poster Session, Poster #12	2:30-4:00	Louis
Fillion	Elizabeth	Afternoon Poster Session, Poster #22	2:30-4:00	Louis

Last Name	First Name	Session	Time	Location
Foster-Gimbel	Olivia	Oral Presentation Session Two	1:00-2:30	Armadilo
Geary	Moira	Oral Presentation Session Two	1:00-2:30	Rock
Geisendorfer	Nicholas	Oral Presentation Session One	11:00-12:30	Lake
Glaser	Rebecca	Morning Poster Session, Poster #4	10:00-11:30	Louis
Glazier-Torgerson	Amy	Morning Poster Session, Poster #23	10:00-11:30	Louis
Gore	Alexandra	Afternoon Poster Session, Poster #23	2:30-4:00	Louis
Heidinger	Clifford	Afternoon Poster Session, Poster #24	2:30-4:00	Louis
Henry	Laura	Afternoon Poster Session, Poster #25	2:30-4:00	Louis
Herndon	Richard	Afternoon Poster Session, Poster #26	2:30-4:00	Louis
Heydari	David	Afternoon Poster Session, Poster #4	2:30-4:00	Louis
Hittle	Adam	Creative Arts Festival	8:00-9:30	Struble Theater
Houskeeper	Sam	Afternoon Poster Session, Poster #35	2:30-4:00	Louis
Howard	Chris	Afternoon Poster Session, Poster #12	2:30-4:00	Louis
Hurley	Joseph	Oral Presentation Session One	11:00-12:30	Lake
Hyland	Kelly	Oral Presentation Session One	11:00-12:30	Lake
Jiang	Qingjia	Oral Presentation Session Two	1:00-2:30	Arch
Kirshner	Mitchell	Afternoon Poster Session, Poster #13	2:30-4:00	Louis
Kumar	Sunjay	Afternoon Poster Session, Poster #33	2:30-4:00	Louis
Lamp	Nathan	Oral Presentation Session Two	1:00-2:30	Rock
Larsen	Elizabeth	Oral Presentation Session One	11:00-12:30	Arch
Larsen	Tori	Afternoon Poster Session, Poster #27	2:30-4:00	Louis
Lee	Paul	Morning Poster Session, Poster #11	10:00-11:30	Louis
Leshin	Rachel	Oral Presentation Session Two	1:00-2:30	Armadilo
Less	Lola	Morning Poster Session, Poster #26	10:00-11:30	Louis
Levin	Emily	Morning Poster Session, Poster #5	10:00-11:30	Louis
Lin	Jeffrey	Afternoon Poster Session, Poster #5	2:30-4:00	Louis
Lin	Alex	Morning Poster Session, Poster #6	10:00-11:30	Louis
Maeng	Yujin	Oral Presentation Session Two	1:00-2:30	Arch
Mallick	Rabeya	Afternoon Poster Session, Poster #28	2:30-4:00	Louis
Marcusson	Courtney	Oral Presentation Session One	11:00-12:30	Armadillo
Marks	Sean	Morning Poster Session, Poster #7	10:00-11:30	Louis
Marone	Jessica	Morning Poster Session, Poster #27	10:00-11:30	Louis
McBride	Jonathon	Oral Presentation Session One	11:00-12:30	Lake
McMonigal	Kayleen	Morning Poster Session, Poster #12	10:00-11:30	Louis
Medrano	Fortunato	Oral Presentation Session One	11:00-12:30	Armadillo
Mok	Kenneth	Oral Presentation Session One	11:00-12:30	Arch
Moler	Chelsey	Oral Presentation Session One	11:00-12:30	Rock
Morales	Eric	Afternoon Poster Session, Poster #29	2:30-4:00	Louis
Morales	Eric	Morning Poster Session, Poster #28	10:00-11:30	Louis
Moravek	Jessie	Oral Presentation Session Two	1:00-2:30	Lake

Last Name	First Name	Session	Time	Location
Morrison	Billy	Afternoon Poster Session, Poster #30	2:30-4:00	Louis
Nadig	Ajay	Afternoon Poster Session, Poster #24	2:30-4:00	Louis
Nagasawa	Katherine	Creative Arts Festival	8:00-9:30	Struble Theater
Neilson	Susie	Oral Presentation Session One	11:00-12:30	Arch
Neilson	Susie	Creative Arts Festival	8:00-9:30	Struble Theater
Nelson	Victoria	Morning Poster Session, Poster #8	10:00-11:30	Louis
Nemzer	Eli	Afternoon Poster Session, Poster #19	2:30-4:00	Louis
Northard	Emily	Oral Presentation Session Two	1:00-2:30	Lake
Oestreich	William	Morning Poster Session, Poster #13	10:00-11:30	Louis
Omara	Kristen	Oral Presentation Session Two	1:00-2:30	Lake
Ovalle	Jacqueline	Creative Arts Festival	8:00-9:30	Struble Theater
Pairs	Pranee	Afternoon Poster Session, Poster #14	2:30-4:00	Louis
Park	Spencer	Afternoon Poster Session, Poster #6	2:30-4:00	Louis
Patel	Kruti	Afternoon Poster Session, Poster #15	2:30-4:00	Louis
Perkins	Mitchell	Afternoon Poster Session, Poster #7	2:30-4:00	Louis
Phelps	Grace	Afternoon Poster Session, Poster #16	2:30-4:00	Louis
Plain	Sarah	Afternoon Poster Session, Poster #8	2:30-4:00	Louis
Powers	Jessica	Morning Poster Session, Poster #29	10:00-11:30	Louis
Quadri	Zaynab	Oral Presentation Session One	11:00-12:30	Arch
Rajanala	Alekya	Morning Poster Session, Poster #14	10:00-11:30	Louis
Reese	Jen	Creative Arts Festival	8:00-9:30	Struble Theater
Reichova	Viktorie	Afternoon Poster Session, Poster #17	2:30-4:00	Louis
Reynolds-Ejzak	William	Creative Arts Festival	8:00-9:30	Struble Theater
Rice	David	Morning Poster Session, Poster #15	10:00-11:30	Louis
Rosengren	Danica	Oral Presentation Session Two	1:00-2:30	Rock
Rubanis	Spyrithon-Pyrro	Afternoon Poster Session, Poster #36	2:30-4:00	Louis
Schwartz	Joshua	Morning Poster Session, Poster #34	10:00-11:30	Louis
Scott	Katherine	Oral Presentation Session Two	1:00-2:30	Rock
Scott	Katherine	Creative Arts Festival	8:00-9:30	Struble Theater
Scott	Katherine	Creative Arts Festival	8:00-9:30	Struble Theater
Seligman	Olivia	Morning Poster Session, Poster #30	10:00-11:30	Louis
Shavlik	Margaret	Oral Presentation Session Two	1:00-2:30	Armadilo
Silverman	Kalina	Creative Arts Festival	8:00-9:30	Struble Theater
Sirota	Karina	Afternoon Poster Session, Poster #26	2:30-4:00	Louis
Smith	Jason	Afternoon Poster Session, Poster #31	2:30-4:00	Louis
Sobhani	Mahalia	Creative Arts Festival	8:00-9:30	Struble Theater
Sonenthal	Haley	Morning Poster Session, Poster #31	10:00-11:30	Louis
Song	Albert	Oral Presentation Session One	11:00-12:30	Lake
Stephens	Jasmine	Oral Presentation Session Two	1:00-2:30	Armadilo
Subramani	Nishant	Afternoon Poster Session, Poster #9	2:30-4:00	Louis

Last Name	First Name	Session	Time	Location
Svabek	Larry	Oral Presentation Session One	11:00-12:30	Arch
Tai	Rex	Morning Poster Session, Poster #16	10:00-11:30	Louis
Torgerson	Jacqueline	Oral Presentation Session One	11:00-12:30	Rock
Varwig	Kyle	Creative Arts Festival	8:00-9:30	Struble Theater
Veerina	Abhinav	Morning Poster Session, Poster #35	10:00-11:30	Louis
Vernon	Emily	Oral Presentation Session One	11:00-12:30	Rock
Wagner	Linzy	Morning Poster Session, Poster #32	10:00-11:30	Louis
Walker	Kaela	Creative Arts Festival	8:00-9:30	Struble Theater
Wilber	Karen	Afternoon Poster Session, Poster #32	2:30-4:00	Louis
Willis	Carrie	Afternoon Poster Session, Poster #37	2:30-4:00	Louis
Wu	Deborah	Morning Poster Session, Poster #33	10:00-11:30	Louis
Wustenberg	Lauren	Oral Presentation Session Two	1:00-2:30	Lake
Yang	Angela	Afternoon Poster Session, Poster #15	2:30-4:00	Louis
Yang	John	Morning Poster Session, Poster #17	10:00-11:30	Louis
Yang	Simon	Morning Poster Session, Poster #18	10:00-11:30	Louis
Yu	Yang	Morning Poster Session, Poster #19	10:00-11:30	Louis
Zhao	Kevin	Oral Presentation Session One	11:00-12:30	Lake

℘ Guide to Poster Presentations

℘ Poster Session One

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

Natural Sciences & Engineering

1. **Antonia Agbeh,** "Understanding Surface Haptics for Children?s Tablet-Based Reading Experiences"
2. **Ebony Calloway,** "Musical Notation without a MIDI"
3. **Neil Dalvie,** "Developing a Platform for Testing Modular Biosensors in the Lycopene Biosynthetic Pathway"
4. **Rebecca Glaser,** "Processing of Ni-free Solid Oxide Fuel Cell Anodes"
5. **Emily Levin,** "Meteorite Classification"
6. **Alex Lin,** "Classifying the Severity of Grain Boundary Corrosion in CoCrMo Biomedical Implants"
7. **Sean Marks,** "Multi-scale simulations of nanoporous materials for xenon-krypton separations"
8. **Victoria Nelson,** "Effective Interactions between Lock-and-Key Colloids"
9. **Sharon Chen,** "Mutations in ELANE produce unfolded protein response: a mechanism for severe congenital neutropenia (Kostmann Syndrome)"
10. **Matthew Du,** "Catalytic Conversion of Fructose to 5-HMF Using a Porous Organic Polymer"
11. **Paul Lee,** "Solution Conformations of Chiral Mannich Bases"
12. **Kayleen McMonigal,** "Calcite Rafts of the Yucatan Peninsula: An Expanded Paleo Sea Level Record"
13. **William Oestreich,** "Colored dissolved organic matter in shallow estuaries: the effect of source on quantification"
14. **Alekya Rajanala,** "Long Distance Homonymous Hemi-Macular Retrograde Degeneration of the Visual Pathway: A Comparison of Anterior and Posterior Visual Pathway Lesions"
15. **David Rice,** "Understanding dynamical instability in exoplanetary systems"
16. **Rex Tai,** "Chronic administration of methamphetamine induces progressive loss of substantia nigra pars compacta dopaminergic neurons in a dose-dependent and withdrawal time-dependent manner"
17. **John Yang,** "Investigating the mechanism of piperazine-derived microtubule binding compound cytotoxic action"
18. **Simon Yang,** "Modular Production of Her2-UCHT Bispecific Antibodies using fusion proteins"
19. **Yang Yu,** "Redox Thermochemistry of Transition Metal Sulfides with GGA+U Calculations"

℘ Poster Session One, continued

Social Sciences & Journalism

20. **Katherine Ardeleanu,** "Anxious Arousal versus Anxious Apprehension: An EEG Study Examining Cue P3; SPN; FRN; and FB-P3"
21. **Alexander Baum,** "Family Board Game Play: Parent-Child Interactions and How to Turn Up the Heat on Children's Learning"
22. **Ben Bernstein,** "Memory Routines for the Transformation of Visuospatial Representations"
23. **Amy Glazier-Torgerson,** "Emotional Support among Low-Income Mothers Enrolled in a Two-Generation Program"
24. **Larry Cheng,** "Targeted Memory Reactivation with Flashing Lights"
25. **Peter Cleary,** " 'Am I Ugly?' Expectations and Perceptions of Appearance-Based Feedback from Redditors"
26. **Lola Less,** "Thinking Out Loud: The Internalization of Speech and its Role in the Development of Silent Reading"
27. **Jessica Marone,**" *Inecesáreas*: Understanding the Prevalence of Medically Unnecessary Cesareans in Buenos Aires; Argentina"
28. **Eric Morales,** "The Lasso Of Truth: Gender Portrayal And Character Sexualization In Contemporary Comics"
29. **Jessica Powers,** "Hedonic Capacity; Nicotine Dependence and Withdrawal in Men and Women"
30. **Olivia Seligman,** "Comparing Female and Male College Student Leader's Aspirations for Future Leadership Positions"
31. **Haley Sonenthal,** "Study Abroad Experiences and Identity Development in Emerging Adulthood"
32. **Linzy Wagner,** "Barriers to Mental Health Resource Utilization at Northwestern University"
33. **Deborah Wu,** "Stereotypes in Hiring: A Racial Comparison"

Humanities & Arts

34. **Joshua Schwartz,** "Seeing is Not Believing: Egotism and Uncertainty in the Allied Military Assessment of Imperial Japan; 1931-1941"
35. **Abhinav Veerina,** "Transcending the Mundane: Examining Master-Disciple Relationships in Sufism and Vajrayana Buddhism"

℘ Poster Session Two

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

Natural Sciences & Engineering

1. **Matt Amrofell,** "Decrypting the Tau Phosphorylation 'Code' of Alzheimer's Disease Through Production of Site-Specifically Phosphorylated Tau"
2. **Thomas Aunins,** "Analysis of the Biosynthetic Pathway of Pyrethrin I"
3. **Austin Dickey,** "Modeling the American Obesity Epidemic"
4. **David Heydari,** "High Power Quantum Cascade Lasers with Angled Cavities"
5. **Jeffrey Lin,** "Effects of two new elements on the precipitation evolution and mechanical properties of Al-Sc-Zr-Si alloys"
6. **Spencer Park,** "Influence of Stoichiometry on the Optical and Electrical Properties of CVD Derived MoS2"
7. **Mitchell Perkins,** "NU Models: Real Time Analysis of Transcriptional and Translational Rates in Non-Model Organisms with an Optimized Cell-Free Platform"
8. **Sarah Plain,** "Diffusional Coating Development during Pack Titanization of Nickel Wires"
9. **Nishant Subramani,** "Identifying the Best Predictors of Unmet Health Care Needs in Patients with Disruptive Behavior Disorder"
10. **Lauren Barmore,** "Planetary System Instability and the Distribution of Orbital Period Ratios"
11. **Robert Coukos,** "Diverse mechanisms regulate dynamic interchromosomal gene clustering in S. Cerevisiae"
12. **Michelle Ferber and Chris Howard,** "Point-of-Care Nucleic Acid Test System and Multi-Drug Resistant Tuberculosis Testing for Limited Resource Settings"
13. **Mitchell Kirshner,** "A Rheological Analysis of Lava Tubes and Fans on Olympus Mons; Mars"
14. **Pranee Pairs,** "Design and Synthesis of Spin Crossover PARACEST MRI Thermometers"
15. **Angela Yang and Kruti Patel,** "The Evaluation of Contralateral Acoustic Stimulation on the MOC Efferent System"
16. **Grace Phelps,** "Investigating Tissue-Specific Activity in C. elegans Polyglutamine Models"
17. **Viktorie Reichova,** "The Development of Second-Generation Activatable Co(III) Schiff Base Complexes as Protein Inhibitors with Enhanced Stability"

Social Sciences & Journalism

18. **Rosalie Chan,** "Taiwanese Hakka youth and cultural connection"
19. **Eli Nemzer and Kate Cobb,** "Viva la Bitcoin: The Rise of Digital Currency in Argentina"
20. **Jonathan Cohen,** "Friday Post-Earnings Drift Revisited"
21. **Maya Collins,** "Background noise and working memory: How do different types of background noise affect young children's working memory?"
22. **Elizabeth Fillion,** "The Real Paleo Diet: Meat as a Component of Australopithecus robustus Nutrition"
23. **Alexandra Gore,** "How students understand the purpose of chemistry laboratory: A descriptive analysis"

☙ Poster Session Two, continued

24. **Clifford Heidinger and Ajay Nadig,** "The Relationship Between Anger; Gratification Delay; and Neural Indices of Reward"
25. **Laura Henry,** "Autism Across Cultures: A comparison between the United States and Germany"
26. **Karina Sirota and Richard Herndon,** "How do people find answers to questions they encounter in everyday life?"
27. **Tori Larsen,** "The Experience of Uncertainty among American Youth: Situating Selfhood in Embodied Experience."
28. **Rabeya Mallick,** "The Tumblr Support Community for Concerns Related to Eating Disorders"
29. **Eric Morales,** "Mobile Marketing to Children: A Content Analysis of Food and Beverage Company iDevice Applications"
30. **Billy Morrison,** "Identifying the Theoretical Model that Best Describes Human Decision-Making Under Uncertainty by Empirically Analyzing Responses to Shifts and Rescaling"
31. **Jason Smith,** "A Synthesis of Large Carnivore Management and its Application to Illinois: Black Bears; Gray Wolves; and Cougars"
32. **Karen Wilber,** "Family and Religion in Cochabamba; Bolivia"
38. **He Chen,** "Addressing Conflicts between Customary and Statutory Marriage Laws for the Miao Minority in China and the Role of Miao Elites"

Humanities & Arts

33. **Sunjay Kumar,** "Saturday; November 7th: An Unusual Day In The Life of Abhishek Jadhav"
34. **Carly Bluth,** "Ecocriticism; Entropy; and the Gothic in Poe's Fiction"
35. **Sam Houskeeper,** "Communism in the Countryside: Paradoxes of the International Revolution and their Inception in the First World War"
36. **Spyrithon-Pyrro Rubanis,** "Tolstoy's Moralism: Taking Art (and Ourselves) Seriously"
37. **Carrie Willis,** "Dynamic Landscapes: The Spatiality of Social Relations at Ightham Mote"

☙ Faculty Judges of Undergraduate Posters

Luis Amaral, Chemical and Biological Engineering

Elisa Baena, Spanish and Portuguese

Christine Bell, Art History, Weinberg Academic Advisor

Steve Carr, Materials Science and Engineering

Bernard Dobroski, Music Studies

Adam Goodman, Center for Leadership

Benjamin Gorvine, Psychology

Eszter Hargittai, Communication Studies

Stephen Hill, Anthropology, Office of Fellowships

Philip Hockberger, Physiology

Andrew Jacobson, Earth and Planetary Sciences

Jinah Kim, Asian American Studies

Rachel Lander, Molecular Biology

Hilarie Lieb, Economics, Weinberg Academic Advisor

Joan Linsenmeier, Psychology, Weinberg College of Arts and Sciences

Maria Mastronardi, Communication

SonBinh Nguyen, Chemistry

Fred Northrup, Chemistry

Seda Ogrenci Memik, Electrical Engineering and Computer Science

Magdalena Osburn, Earth and Planetary Sciences

Laura Panko, Biological Sciences, Weinberg Academic Advisor

Ishwar Radhakrishnan, Molecular Biosciences

Jennifer Richeson, Psychology

Andy Rivers, Physics, Weinberg Academic Advisor

Cynthia Robin, Anthropology

Sarah Rodriguez, Medical Humanities and Bioethics, Global Health Studies

℘ Faculty Judges of Undergraduate Posters, continued

Fay Rosner, French, Weinberg Academic Advisor

Galya Ruffer, Political Science, International Studies

Helen Schwartzman, Anthropology

Evan Scott, Biomedical Engineering

Lilah Shapiro, Sociology

Nitasha Sharma, African American Studies, Asian American Studies

Mark Sheldon, Philosophy, Medical Humanities and Bioethics

Yumi Shiojima, Asian and African Languages

David Smith, Psychology

Mike Smutko, Physics and Astronomy

Jason Tait Sanchez, Communication Sciences and Disorders

Paul Umbanhowar, Mechanical Engineering

Akbar Virmani, Political Science, African Studies

Cindy Voisine, Biology

Mark Witte, Economics

Brad Zakarin, History

Rachel Zuckert, Philosophy, German

℘ ☙

Poster Presentation Abstracts

Alphabetical by presenter's last name

Antonia Agbeh

Faculty Advisor: Anne Marie Piper

Understanding the Effects of Haptic Feedback

Can e-book content with tactile feedback, compared to traditional e-book content, aid children's learning? How does tactile feedback affect the parent-child reading experience? This project understands the effects of adding haptic feedback to electronic books. We are conducting a between-subjects laboratory study with 16 parent-child dyads (children 4-7 years old). Specifically, we are evaluating whether haptic feedback has an effect on (1) parent-child interaction with the e-book, including parent use of interrogatives and distraction talk between the dyads and (2) child engagement with the story and overall appeal of the e-reading experience. After reading the book, parents and children participate in a brief interview about their experience. All interactions during the testing sessions are video recorded and coded by the research team. The results of this study provide new empirical evidence of how haptic technology might add to or potentially take away from children's reading experiences. Findings will also guide content designers on whether and how to include haptic feedback in children's educational and entertainment content as surface haptic technology becomes more widely available to consumers.

Matt Amrofell

Faculty Advisor: Michael Jewett

Decrypting the Tau Phosphorylation "Code" of Alzheimer's Disease Through Production of Site-Specifically Phosphorylated Tau

The Tau protein functions as a microtubule stabilizer in neurons. However, when Tau becomes hyper-phosphorylated, neuronal axons degrade due to microtubule destabilization and neurofibrillary tangle formation. These biomarkers are commonly observed and associated with Alzheimer's disease. However, the mechanistic understanding of the phosphorylation "code" behind this process remains unclear. We hypothesize that combinatorial effects of multiple phosphorylation drive the severity of the disease state. My work seeks to produce site-specific phosphorylated Tau at seven disease-associated sites, singly and combinatorially. I will use a phosphoprotein production platform developed in the Jewett lab that employs three primary innovations: (1) An engineered orthogonal translation system (OTS) capable of incorporating a phosphoserine residue at genetically encoded sites, (2) genomically reengineered E. coli strains that support Amber codon suppression by the engineered translation apparatus, and (3) a cell-free protein synthesis (CFPS) platform for expression of human phosphoproteins. The combination of these technologies expands the genetic code to enable the site-specific incorporation of phosphoserine into proteins. I have generated a human-Tau construct optimized for expression in E. coli, as well as variants with amber codons for phosphoserine incorporation. Phospho-Tau variants will be evaluated in microtubule stability and neurofibrillary plaque formation assays. These experiments will provide a foundation for elucidating how the quantity, density, and distribution of serine phosphorylation contribute to Tau-based pathology.

Katherine Ardeleanu

Faculty Advisor: Robin Nusslock

Anxious Arousal versus Anxious Apprehension: An EEG Study Examining Cue P3, SPN, FRN, and FB-P3

The goal of the present study is to examine the relationship between different event-related potentials and symptoms of anxious arousal versus anxious apprehension. To date there has not been much research examining the difference in ERP magnitude between anxious arousal and anxious apprehension. Anxious arousal refers to a state of physiological arousal that is often associated with panic attacks or similar stressful conditions (Nitschke et al., 1999). Physical symptoms such as rapid breathing, increased heart rate, and increased blood pressure are manifested. Anxious apprehension, on the other hand, is characterized by worry and rumination about future events. This state is frequently accompanied by muscle tension, restlessness, and fatigue. For my thesis project, I use EEG data and questionnaires to examine the links between certain ERPs and individual differences in anxious arousal and anxious apprehension. Specifically, I will be analyzing the magnitude of the signals for Cue P3, SPN, FRN, and FB-P3 in response to stimuli, decision-making, and response feedback. These signals are significant indicators of rumination and reaction related to the cues and outcomes of a decision. In order to investigate the relationship between the ERPs and type of anxiety, I will be using the door task, which involves all of these components. Participants will have the opportunity to win or lose money in this task, which will ensure that they are invested in the task..

Thomas Aunins and James Jeffryes

Faculty Advisor: Keith Tyo

Analysis of the Biosynthetic Pathway of Pyrethrin I

Pyrethrins are naturally occurring secondary metabolites produced by the C. cinerariaefolium flower as an insect defense mechanism. These compounds have long been co-opted for use as industrial and household pesticides, but have been usurped by synthetic analogues. With new environmental concerns regarding these analogues there is renewed interest in pyrethrins, though there are gaps in what is known about the biosynthetic pathway through which they are produced. This research used the Biochemical Network Integrated Computational Explorer (BNICE) to generate a large map of potential synthesis pathways for an unknown section of the alcohol moiety of the pyrethrin synthesis. This map was then narrowed down through comparison with previous literature and thermodynamic evaluation to produce a hypothesis that could be tested and verified in a future study using physical experiments. Additionally, a secondary goal of this research was to improve upon the predicting power of the BNICE system by adding metabolic reactions to the library that it draws from when creating the pathway map. Creation of reaction operators primarily drew from Enzyme Commission reaction classes that had not previously been mapped by BNICE, as well as reactions from the E. Coli metabolome. In total 60 operators were created, including 33 from the E. coli metabolome.

Lauren Barmore

Faculty Advisor: Jason Steffen

Planetary System Instability and the Distribution of Orbital Period Ratios

The purpose of this study is to understand the dynamics of planetary orbits outside our solar system. This project focuses on how the ratio of the orbital period from one planet to its neighbor influences the stability of the orbits. We studied this by making simulations of planet systems and analyzing their motion over hundreds of thousands of years. This allows us to see the dynamical evolution of planetary systems over time and the distribution of orbital period ratios at the end of the simulation. We found that there are many more planets in close orbits at the beginning of the simulations than at the end, meaning that some of the close pairs collided or were ejected from the system. We also found that our simulations resulted in some unusual orbital resonance patterns that are not commonly observed in planet systems. The results of this research is a greater understanding of the factors that influence orbital stability. This project seeks to fill the gaps between our understanding of the formation process of planets and the planet systems we observe today.

Alexander M. Baum

Faculty Advisors: Michael Horn and Shirin Vossoughi

Family Board Game Play: Parent-Child Interactions and How to Turn Up the Heat on Children's Learning

Among the most pressing concerns Americans have for their children are the quality and progression of their education. A large degree of learning occurs in informal education settings, such as the home. Board game play is a home activity in which family members engage together that may facilitate children's learning. The present study analyzes video footage of five families each playing the board game *Turn Up the Heat!,* a team game focused on energy conservation. Qualitative analysis of video data identifies how learning might be occurring through gameplay interactions between family members. The study finds that parents and children may assume teacher and learner roles at different points throughout the game, and that teaching and learning roles are fluid and complex. Teaching and learning practices also vary across ages and households. This study contributes to our understanding of the kinds of gameplay-related practices and dispositions that youth are capable of acquiring and using. It is possible that by studying board game play in homes, more educational opportunities within board game play may be further identified and examined. This study will hopefully pave the way for future research into how the practices, skills, attitudes, and behaviors that children learn during board game play at home might be harnessed or built upon in schools.

Benjamin Bernstein

Faculty Advisor: Brandon Liverence and Steven Franconeri

Memory routines for the transformation of visuospatial representations

Tasks like map-reading, perspective-taking, and mental simulation all involve transforming (e.g., rotating or reflecting) internal visuospatial representations to match current/imagined viewpoints. Here, we explored the memory routines that implement such transformations, by quantifying their associated mental costs. Participants searched for targets within a 4x4 configuration of real-world objects (viewed one-at-a-time through a central window), using keypresses to move between positions (thereby changing which object was visible inside the window). The configuration remained stable for 30 trials (enabling participants to acquire a robust memory representation) but then changed; participants then completed 10 additional trials. We contrasted the costs of transforming intrinsic (object-centered) versus global (world-centered) reference frames of visuospatial representations. There were 3 transformation types: 1) *Intrinsic*: objects' orientations rotated 180° but positions remained unchanged; 2) *Global*: positions and orientations rotated 180° in sync; and 3) *Both*: locations rotated 180° but orientations stayed upright. We observed slower RTs after transformation versus before for *Global* (2.06sec/trial) and *Intrinsic* (0.63sec/trial), which differed significantly. Notably, though *Global* (where objects' positions changed and orientations were "upside-down") was more visually distinct from the initial configuration than *Both, Global* was significantly less costly than *Both* (2.85sec/trial), underscoring the contribution of intrinsic reference. These results suggest that visual scenes are redundantly encoded in terms of multiple spatial reference frames, and each must be transformed independently. These results help establish a taxonomy of memory routines, and validate our novel paradigm as a powerful tool for studying the flexibility and durability of visuospatial memory representations.

Carly Bluth

Faculty Advisor: John Alba Cutler

Ecocriticism, Entropy, and the Gothic in Poe's Fiction

Most people know Edgar Allan Poe as a gothic writer, famous for classic works such as "The Tell-Tale Heart" and "Annabelle Lee." However, what many people are not familiar with is his compelling portrayal of the natural world, specifically disease. Through ecocriticism—literary analysis of the relationship between humans and the natural world—my project traces the environment's role within Poe's fiction stories to see how it represents an ominous power that outlasts humanity. I specifically focus on "The Fall of the House of Usher," "The Masque of the Red Death," and "The Black Cat," to illustrate how disease works as a penetrating force that affects humans through entropic processes—the scientific law stating that matter, as an expected consequence of the universe, declines from a state of order to disorder over time. This project also analyzes events in Poe's life that influenced how he considers death and disease in his tales. The Edgar Allan Poe Collection (Enoch Pratt Free Library, Baltimore) contains documents from Poe's life, including postcard correspondence with family and contemporaries. These materials reveal significant insight into his tragic life, especially his wife's premature death from tuberculosis. My purpose in looking at Poe's thoughts in motion is

to show how these materials have translated and developed into his works, thus asking readers to re-envision their relationship to the natural world—humanity is delicate and feeble relative to nature's enduring vigor.

Ebony Calloway

Faculty Advisor: Ilya Mikhelson

Musical Notation without a MIDI

My research project answers the question whether it is possible to create a device to notate music of an acoustic instrument without the use of a Musical Instrument Digital Interface, MIDI. Right now there are only digital ways of notating music, I first recorded and analyzed individual notes on just the piano, then created a musical profile that can be applied to identify certain notes and then maybe chords as well. This is important because this sort of audio analyzing can be applied to many other situations such as voice recognition and security. I am building upon Fourier Transforms to compare the fundamental frequencies that define a specific note and improve both the accuracy and speed of the algorithms by using the frequency and time domains. I spent a couple of weeks making sure there was an accurate way to make sure that the correct notes were being identified. I have found that it is possible to discern individual notes because that process has been almost perfected, but figuring out the chords has proven to be slightly harder. I am working with a smaller library to simplify the comparisons. The project's accuracy can be further expanded upon to be used with multiple instruments and even an entire orchestra. This would be invaluable to musicians when they are writing music and it is hard to stop playing to write down the music they just played.

Rosalie Chan

Faculty Advisor: Jill Blackman

Taiwanese Hakka Youth and Cultural Connection

I plan to do research on Hakka identity preservation among youth. The Hakka people are a Chinese ethnic minority in Taiwan. Their Chinese name, *ke-jia ren*, literally means "guest people." Before 1987, the Chinese Nationalist Party of Taiwan enforced a Mandarin-only policy, which disadvantaged local Taiwanese people, including the Hakka. However, in more recent years, the Hakka Affairs Council, which was established to preserve and educate people about Hakka culture, made efforts such as establishing cultural centers and classes, organizing festivals, and promoting the teaching of the Hakka language in Taiwan's primary schools. My research will focus on young adults ages 18 to 25 of Hakka ethnicity because despite these efforts, it is rare for them to know the Hakka language, implying that they may not know much about the culture. The research will answer questions of how exposed they have been to their culture through their upbringing or through the efforts of the Hakka Affairs Council, how important their Hakka identity is to them, how they view their identity, and whether they have made efforts to learn more about their Hakka cultural background and language.

He Chen

Faculty Advisor: William Hurst

How Laws for the Minority Evolve: Addressing Conflicts between Customary and Statutory Marriage Laws for the Miao Minority in China and the Role of Miao Elites

This project studies the customary and statutory marriages laws for the ethnic minority group Miao in prefectures of Southwest China. Specifically, it examines how differences arising from national or regional laws and local normative systems, such as areas involving marriageable age and the division of property after divorce, are addressed. By interviewing local legislators, judges and ethnic minority leaders, this project discusses how the Regional Ethnic Autonomy Law plays limited roles while local Miao elites act as important agents in mitigating such conflicts. The project presents two case studies in minority-dominated counties where Miao elites have attempted to leverage the legal status of Miao customs or to repackage statutory laws in ethnic traditions. By delineating innovative practices occurring at the local level and involving non-state actors, this study presents an aspect of the Chinese legal system that is more pluralistic and diverse than commonly believed.

Sharon Chen

Faculty Advisor: Seth J. Corey

Mutations in ELANE produce unfolded protein response: a mechanism for severe congenital neutropenia (Kostmann Syndrome)

Severe congenital neutropenia (SCN) and cyclic neutropenia (CyN) are inherited hematologic disorders characterized by low neutrophil counts, disruption of granulopoiesis and, in the case of SCN, a 10,000-fold increase in the risk of developing acute myeloid leukemia (AML) or myelodysplastic syndromes (MDS). ELANE is the gene encoding for neutrophil elastase, mutations in which have been found in patients with SCN and CyN. However, the mechanism by which mutant ELANE effects these disorders is poorly understood. It has been hypothesized that the misfolding in mutant ELANE induces ER stress and leads to activation of the Unfolded Protein Response (UPR). UPR is a highly conserved process involving at least three main pathways that sense unfolded proteins and provide a means for the cell to pause and repair the damage. These pathways (PERK, ATF6 and IRE1) induce the expression of genes crucial to the production of proteins that either induce apoptosis or attempt to correct protein misfolding (i.e. the UPR pathway). Current treatment for SCN and CyN is administration of granulocyte colony stimulating factor (GCSF), which results in increased neutrophil counts and prevention of life-threatening infections. But the mechanism through which GCSF accomplishes this is unknown. I hypothesize that ELANE mutations triggers excessive activation of UPR pathways that ultimately lead to MDS/AML. In addition, I hypothesize that GCSF rescues the cells from UPR-mediated apoptosis by repressing the UPR.

Larry Cheng

Faculty Advisor: Ken Paller

Targeted Memory Reactivation with Flashing Lights

Previous literature reveals biological evidence that the sleeping brain is sensitive to sensory stimuli despite the sleeper's lack of awareness. This led researchers Rasch and colleagues to experiment with odors to induce targeted memory reactivation. In his innovative study, participants were taught paired object-location associations while exposed to the scent of a rose. During sleep, rose-scented air was administered to participants which yielded improved recall of the learning. Similarly, Rudoy and colleagues found object-location associations paired with their characteristic sound (e.g. door-creak, dog-bark) were more likely to be recalled when cued during sleep. Because there is no current literature on light induced memory reactivation, this study can yield insight into how the brain responds to visual stimuli during sleep. If memory can be improved by way of this novel phenomenon of "sleep learning," individuals may overcome deficits in recall and enhance semantic memory task performance. Participants wore a sleep mask, engineered to display red light blinking at specific frequencies, during a word learning task. At night, memory of a word list tied to a specific light frequency will be cued via administration of the light during slow wave sleep. Preliminary results did not yield a significant cuing benefit, but a redesign with increased explicit attention to the visual light frequency, lengthened exposure to reactivation, and further induced forgetting via an increase in the interim between learning and posttest may yield significant effects.

Peter Cleary

Faculty Advisor: Renee Engeln

"Am I Ugly?" Expectations and Perceptions of Appearance-Based Feedback from Redditors

Men and women who posted photos on the Reddit page "AmIUgly" completed a survey of motivations for posting and expectations/perceptions of feedback. Feedback was more positive and less critical than expected. This contrasts with findings that appearance commentary generally has a negative impact.

Jonathan Cohen

Faculty Advisor: Benjamin Iverson

Friday Post-Earnings Drift Revisited

To what extent is Friday post-earnings announcement drift due to investor inattention or selection bias? I reproduce DellaVigna and Pollet's (2009) findings that firms' share prices following Friday earnings announcements exhibit less immediate response and more longer-term drift compared to companies' share price following weekday earnings announcements. I also reproduce Michaely, Rubin, and Vedrashko's (2015) findings that within firms that have ever released earnings on a Friday, the share price response is the same between Friday and weekday earnings announcements. If DellaVigna and Pollet's investor inattention hypothesis is true, then an exogenous event that increases the salience of this market anomaly due to inattention should attenuate it. I exploit the dissemination and publication of DellaVigna and Pollet's initial paper to test this. Additionally, an exogenous relaxation of inattention constraints should also attenuate it. I match similar stocks on the NYSE and NASDAQ and exploit the NYSE Hybrid Market implementation, a change in market structure that facilitated electronic trading, to test this.

Maya Collins

Faculty Advisor: Tina Grieco-Calub

Background noise and working memory: How do different types of background noise affect young children's working memory?

Background speech competitors, much like those observed in an occupied classroom, have been shown in previous research to impair speech perception in listeners across the lifespan. A growing body of work suggests that individuals with limited cognitive resources tend to have the poorest performance in these adverse listening environments. This work raises two possibilities: (1) speech competitors vie with the target speech for cognitive resources; or (2) speech competitors directly interfere with cognitive processing. The present study was designed to test the latter hypothesis. Sixteen five-year-old children (M = 61.54 months, range = 60-66) were administered the Missing Scan Test (MST; Buscke, 1963) that was adapted for use in young children. Each child participated in the MST in two listening conditions that were counterbalanced for order: quiet and two-talker speech babble at 40 dB SPL-A. On each trial, children were shown a predetermined set (2-10 animals) of animals and asked to name them. The animals were removed from the children's sight for 10 seconds. The children were subsequently reshown all but one of the animals, and asked to name the one animal that was missing. Children's working memory span was calculated as the largest set of animals for which children responded accurately on two successive attempts. The data showed that children had statistically higher working memory spans in quiet than in the presence of the speech babble. These results suggest that speech competitors, similar to common forms of classroom noise, can directly interfere with children's working memory.

Robert Coukos

Faculty Advisor: Jason Brickner

Diverse mechanisms regulate dynamic interchromosomal gene clustering in *S. cerevisiae*

The eukaryotic genome is spatially organized. Interactions between coregulated genes and stable nuclear structures affect both the positioning of genes and their transcriptional regulation. In yeast, many inducible genes localize to, and physically interact with, the nuclear pore complex (NPC) under activating conditions, increasing strength of transcription. Gene recruitment to the NPC is mediated by small cis-acting elements called "*DNA zip codes*" in their promoters. Transcription factors bind to these elements and are necessary and sufficient for the recruitment of the gene from the cytoplasm to the nuclear periphery. Additionally, genes that share the same zip code cluster together at the nuclear periphery. This positioning is generally regulated, yet the mechanisms remain unknown. We have identified three strategies by which transcription factor-mediated recruitment is regulated. For *INO1*, Put3-mediated recruitment is regulated through association of transcriptional repressors and local histone deacetylation. Ste12 recruitment of *PRM1* to the NPC is blocked by the Dig2 repressor. Finally, the spatial organization of *HIS4* is regulated by the translational efficiency of the transcription factor Gcn4, which is poorly translated in the presence of amino acids. Upon induction of these genes, each of the regulatory mechanisms can be relieved, allowing transcription factor binding to DNA zip codes. These different strategies allow dynamic reorganization of gene positioning and interchromosomal interactions over very different time scales.

Neil Dalvie

Faculty Advisor: Joshua Leonard

Developing a Platform for Testing Modular Biosensors in the Lycopene Biosynthetic Pathway

The rapidly increasing toolbox of synthetic biology has allowed numerous advances in the engineering of metabolic pathways. One tool that is largely missing from this toolbox is the ability to sense the dynamic levels of a particular metabolite and output that signal in a living cell. While there are a limited number of naturally occurring biosensors that do this, it would be advantageous to be able to design and test Small molecule Responsive Transcriptional Regulator (SmaRTR) biosensors. To help address this need, we have developed a platform for testing SmaRTR biosensors in the engineered lycopene pathway in Escherichia coli. The purpose of this platform is to create varying levels of metabolite throughput in the pathway in order to test both the responsiveness of a biosensor to metabolite presence, and the dynamic range of a biosensor. To do this, we upregulated several genes in the pathway and quantified lycopene production under the assumption that increased lycopene yield indicates higher pathway throughput. This system will allow the development of SmaRTR biosensors in the lycopene pathway, and serves as a model for testing biosensors in other industrially important pathways. The development of SmaRTR biosensor technology will lead to quantitative insight into metabolic flux in living cells, adding a strong measurement tool to the synthetic biology and metabolic engineering toolbox.

Austin Dickey

Faculty Advisor: Daniel Abrams

Modeling the American Obesity Epidemic

The past 30 years of American obesity have been compared to an epidemic. The average body mass index (BMI) of Americans grew 15% from 1987 to 2013, and the number of people classified as "obese" by the Center for Disease Control (CDC) has almost tripled in that time. Examining BMI data over space and time suggests there are two factors at play: a shift in nutrition and exercise, and a more epidemic-like "diffusion" of obesity across social networks. Here we fit a mathematical model to the data in order to characterize the extent to which these factors contribute to the obesity epidemic, and we make recommendations based on this model.

Matthew Du

Faculty Advisor: SonBinh Nguyen

Catalytic Conversion of Fructose to 5-HMF Using a Porous Organic Polymer

With the depletion, rising prices, and climate change resulting from the use of petroleum-based resources, extensive efforts have been devoted to the efficient synthesis of value-added chemicals, such as 5-hydroxymethylfurfural (HMF), from renewable biomass. Currently, the production of HMF from fructose, a common carbohydrate, is being highly studied in chemical research. Although numerous catalyst and solvent systems have been developed to effectively carry out this reaction, they still present major drawbacks, including poor HMF selectivity, expensive purification, and low catalyst recyclability. On the other hand, porous organic polymers (POPs) have the potential to protect products from side reactions; allow easy purification; and are sufficiently stable for high reusability. Thus, we chose to explore the conversion of fructose to HMF using the acid-functionalized POP named JUC-Z10-SO3H (JUC). Thus far, an analytical method using GC-FID has been developed that can simultaneously analyze both HMF yield and fructose conversion. Furthermore, we began the optimization of the analogous homogenous reaction, which uses methanesulfonic acid as catalyst in place of JUC, using a variety of solvent mixtures, temperatures, and reaction times. Since we noticed improved fructose conversion and HMF selectivity at higher temperatures and lower reaction times, we are currently optimizing this reaction under microwave-assisted (MA) conditions, which allow reactions to be heated at higher temperatures and for shorter reaction times while reducing byproduct formation. We will then apply the ideal conditions to the optimization of acid strength and catalyst loading and hydrophobicity for the reaction using JUC.

Michelle Ferber and Chris Howard

Faculty Advisor: Sally McFall

Point-of-Care Nucleic Acid Test System and Multi-Drug Resistant Tuberculosis Testing for Limited Resource Settings

Multidrug-resistant tuberculosis (MDR-TB) caused by strains resistant to at least isoniazid and rifampin, is an emerging global health problem. Rapid and accurate diagnosis is critical for improving patient outcomes and reducing transmission. The Center for Innovation in Global Health Technologies has developed an extraction and detection method for rapid diagnosis of TB that is highly sensitive and specific. Our goal is to adapt this method to identify rifampin resistance (RIF), a well accepted surrogate for MDR, in TB positive patients. Mutations in the 81-base pair rifampicin resistance determining region (RRDR) of the rpoB gene, one of the subunits of the bacterial RNA polymerase, accounts for >95% of drug resistant cases. We conducted a literature review of 1,931 different strains and used the results to create a map of the RRDR nucleotides that are mutated in highly resistant strains and nucleotides that are never mutated. This map was used to design qPCR primers and 4 fluorescent probes that bind different sequences within the RRDR. Each probe has high affinity for the wildtype sequence and reduced affinity for mutations. Failure or delayed binding of a probe compared to the other 3 probes indicates a potential RIF resistant mutation. Using plasmids that contain either the wildtype or mutant sequences, significant cycle threshold delays were detected with the probe that bind to the corresponding mutant sequences, but not with the other probes. We have developed a qPCR assay that sensitively detects genotypic changes in the RRDR indicating a potential MDR strain.

Elizabeth Fillion

Faculty Advisor: William Leonard

The Real Paleo Diet: Meat as a Component of *Australopithecus robustus* Nutrition

The robust australopithecines have traditionally been portrayed as an evolutionary dead end whose diets denied them the encephalization experienced by our meat-eating ancestors, early *Homo*. *Australopithecus robustus* was dismissed as an herbivorous specialist, whose massive teeth and jaws limited its dietary options to tough, nutrient-poor foods like nuts and leaves. Recent fossil and archaeological evidence from Swartkrans Cave in South Africa challenges this understanding of *A. robustus* and suggests that it may have eaten a generalized diet like *Homo*. Stable carbon isotope analyses paired with analysis of microwear on teeth indicate that A. robustus had a diverse diet that varied throughout the year and most likely included animal foods. The question paleoanthropologists must now ask is what caused seasonal variation in robust australopithecine diets? The current belief is that climate change in southern Africa directly influenced hominin foodways, but this simple model does not adequately explain the intimate relationship between diet and environment. Periodic dietary variation is also observed in modern chimpanzee populations. Analysis of chimp hunting behavior shows that chimps are adapting to a drier, more seasonal habitat by responding to specific nutritional or social influences, such as a seasonal lack of protein rich plants or gaining sexual access to females.

While trying to understand the social patterns of a long extinct organism is currently out of our reach, I suggest that modern chimps can offer anthropologists insight into specific ecological factors which may have driven *Australopithecus robustus* to broaden its palate. The next step in this project is to learn more about how changes in the nutritional quality of local vegetation may have affected early hominin diets.

Rebecca Glaser

Faculty Advisor: Scott Barnett

Processing of Ni-free Solid Oxide Fuel Cell Anodes

Solid oxide fuel cells (SOFCs) are devices that convert the energy of chemical bonds into electricity. SOFCs are usually fueled by hydrogen gas, but they also show promise for efficient use of natural gas and as storage devices for renewable energy technologies. The most common SOFC anodes are Ni-based; however, Ni coarsens at the elevated temperatures of operation (~800°), thereby losing electrical contacts and decreasing cell efficiency. This project investigates SrTi0.3Fe0.7O3 as a Ni-free anode material and how to process it to achieve high power densities. STF is advantageous over other Ni-free anodes because it does not contain expensive rare earth elements. The particle size and uniformity of the STF anodes has been investigated and power densities up to 270mW/cm2 have been found for cells with a STF anode, dry-pressed La0.9Sr0.1Ga08Mg0.2O3 electrolytes, and screenprinted La0.6Sr0.4Fe 0.8Co0.2O3/Ce0.9Gd0.1O2 cathodes. Additionally, tape casing, which is another ceramics processing method, has been investigated as it enables production of more uniform cells in larger quantity. Slurry and tape properties have been modelled and compared to experimental data. The tape characterization demonstrates the application of a standard ceramic height modeling technique to a new system. This work builds on previous studies of perovskite anodes and broadens the range of choices for non-Ni anode materials.

Amy Glazier-Torgerson

Faculty Advisors: Terri Sabol, Terese Sommer, and Lilah Shapiro

Emotional Support among Low-Income Mothers Enrolled in a Two-Generation Program

Two-generation programs that provide services to low-income parents while their children receive high-quality early education are proliferating because of their effectiveness in raising families' socioeconomic status and delivering high-quality content. While such programs are promising approaches, little is understood about the factors that make them more beneficial for some low-income parents than others. It is suspected that emotional support, which is associated with improved physical and mental well-being, plays a role in how well parents can participate in challenging educational programs. Limited research has been conducted on the frequencies of emotional support from a variety of sources, including family, friends, romantic partners, and religious observance, for low-income parents with young children, and how this support influences their pursuit of career goals. In this study, I analyzed interviews from the Career*Advance*® two-generation program in Tulsa,

Oklahoma of 21 mothers who were highly motivated to further their careers in the health care field. I created a framework for assessing the levels of emotional support, specifically from four categories, that each of the participants possessed at baseline and after 1-1.5 years in the program. I analyzed how that emotional support changed over time, and how emotional support at baseline was connected to how participants experienced emotional support within the program. Participants with higher emotional support at baseline were significantly more likely to use program resources that were intended to provide emotional support. Findings from this study will influence the design of two-generation interventions and encourage such programs to help parents establish networks of emotional support in their lives outside of the program.

Alexandra Gore

Faculty Advisors: Shelby Hatch and Stanley Lo

How students understand the purpose of chemistry laboratory: A descriptive analysis

Students understand the purpose of chemistry laboratory coursework in a variety of ways, as documented by a study that asked students: "What is the purpose of laboratory?" before and after taking the chemistry lab sequence at Northwestern. This project performs descriptive analysis to identify differences in student thinking across academic and demographic factors and also considers how students' responses changed before and after taking the course. In addition, this project employs network analysis to identify codes that commonly appear together. The preliminary findings can help educators better understand students' educational experiences.

Clifford Heidinger and Ajay Nadig

Faculty Advisor: Robin Nusslock

The Relationship Between Anger, Gratification Delay, and Neural Indices of Reward

We investigated how individual differences in personality relate to neural activation patterns during a gambling task, reflecting decision-making with rewards and losses at stake. The NIMH's Research Domain Criteria (RDoc) promotes research that develops "new ways of classifying mental disorders based on behavioral dimensions and neurobiological measures," and this project focuses on further understanding the brain's reward system, which is implicated in psychopathologies such as depression and bipolar disorder. Using electroencephalography (EEG), a technique in cognitive neuroscience that measures real time electrical activity of the scalp, we examined stimulus preceding negativity (SPN) and P300, which are associated with reward anticipation and reactivity during the gambling task. We measured personality traits such as anger, ability to delay gratification, and aggression through self-report questionnaires and the delayed-discounting task, in which participants choose to tradeoff less money now for more money later. We predicted that participants who report angry and aggressive traits and have low ability to delay gratification would have significantly larger SPN and P300. Results indicated that decreased gratification delay correlated with decreased reward anticipation (SPN), $p=0.019$, $r=-0.401$, and decreased reward reactivity (P300), $p=0.032$, $r=0.367$. These results suggest

that decreased ability to delay gratification is due to the undervaluation of the delayed-but-larger reward, not the overvaluation of the immediate-but-smaller reward. Contrary to our hypothesis, here were no significant results between anger traits and reward anticipation or reactivity. These results indicate that at the neural level, gratification delay and impulsivity play a larger role in reward systems than anger traits.

Laura Henry

Faculty Advisor: Molly Losh

Autism Across Cultures: A comparison between the United States and Germany

To date, psychological research has primarily focused on the United States and has often applied finding to other Western countries. Additionally, while psychological research on autism spectrum disorder (ASD) suggests that there may be some cultural differences in features of ASD between Western and Eastern countries, this literature often generalizes findings from one Western country to exemplify Western countries as a group. However, there may be differences even among Western countries that influence what behaviors are considered atypical and indicative of ASD. I investigated this possibility through comparative research in the US and Germany. Data was collected through a series of 13 in depth, semi-structured interviews with clinicians who work in ASD diagnostics in both countries. Qualitative analyses of interview transcripts revealed several consistencies in diagnostic techniques between countries but also a number of differences in variables influencing the diagnostic process. These differences include the diagnostic criteria used to evaluate for ASD, the perceived stigma associated with ASD, the reported external pressure to give a diagnosis, and the reported age-range of initial diagnosis. It is critical to understand the role of culture in ASD assessments because it is possible that US research based interventions may not be equally effective in other countries if the diagnosed populations differ between countries. It is also important to understand the role of subtle cultural differences in the diagnosis of ASD in order to broaden our theoretical understanding of how symptoms of behaviorally diagnosed disorders such as ASD may be somewhat constructed by cultural context.

David Heydari

Faculty Advisor: Manijeh Razeghi

High power quantum cascade lasers with angled cavities

The quantum cascade laser (QCL) has experienced rapid development in recent years, reaching power levels that allow for local chemical sensing in parts per billion. Such a detection level is of particular interest for application in medical diagnostics and exhaled breath analysis. Because the sensitivity and range are directly proportional to the output power of the laser, further increasing the output power of a QCL would lead to more sensitive medical diagnosis systems and remote sensing in greater distances. Broad area (BA) QCL is the most straightforward approach for power scaling of the QCL. Due to the increase in the size (area) of the cavity, the output power can be hundreds of times higher

than a narrow cavity device. A QCL with an output power of 203 W is demonstrated in pulsed mode at 283K using the novel angled cavity, a remarkably simple technique used to achieve both high power and high brightness—necessary for sending infrared light across great distances. In distinct contrast to a straight cavity BA QCL, the lateral far field is single lobed with a divergence angle of only 3°, demonstrating remarkable beam quality. An ultrahigh brightness value of 156 MW cm-1 sr-1 is obtained, which marks the brightest QCL to date (published APL, March 2015, D. Heydari, et al.). In addition, the power levels achieved for this laser marks the most powerful (peak) single laser diode source to date (published APL, March 2015, D. Heydari, et al.).

Sam Houskeeper

Faculty Advisor: John S. Bushnell

Communism in the Countryside: Paradoxes of the International Revolution and their Inception in the First World War

The industrial revolution was undoubtedly the definitive event in a Marxist view of history and the original source for socialist theory, but it was World War I that proved to be the great crucible of socialism. Most scholars may only agree with this characterization of the War for its seemingly indirect result, the Russian Revolution, but the War and the years immediately following saw numerous socialist struggles across Europe come to a head. The War placed unprecedented strain on the governments and economies of the European continent, and gave the manifold, simmering efforts of the socialist cause opportunity. The opportunities provided by the War were not the type foreseen by Marx, but they were seized nonetheless, and so required theoretical adaptation. The resultant transformation of Marxism fused it to agrarianism and nationalism, yielding the great paradoxes of communism in the twentieth century.

Mitchell Kirshner

Faculty Advisors: Donna Jurdy and Wesley Burghardt

A Rheological Analysis of Lava Tubes and Lava Fans on Olympus Mons, Mars

Vast shield volcanoes dominate the equatorial Tharsis region of Mars. Of these volcanoes, Olympus Mons is the largest. Much remains unknown about Olympus Mons: researchers are limited to observations from orbiting satellites, and as such any information available is in the form of images and spectrometer data taken from a distance. Despite these limitations, remote sensing techniques have identified interesting features on the volcano worth noting. Lava tubes have received particular attention because their final morphologies may prove to be ideal locations for habitation zones for both native life and explorers. In addition, lava fans, or delta-shaped volcanic features, heavily populate the volcano. The sources for these fans are not fully understood, but many appear to have formed from lava tubes originating at small volcanic vents. It is possible that liquid water could have been trapped within a fissure near a vent on Olympus Mons, creating an environment heated by magma and shielded from any radiation which could potentially host microbial life. Using GIS software, lava

tubes and fans were mapped based off of work previously conducted by planetary volcanologists to search for such biological environments. Using geometric parameters inferred from mapping, a rheological analysis was performed on lava tubes, yielding information related to flow rates and viscosities of individual flows. The relationship between lava tubes and fans was observed around the entirety of Olympus Mons through the comparison of slope, elevation, viscosity, and flow rates; important statistical information is presented.

Sunjay Kumar

Faculty Advisor: Maaza Mengiste

Saturday, November 7th: An Unusual Day In The Life of Abhishek Jadhav

The impetus for this project came when I received a text message from a friend inviting me to go along to a "gay party" in Mumbai. I had been studying in Pune, Maharashtra for several months at that point, and had attended one of the few queer film festivals in India, which was held a couple blocks from my school. Though I had prior plans related to my school work and could not attend, the text message left me wondering about the experiences of the people attending that party, and more generally the experiences of closeted middle-class queer Indian men. My personal friendships with several men from this group that I developed over my time studying in Pune helped me understand some of the tensions around family, community, and identity that a character like Abhishek might be experiencing. I also drew on my experience traveling between Mumbai and Pune to help crystallize the setting and render the unfamiliar familiar. Through this process, I found a compelling similarity between my life experiences and those of the main character, despite our different nationalities and cultural background. In this work I hope to provide a different perspective to our collective understandings both of India as a place and of queer subjectivity.

Tori Larsen

Faculty Advisor: Rebecca Seligman

The Experience of Uncertainty among American Youth: Situating Selfhood in Embodied Experience

For American youth who attend four-year colleges, the transition to life after college may involve a time of increased uncertainty about the future. Such uncertainty may affect and involve an individual's sense of self, identity, and purpose, thus being a potential source of distress for students. People mediate uncertainty in a variety of ways, and the ways in which it is mediated could have implications for individual health and well-being. The study I am presenting is a case-study evaluation of college seniors who are looking toward life after graduation. An interview consisting of open-ended questions and minimal prompting from the researcher was employed in order to allow participants to articulate their own experiences. It was found that individuals, while sharing many similarities in their conceptions of uncertainty, differed in how uncertainty was recognized in their own lives. Furthermore, even when uncertainty was recognized within an individual's life, individuals varied

significantly in the meaning they attributed to the uncertainty they recognized. This supports the notion that individuals have the potential to mediate the uncertainty they experience in ways that vary individually. This study, while limited in scope, provides justification for further research into the power individual interpretations have on how something like uncertainty is experienced. Understanding how uncertainty is experienced by college seniors can provide us with insight into how people can mediate the potentially negative effects uncertainty can have on well-being.

Paul Lee

Faculty Advisor: Fred Northrup

Solution Conformations of Chiral Mannich Bases

Molecular conformation can have significant effects on the properties of a molecule such as its solubility and reactivity. Variable temperature 1H NMR spectroscopy was used to study the solution conformations of two enantiomeric pairs of chiral Mannich bases: N-(2-hydroxylbenzyl)-methylbenzylamine (1-R and 1-S) and N-(2-hydroxylbenzyl)-naphthylethylamine (2-R and 2-S). These molecules are capable of intramolecular hydrogen bonding under appropriate temperature and solvent conditions. We observed significant chemical shift and line-width changes in the NMR spectra of these molecules as a function of different solvents (d2-DCM, DMSO, d7-DMF, CDCl3, CD3OD, and D2O), temperature (a range from -50°C to 130°C, depending on the freezing and boiling points of each solvent), and most surprisingly on whether the molecule was the R- or S-enantiomer. These NMR spectrum changes can be attributed to conformational changes and molecular rotation that can be hindered by intramolecular hydrogen bonding. The NMR spectrum changes were more extreme for the heavier naphthyl compound consistent with more hindered rotation. Preliminary computational chemistry results suggest different molecular conformations for the R- and S-enantiomers in some solvents. It is possible that these results may lead to a method of determining the absolute configuration of chiral amines.

Lola Less

Faculty Advisors: William Horton and Karl Rosengren

Thinking Out Loud: The Internalization of Speech and its Role in the Development of Silent Reading

The aim of this study was to examine how suppressing and encouraging oral movement during reading impacted children's comprehension and fluency, and whether these effects were mediated by children's tendency to read aloud or read silently. Twenty-eight children (N = 11 female, $Mage$ = 79 mo., SD = 10.9 mo.) read three stories and completed three reading comprehension tasks. Based on spontaneous reading behaviors from the first story, participants were sorted into the "Aloud" or "Silent" group. To manipulate speech levels while reading, all participants completed a suppression condition, in which they wore wax lips while reading, and an encouragement condition, in which they were told to read aloud. Performance in these three conditions was judged based on a reading

comprehension score and a measure of reading fluency (in words per minute). Overall, children that spontaneously read silently exhibited higher reading comprehension scores than those who spontaneously read aloud ($F(1,20) = 4.75$, $MSE = 0.06$, $p = 0.04$, $\eta^2 = 0.19$). Additionally, children who spontaneously read aloud exhibited lower reading comprehension scores in the suppression condition than either the spontaneous condition (t (21) = 2.92, $p = 0.008$) or the encouragement condition (t (21) = -2.04, $p = 0.054$). There were no significant effects on fluency. These findings suggest that silent reading may be developmentally superior to reading aloud, but also that reading aloud is an important step in the acquisition of skilled reading. As such, suppressing oral reading may be detrimental to this process.

Emily Levin

Faculty Advisor: Philipp Heck and Kathleen Stair

Meteorite Classification

Meteorites provide us with insight to the early Solar System. They are pieces of celestial bodies such as asteroids, the Moon, or Mars, which have collided with Earth. These pieces help us to understand the evolution of our Solar System. Meteorites are classified into groups based on their elemental and oxygen isotopic composition, and petrography. Meteorites with the same classification could have similar origins or formation histories. By far the most common class of meteorites is ordinary chondrites. This research seeks to classify meteorites in the Chicago Field Museum's collection. Scanning electron microscopy (SEM) with energy dispersive X-ray spectroscopy (EDS) was used to analyze meteorite cross-sections and the composition of phases such as olivine and pyroxene within the meteorite. Backscattered electron imaging was used to view microstructure within the cross-section and determine chondrule integration in the meteorite. This information was used to classify each meteorite into groups H, L, or LL, which are based on bulk iron content, and by petrologic type referring to the degree of thermal alteration in types 3-6 and aqueous alterations in types 1-3 experienced by the chondrite.

Alex Lin

Faculty Advisor: Laurence D. Marks

Classifying the Severity of Grain Boundary Corrosion in CoCrMo Biomedical Implants

Despite its superior mechanical properties, cobalt-chromium-molybdenum (CoCrMo) alloy with the addition of carbon is susceptible to corrosion due to tribological events such as joint movements and its constant exposure to corrosive body fluids. This degradation process, which releases nanoscale wear particles and toxic ions into the body, does not only pose health complications but also reduce the lifetime of implants. Grain boundaries, which are the interfaces between two grains of the same phase, have been commonly associated with the mechanical behavior of alloys and their structure is especially significant. Recent experimental investigations observed that CoCrMo corrodes preferentially along high-angle grain boundaries and exhibits corrosion resistant behavior along annealing twin boundaries by using the coincident lattice theory. Electron back-scattered diffraction

(EBSD) in combination with scanning electron microscopy (SEM) confirms the corrosion resistant behavior along low energy low-angle grain boundaries with a high degree of lattice coincidence ($\Sigma \leq 11$). Furthermore, measurements from white light interferometry indicate that corrosion severity increases with the decreasing degree of lattice coincidence. The present work aims to establish a quantitative relationship between the corrosion depth, crystallographic geometry of the grain boundaries and their corresponding interfacial energies and to provide a more refined understanding of the exact geometries that show corrosion resistant behavior.

Jeffrey D. Lin

Faculty Advisors: David C. Dunand and David N. Seidman

Effects of two new elements on the precipitation evolution and mechanical properties of Al-Sc-Zr-Si alloys

The aerospace and automotive sectors are seeking to phase out heavy structural materials used in hot components of vehicles, such as jet engines and brake rotors. A new class of "aluminum superalloys" with dilute additions of scandium and zirconium has been developed and studied in response to this increasing demand to replace current iron and nickel-based alloys used at elevated temperatures. Current aluminum alloys on the market are limited to ambient temperature use, and so one of the aims of recent studies has been to stabilize performance at high temperatures between 300ºC and 400ºC. Al-Sc-Zr alloys hardened with dispersed nanoparticles (precipitation strengthening) are promising candidates to achieve these goals. Several new species of Al-Sc-Zr-based alloys are studied under a variety of heat treatment experiments as well as Vickers hardness measurements and local electrode atom probe tomography (LEAP) in order to draw connections between the material properties and the atomic-scale structure. Each species contains a unique alloying element that we believe may do the following: 1) Shorten the heat treatment processing cycle, 2) increase the peak strength, or 3) prolong the alloy's use at elevated temperatures. Understanding the isolated effects of each of the unique alloying elements on Al-Sc-Zr alloys will enable us to utilize the useful ones to engineer a high strength and heat-resistant aluminum superalloy. Beyond this, materials engineers need to assess its formability and castability as well as its performance in vehicle components before it can fully replace heavier nickel and steel superalloys already in use.

Rabeya Mallick

Faculty Advisors: Jolie Matthews and Renee Engeln

The Tumblr Support Community for Concerns Related to Eating Disorders

Individuals with eating disorder related concerns have been able to come together in recent years with the creation of online eating disorder communities. While existing research has examined membership in online eating disorder communities—both those geared toward recovery and those aimed to perpetuate disordered eating behaviors—the interaction of these subgroups on neutral blogging sites like Tumblr has not been thoroughly examined. The current study aims to examine the activity of

individuals who seek out the online community of support that exists on Tumblr for eating disorder related concerns. A content analysis of material posted under topics relevant to eating disorders was conducted to examine what themes are present in content created and shared by members. Using a grounded theory approach, a coding scheme was developed to analyze the media, popularity, and themes present in posts under the "body image" and "eating disorder" search categories. Sharing personal stories of eating disorder struggles and recovery, as well as support seeking language was characteristic of posts under the "eating disorder" search. Meanwhile posts under the "body image" search were largely focused on critiquing societal standards of beauty and health. This research will contribute to better explaining the nature and culture of engaging in the Tumblr community, as well as what kinds of supports individuals seek and provide relevant to eating disorders online. Future research can expand upon this knowledge to investigate the interactions that take place in this community, and the connection between membership in the community and offline behaviors.

Sean M. Marks

Faculty Advisor: Randall Snurr

Multi-scale simulations of nanoporous materials for xenon-krypton separations

Metal-organic frameworks (MOFs) are nanoporous materials which show great promise for industrial chemical separations. For example, high-purity xenon and krypton are required for medical applications, but the conventional method (cryogenic distillation) requires a tremendous amount of energy. MOFs pose an energy-efficient alternative for this difficult separation. One major challenge is deciding which particular MOF among thousands of possibilities would be best-suited for xenon-krypton separations. The goal of my ongoing research project is to perform high-throughput simulations of MOFs as a "first-pass" screening to determine likely candidates. To this end, a number of test materials were chosen as a training set to develop a rapid method for assessing MOFs. I first used molecular simulations of pure xenon and krypton to characterize the performance of these materials in terms of how much each species adsorbs (or "sticks") to the interior surfaces of the porous MOF. From this, I developed a correlation to predict the pure-species adsorption behavior in terms of easily-calculated properties. Next, I applied the *Ideal Adsorbed Solution Theory* (IAST) from thermodynamics and wrote a program which predicts the behavior of xenon-krypton mixtures using my correlation. I found that the results agreed well with those of high-fidelity molecular simulations, and could be obtained in a fraction of the time. Future work involves the application of my IAST-correlation model to simulations of *pressure-swing adsorption* (PSA), an industrial method for separating mixtures of gases such as xenon and krypton.

Jessica Marone

Faculty Advisor: Helen Schwartzman and Mary Weismantel

***Inecesáreas*: Understanding the Prevalence of Medically Unnecessary Cesareans in Buenos Aires, Argentina**

It is estimated that 3.5 million medically unnecessary cesarean sections (CS) are conducted globally every year. This phenomenon is especially apparent in Argentina where elective CS up over half of all CS carried out. These elective surgeries have been show to lead to health problems for both mother and child and has been considered by some an "international pandemic". Due to the medical relevance of unnecessary CS, it is both critical and timely to understand the underlying factors motivating the inflated rates. Previous work has indicated that the nature of the doctor-patient relationship may influence the decision to undergo unnecessary CS. In light of the growing concern for unnecessary CS, I sought to assess if, how, and why the characteristics of the doctor-patient relationship contribute to the high rates of elective CS. For this project, I spent eight weeks in Buenos Aires, Argentina conducting extensive interviews with medical professionals and mothers. Based on my research, I argue that the intimate nature of the doctor-patient relationship allows patients more authority over their care. As a consequence, patients have more power to request medical procedures, such as elective unnecessary CS. This suggests that the social dynamics of the doctor-patient relationship may in part underlie the inflated rates of elective CS in Buenos Aires.

Kayleen McMonigal

Faculty Advisor: Patricia A. Beddows

Calcite Rafts of the Yucatan Peninsula: An Expanded Paleo Sea Level Record

Paleo sea level records for low-latitude sites based on coral or mangrove deposits have uncertainties of 1-10+ m, due to the depth range over which coral species grow, and the compaction and decay of mangrove peat. Along the Caribbean coast of the Yucatan Peninsula, cave infill sediments include sequences of carbonate rafts. The rafts precipitate on the water table due to off-gassing of CO2. Once sedimented, the raft deposits are well preserved, with several meters of accumulation in places. The flat toped raft sequences accumulate to within 0.1-1 m of the water table, which is constrained to have a small offset from sea level. Rafts were observed to reach visible size in 72 hours. Time lapse photography revealed a water level dependence on raft formation. Air ventilation near the water table is greatly reduced when water level reaches the lowest level of cave ceiling elevation, occluding air flow even where the passage is not fully flooded and inhibiting raft formation. While the greatest raft formation rate was observed in quiescent waters, floating rafts were transported intact particularly at higher water levels when flow at the water table was greatest. Manual push cores from flat toped raft banks revealed intact stratigraphy, with variation in raft textures, size, and organic content. Raft sedimentation rates are on the order of 1 cm/100 years based on radiometric dating down core. These results support the potential of calcite rafts deposits as a valuable new expanded record for low latitude carbonate coastlines.

Eric Morales

Faculty Advisor: Ellen Wartella

The Lasso Of Truth: Gender Portrayal And Character Sexualization In Contemporary Comics

Since the birth of Superman in the 1920s, the superhero has been an icon of American culture. Yet after 77 years of development, this genre still vastly under-represents female characters. There has been little research done on the portrayal of female superheroes in comics. The purpose of this study is to gain a better understanding of the portrayal of gender in contemporary comics, specifically focusing on the sexualization of characters. 5 of the best-selling, unique character titles from DC Comics' 2011 company-wide relaunch were sampled. Character representation was coded for in four categories: general demographics, physical characteristics, presence and dialogue, and action given and received. Only 23% of characters were found to be female. On average, female characters spoke more than males, and were nude 12% of the time, compared to males' 0%. However, females had higher instances of dialogue, total lines, and percentage of time speaking. Title female characters were rarely sexualized, while in general females were less sexualized than expected. Female's absolute portrayal was still far lower than that of males. A future project will need to increase the size of the sample drastically, as well as focus on titular characters so as to reduce confounding variables from limitedly represented side characters. Considering the increasing popularity of the superhero genre, in both the print and film mediums, as well as increasing fan bases, including children of both genders, addressing the stereotypes of characters that could be used as role models is of paramount importance.

Eric Morales

Faculty Advisor: Ellen Wartella

Mobile Marketing to Children: A Content Analysis of Food and Beverage Company iDevice Applications

With a third of children overweight or obese, childhood obesity is a public health threat (Skinner & Skelton, 2014). Food marketing plays a causal role in children's dietary intake (IOM, 2006), which is unfortunate given that most television- (Kunkel, Castonguay, Wright, & McKinley, 2014) and web-based (Henry & Story, 2009) food marketing promotes obesogenic foods inconsistent with healthful diets. As children shift towards an increased use of mobile devices (Rideout & Saphir, 2013), it is imperative to understand the nature and prevalence of food marketing to determine if the food industry presents a threat on this platform. I therefore conducted a content analysis of approximately 50 food and beverage mobile applications (apps). This is the first study to systematically explore apps across food industry sectors. I coded for child friendliness and for content, scoring features such as arts activities and games. The energy density (a metric of nutritional quality) of featured foods also was calculated. Only 12 apps in our sample were child-friendly. Most promoted moderately healthy foods, were fairly simple, and featured art-based activities that allowed children to create multiple pieces of artwork using multiple stampers. Interestingly, only half featured branded food stamps. Companies may have produced only a small number of simplistic child-friendly apps attempting to curtail their role in childhood obesity epidemic or perhaps because they have yet to leverage this new

technology. Future studies should examine whether art-themed apps effectively promote children's food preferences and should continue monitoring the presence of child-directed mobile marketing.

William Morrison

Faculty Advisor: Marciano Siniscalchi

Identifying the Theoretical Model that Best Describes Human Decision-Making Under Uncertainty by Empirically Analyzing Responses to Shifts and Rescaling

In 1961 Daniel Ellsberg proposed an experiment (now known as the "Ellsberg Paradox") that demonstrates how the core economic model of decision-making, Subjective Expected Utility (SEU), fails to account for subjects' aversion to ambiguity. The implications are troubling; even outside of academia, several key industries including marketing, entrepreneurship, and finance rely upon decision-making models in making corporate choices. The medical field also utilizes such models to assist or evaluate doctors who frequently make diagnoses under ambiguity. To address this need, several economists have proposed alternative models that generalize SEU, but as of today there is no consensus as to which theoretical model best describes human decision-making. To address this, I propose an experiment that directly tests certain key assumptions underlying these models; this will provide key insights into which model, or class of models, best mirrors human behavior. Participants in the experiment will be presented with risky or ambiguous bets, and told they can either participate in the bet or receive a certain amount of money for certain. They are asked to identify the amount of money at which they are indifferent between participating in the bet and taking the money. By comparing their answers across different bets, I can identify which of these assumptions hold empirically, and use such results to identify which model or class of models best models human decision making.

Victoria Nelson

Faculty Advisor: Erik Luijten

Effective Interactions between Lock-and-Key Colloids

The self-assembly of lock-and-key colloids can be exploited in the sustainable development of soft matter applications, such as commercial materials and microscopic machinery. My project models the lock-and-key system with advanced Monte Carlo algorithms to further understand the interactions of these particles. With these simulations, I calculate the radial distribution function in terms of separation and orientation of the colloidal particles. To determine what controls the system's self-assembly, I vary the concentration of depletant particles in the system that give rise to the attraction between the lock and key particles, and change the anisotropic shape of the lock particle. From these data, I formulate an expression for the potential describing the strength of the attraction between the lock and key as a function of radial and angular separation. This expression can be used for further development and application of these colloids. This work not only improves understanding of self-

assembly of soft matter as it applies to materials engineering, but also furthers understanding of cellular interactions in biological systems.

Eli Nemzer and Kate Cobb

Faculty Advisor: Dilip Gaonkar

Viva la Bitcoin: The Rise of Digital Currency in Argentina

We received an off-cycle summer URG this past winter to study the adoption of digital currency in Buenos Aires in relation to the unique economic climate that has developed in Argentina since President Cristina Kirchner severely limited access to U.S. dollars in late 2011. With citizens now forced to navigate a murky and informal market in order to acquire a currency they trust as a stable store of value, the city has become the largest hub of digital currency in Latin America. After 2013's rapid global rise of Bitcoin, a previously fringe digital currency, ample research was done on the economic implications of completely deregulated alternative currency forms. However, we sought to take a more sociological perspective and explore whether Bitcoin adoption in a nation like Argentina could be categorized as a social movement. In Buenos Aires we interviewed members of the Bitcoin community, local academics, and a random sample of Argentine citizens. In addition to conducting interviews, we gathered observational evidence by attending local Bitcoin events and visiting a variety of businesses that accept Bitcoin across the city. While we found the community to be smaller in number than we initially thought, the sense of adoption being a tool of political and social protest against the established economic hierarchy was certainly present. In Buenos Aires a growing number of people undoubtedly view Bitcoin and other forms of cryptocurrency as a viable alternative for the inflation and lack of economic efficacy that affect many citizens in the developing world.

William Oestreich

Faculty Advisor: Neil Ganju

Colored dissolved organic matter in shallow estuaries: the effect of source on quantification

Light availability is critical for the ecological function of shallow estuaries, as benthic primary production from submerged aquatic vegetation is contingent upon light penetration to the seabed. A major contributor to light attenuation in estuaries is colored dissolved organic matter (CDOM). CDOM is often measured via a proxy, fluorescing dissolved organic matter (fDOM), due to the ease of *in situ* fDOM measurements. Fluorescence must be converted to CDOM absorbance for use in light attenuation calculations and models. However, this fDOM-CDOM relationship varies among and within estuaries. We quantified the variability in this relationship within three estuaries: West Falmouth Harbor (WFH), Barnegat Bay (BB), and Chincoteague Bay (CB). The ratio of absorption coefficient at 340nm (m-1) to fDOM (QSU) was higher in WFH (1.22) than in BB (0.22) and CB (0.17). Conservative mixing models of freshwater and marine end-members based on stable carbon isotope analysis indicate DOM contributions from marine plankton, terrestrial plants, and *Spartina* cordgrass. Comparison of DOC source to fDOM-CDOM absorption ratio at each site demonstrates

the influence of source on optical properties; greater contribution from marsh (*Spartina*) organic material correlated with higher fDOM-CDOM absorption ratio. We find that application of a uniform fDOM-CDOM absorption ratio and spectral slope for a given estuary yields errors in modeled light attenuation ranging from 11-33% depending on estuary; use of uniform values across all estuaries doubles this error. These results suggest that continuous monitoring of light attenuation in estuaries requires some quantification of CDOM absorption and source to refine light models.

Pranee Pairs

Faculty Advisor: T. David Harris

Design and Synthesis of Spin Crossover PARACEST MRI Thermometers

Temperature sensitive imaging has numerous medical applications including diagnosis of primary brain tumors, temperature-induced drug activity in tumors, temperature controlled expression of gene promoters, and treatment of cardiac arrhythmias. Magnetic Resonance Imaging (MRI) is a popular method for temperature imaging because it is non-invasive, uses low-energy radiation, and offers excellent three-dimensional spatial resolution. High-resolution MRI thermometry can be achieved by employing contrast agents (CAs) that are capable of Paramagnetic Chemical Exchange Saturation Transfer (PARACEST) and temperature-induced spin crossover. Iron(II) complexes were synthesized with varying ligands, and Evans Method susceptibility studies were conducted to determine the presence of spin crossover. [FeII(pyclen)(2-(2-pyridyl)imidazole)]Br2 (pyclen = 1,4,7,10-tetraaza-2,6-pyridinophane) was shown to undergo an electronic spin transition from low-spin (S = 0) to high-spin (S = 2) from 274 K to 343 K. The complex also has a labile proton that can exchange with bulk water to participate in PARACEST. This study highlights a ligand design that can potentially be used in the development of a temperature-sensitive MRI contrast agent..

Spencer Park

Faculty Advisor: Lincoln Lauhon

Influence of Stoichiometry on the Optical and Electrical Properties of CVD Derived MoS2

Moore's Law has been cited as the guideline for semiconductor and integrated circuits growth for the last 40 years. For further miniaturization of electronic devices, semiconducting molybdenum disulfide or MoS2 is hailed as the 2-D analogue of Si and the building block for the next generation of electronic materials. Applications for MoS2 include logic circuits, flexible electronics, optoelectronics and many others. To produce this material, chemical vapor deposition (CVD) presents the easiest method of integration into large-scale production. We set out to vary CVD growth parameters to introduce material imperfections or defects in order to engineer the properties of the monolayer MoS2. It was discovered that by controlling the rate of sulfur evaporation, we were able to systematically introduce sulfur vacancy defects into the material which we confirmed through Raman spectroscopy, photoluminescence spectroscopy (PL), and x-ray photoelectron spectroscopy (XPS). Sulfur defects proved to be deleterious to PL signal of the material: decreasing emission intensity to 35% of the

intensity for stoichiometric material. Field-effect transistors were then fabricated on MoS2 samples to determine the electrical performance. It was discovered that sulfur vacancies acted as electron donors which enhanced electrical properties through increased carrier density and improved field-effect mobility: substoichiometric devices achieved low threshold voltages and an average mobility of 15.3 $cm^2/(V*s)$. Counter to intuition, this study demonstrates that these sulfur vacancy imperfections are in fact beneficial to the electrical properties at the expense of optical properties. Thus, defect engineering will play an important role for future device performance optimization.

Mitch Perkins, David Lee, Kristi Lui, Sharon Chen, and Abdullah Memon

Faculty Advisors: John Mordacq and Josh Leonard

NU Models: Real Time Analysis of Transcriptional and Translational Rates in Non-Model Organisms with an Optimized Cell-Free Platform

Synthetic biology today relies on the engineering of genetic parts to perform novel tasks and improve upon existing, natural biological systems. Though highly promising, synthetic biology is currently limited to classic model organisms such as E. coli, yeast, or C. elegans that have been studied extensively and are well understood. Reliance on E. coli overlooks the potential benefits of exploration in other bacterial strains that are model organisms in their own ways. We seek to crack open other fields relating to non-model strains in order to expand research in areas such as antibiotic production, agricultural industry, and more. We utilized a cell-free platform to bypass difficulties of transformation in these non-model strains. Using lysates from our non-model strains including nitrosomonas, pseudomonas, and streptomyces, we tested cell activity in-vitro with a collection of known parts to better characterize the systems at work. Our construct for characterization included a spinach aptamer and RFP tag that together provided a real-time readout of transcriptional and translational rates. By ligating various ribosomal binding sites and promoters, we were able to characterize these non-model strains for future optimization. The system we established and successfully tested is universally applicable as seen in the following experiments. Because these non-model strains have potential to allow work that E. coli is not equipped to handle, the implications for future biotechnologies are revolutionary.

Grace Phelps

Faculty Advisor: Richard I. Morimoto

Investigating Tissue-Specific Activity in *C. elegans* Polyglutamine Models

We have developed a *C. elegans* model that can target the nuclear envelope in cells in a tissue-specific manner. We utilized a modified version of INTACT strategy, developed by the Henikoff lab, to create distinct models targeting the nuclei in neurons, muscle, and intestine, called nuclear targeting fusion (NTF). This system can be used to affinity purify tissue-specific nuclei from a set of total nuclei using nuclei isolation techniques which can be used for gene expression analyses to investigate the different requirements of transcription factors for each tissue type. I aim to utilize this system to investigate

why neurons in particular are more susceptible to protein damage and aggregation as occurs in many neurodegenerative diseases. Thus far, I have created double homozygous *C. elegans* lines of the NTF model and *C. elegans* polyglutamine (PolyQ) model made by our lab that specifically expresses PolyQ in neurons to study this question. PolyQ expansion is associated with many neurodegenerative diseases including the Huntington's disease and different types of Ataxia and known to interfere with transcription. Our lab's PolyQ worm models have successfully recapitulated many aspects of the PolyQ toxicity observed in these human diseases. Given the heightened sensitivity of gene expression analysis with our NTF models, we expect to gain new insights on both cellular protective mechanisms against PolyQ and the detrimental effects of PolyQ toxicity at the level of gene expression.

Sarah Plain

Faculty Advisor: David Dunand

Diffusional Coating Development during Pack Titanization of Nickel Wires

Porous NiTi (Nitinol) is an ideal material for permanent biomedical implants, since the open cell structure allows for easy tissue infiltration and the mechanical properties are very similar to those of bone. Scaffolds, 3D structures woven out of shape memory NiTi wires, are well suited for this purpose, offering high permeability and high surface area. However, weaving wires of this material is very difficult due to its shape recovery properties. Pack titanization, a simple chemical vapor deposition process in which a titanium-containing powder mixture reacts to deposit titanium on a substrate, was explored to prove the feasibility of creating NiTi from a nickel wire, a material that is much easier to weave at room temperature. After sufficient titanium has been deposited on the wires, a second heat treatment is required to allow for interdiffusion of the nickel and titanium to create a uniform NiTi wire. The composition of the coating formed on 50 μm nickel wires was studied as a function of titanization time, temperature, and pack composition. Phase evolution was studied during the homogenization step to further understand the diffusion behavior of this system.

Jessica Powers

Faculty Advisor: Brian Hitsman

Hedonic Capacity, Nicotine Dependence and Withdrawal in Men and Women

Hedonic capacity is a dispositional ability indicative of levels of positive affect to typically rewarding events. Low hedonic capacity, or anhedonia, is a core component of depression and reflects diminished positive affect levels. Anhedonia has also been shown to impact withdrawal in smoking cessation, but few studies have sought to understand other factors that would impact this relationship. The current study observed gender differences in the association between hedonic capacity, nicotine dependence and other covariates at baseline while analyzing the impact of these variables on abstinence. At baseline smoking, higher rates of anhedonia were found in men in than women. This finding contradicted the initial hypothesis that women would have higher rates of anhedonia due to their higher rates of depression. In analyzing for abstinence outcomes, gender did not significantly

impact relapse. Hedonic status had a main effect on relapse, where anhedonia was associated with a greater likelihood of abstinence after cessation. During analysis of other smoking-related factors, nicotine dependence levels were the only significant covariate to impact abstinence, and greater dependence was associated with greater chance of relapse. Separate analyses were run at baseline and after cessation on the relationship of hedonic status, gender and different smoking-related covariates. Significant factors included positive affect levels, depression and withdrawal symptoms. Many of present findings contradict existing literature on relationship of hedonic status, gender and relapse. This incongruence poses new questions about the nature of hedonic capacity, gender and other factors on withdrawal in smoking cessation.

Alekya Rajanala

Faculty Advisor: Y. Joyce Liao

Long Distance Homonymous Hemi-Macular Retrograde Degeneration of the Visual Pathway: A Comparison of Anterior and Posterior Visual Pathway Lesions

Trans-synaptic degeneration is the atrophy of nerve cells following damage to the axons that make synaptic connections with them. In this study, we used optical coherence tomography (OCT) to examine the severity and timing of trans-synaptic degeneration in human visual pathway lesions. We performed a retrospective review of patients with homonymous visual field loss and confirm lesions of the visual pathway. Patients were categorized by location of brain lesion. We analyzed over 70 OCT studies and correlated the findings with visual field loss and MRI. Stanford IRB approved this study. We studied changes in macular ganglion cell complex (GCC) in 15 patients with anterior and 20 patients with posterior visual pathway lesions. There was significant hemi-macular thinning of the GCC in patients with anterior ($P<0.0001$) and posterior ($P=0.01$, Mann-Whitney) lesions. At one year after onset, anterior lesions led to significantly more severe GCC thinning than posterior lesions ($P=0.03$). Within two years, the rate of thinning of the anterior lesions was significantly faster and more than three times that of the posterior lesions ($P=0.05$). Retrograde, homonymous, hemi-macular thinning occurred in the human visual pathway over long distance, even trans-synaptically. There was more rapid and severe thinning in anterior visual pathway lesions (optic tract, LGN) compared with that of occipital lobe lesions. Further investigation of trans-synaptic degeneration can assist regeneration therapy and efforts to restore patient vision.

Viktorie Reichova

Faculty Advisor: Thomas Meade

The Development of Second-Generation Activatable Co(III) Schiff Base Complexes as Protein Inhibitors with Enhanced Stability

Cobalt(III) Schiff base complexes (Co(III)-sb), developed by our group, inhibit metal-dependent proteins by binding irreversibly to histidine residues and distorting protein structure. Currently, this process is limited by the dissociation of the Co(III)-sb axial ligands, which occurs spontaneously in

the first-generation complex. Based on the success of this approach, we are developing Co(III)-sb complexes that are selectively activated by a) light exposure or b) a change in pH. We propose that the trigger will generate the reactive Co(III)-sb species that subsequently coordinates to histidine residues in target proteins. The light-activated complexes incorporate Ru(II) polypyridine to initiate a single electron transfer from Ru(II) to Co(III) after exposure to blue light. This causes the axial ligand bonds to weaken and allows the Co(III)-sb to bind to histidines that may be present. Our current approach focuses on synthesising and characterising supramolecular coordination complexes (SCCs) that would promote greater stability prior to light exposure. The pH activated complexes incorporate Co(III)-sb with imidazole axial ligands. These ligands become protonated in an acidic environment and dissociate, enabling binding of Co(III)-sb to histidine residues. We investigated derivatives of the pH-activated complexes with modifications to the equatorial ligands that showed promise in increasing stability in neutral pH. Both classes of Co(III)-sb complexes have been assessed in enzyme assays and have been shown to inhibit the enzymes thermolysin and human α-thrombin.

David R. Rice

Faculty Advisor: Jason H. Steffen

Understanding dynamical instability in exoplanetary systems

The relationship of the orbital spacing (Δ) between planets in a planetary system and the time over which that system remains stable gives us insight into the dynamical evolution of that system. A known relationship derived through numerical simulations, gives the average time to instability for systems of a certain Δ. However, the instability time for systems of similar Δ can vary more than an order of magnitude. Previous work has established the change in the relationship between Δ and instability time for various planet masses and planet multiplicity, however, little work has been done to understand the distribution of instability times for a fixed Δ. We simulate several thousand planetary systems on QUEST with fixed Δ and vary a variety of other parameters to gain an understanding of the nature of the instability and the drivers of instability time. We define instability time as both the time until a close encounter between pairs of planets and the time until a planetary collision. We use Mercury6, an n-body orbital integrator, and demonstrate that small perturbations on a system with fixed Δ has a large effect on the distribution of instability time. Other studies to examine the effect of system size and other parameters are ongoing. These results should give insight into the dynamical evolution of exoplanetary systems we observe using Kepler.

Pyrros Rubanis

Faculty Advisor: Mark Alznauer

Tolstoy's Moralism: Taking Art (and Ourselves) Seriously

"*Ajax was a better man than Odysseus.*" "*Pixar makes better movies than Godard.*" It is difficult to see how life could be meaningful or interesting without such opinions of evaluation and taste. This is considered obvious in any discussion of morality, but art suffers doubt: taste is considered trivial,

discussion of "good art" is taken seriously only if one is "cultured" and "informed", and the rift between life and art grows. Tolstoy, being a writer of the thoughts and trials of everyday life, sought to repair this rift in his "What is Art?". Using that work as foundation, this philosophical project seeks to define Art as a fundamental mode of communication between individuals and societies. Just as philosophy and science rationally convey what we find important and true about the world, art too conveys a way of looking at the world. Discussions of taste, then, are anything but trivial, for in judging a work we also judge a particular perspective on what is meaningful in life. Tolstoy concludes that such a view of art necessitates a union between morality and art: good artworks are only those which find meaning in the moral utopia of universal brotherhood. As radical as this is (Tolstoy rejects nearly the entire aesthetic Canon, including his own major works), we can go even further and, in surveying different artworks, find a meaning of life suitable for each of us, a personal canon that aids us in developing our own view on what is important in life.

Joshua Schwartz

Faculty Advisor: Laura E. Hein

Seeing is Not Believing: Egotism and Uncertainty in the Allied Military Assessment of Imperial Japan, 1931-1941

Imperial Japan's simultaneous attacks on Pearl Harbor, the Philippines and Malaya in December 1941 are traditionally understood to have been a complete surprise. In my project, I challenge this narrative by showing that American and British military intelligence officers and attachés commissioned to assess the Japanese threat to Western interests in the Far East regularly contemplated the possibility of an attack on these positions, particularly after Japan's instigation of war with China in July 1937. Using the troop attachment reports of American and British Japanese-language officers who trained with and observed Japanese forces from 1931 to 1941, I unravel the evolution of Allied perceptions of Japanese combat efficiency and argue that preoccupation with Western concepts of war blinded the Allies to the full extent of Japan's military capabilities. I highlight the uncertainty, indecision and inconsistency of Allied statesmen, generals and ambassadors in their assessments of Japan's regional intentions, suggesting that policymakers were equally at fault in underestimating the immediacy of the Japanese threat. Based on this analysis, I find that Allied military intelligence in the Far East during the interwar period functioned as an echo chamber, in which low-level and high-level officials reinforced each others' overconfident assessments and faulty conclusions. While other scholars attribute Allied unpreparedness in December 1941 to racial prejudice, bureaucratic deficiency or lack of resources, I assert that military egotism and reactive foreign policy caused the Allies to underestimate the Japanese before the initial battles of World War II in the Pacific.

Olivia Seligman

Faculty Advisor: Alice Eagly

Comparing Female and Male College Student Leader's Aspirations for Future Leadership Positions

Past research has found that leadership experience early in life predicts future careers in leadership positions (e.g., Kuhn & Weinberger, 2005). However, there is little research that compares how past leadership might affect women differently from men. The present study examines whether among college leaders, there is a discrepancy by gender for future leadership aspirations, and if so how this can be understood. Seventy-three students in leadership positions at Northwestern University participated in this study (43 women and 30 men). Participants completed an online questionnaire about their experiences with and aspirations for formal leadership positions within groups or organizations. The questionnaire focused on four main categories: past leadership experiences, aspirations for future leadership positions, contributing factors to leadership aspirations, and perceived barriers to future leadership. Results showed that there were no significant differences by gender for past leadership experience and future aspirations for leadership. The factor of encouragement by parents and others close to the participants was a significant predictor for aspirations for management positions for women ($p=.009$), but not for men ($p = .798$). Results were limited by the small population size and the lack of diversity in the population. Future studies could address how to best encourage women to pursue leadership roles.

Karina Sirota and Richard Herndon

Faculty Advisor: Darren Gergle

How do people find answers to questions they encounter in everyday life?

Every day, people work through dozens of questions from the most banal to the extremely serious related to their personal life, their jobs, or any other number of contexts. While extensive research has examined how people use the Internet and social media for finding answers to questions, there has been surprisingly little work investigating the issue from a more holistic perspective that covers the various devices, resources, and contextual factors of such situations. This project aims to uncover the types of questions for which people are most likely to turn to digital environments versus other sources, to understand how location, activity and social contexts influence information needs and question formulation, and to identify new opportunities for technologies to support a broad range of everyday information-seeking experiences. Last summer, our research team (PIs Darren Gergle and Eszter Hargittai as well as fellow research assistant Research Herndon) collected data on people's question-asking habits through text-messaging. The data set includes open-ended responses to a series of questions about the information needs of 25 adults age 18 and over from across the United States. In total, we analyzed the details of 186 question-asking incidents in the form of over 1,100 text-messages.

Jason Smith

Faculty Advisors: Monica Prasad, Christopher Carroll, and Seth Magle

A Synthesis of Large Carnivore Management and its Application to Illinois: Black Bears, Gray Wolves, and Cougars

As increased sightings of black bears (*Ursus americanus*), gray wolves (*Canis lupus*), and cougars (*Puma concolor*) occur in the State of Illinois, it is prudent to consider policy approaches to deal with these species. Each can be a valuable player in improving ecosystems, but also a nuisance and threat to humans. This study aims to be applicable directly to their increasing relevance and serve as a synthesis of best practices and suggestions from groups across the country who have worked with the species. Different state plans have been reviewed, from states with varying degrees of experience with the three species. These plans demonstrate typical techniques used for each carnivore, and often include hunting as a primary management tool in addition to a focus on preventing conflict through public education. States prioritize maintaining populations of these species while minimizing conflicts with humans. From a review of these plans and relevant literature on the topic, recommendations emerge. These involve a focus on "people management" that includes preventative action, personal agency, and information on the benefits of the carnivores. Hunting, while a beneficial recreational experience that is often publically supported, is a complicated tool that should be carefully designed and considered. As Illinois is only beginning to experience these animals, the initial policies should prioritize people management approaches over hunting as the carnivores continue to cross into Illinois.

Haley Sonenthal

Faculty Advisor: Lilah Shapiro

Study Abroad Experiences and Identity Development in Emerging Adulthood

Using open-ended interviews, this study collected narratives about Northwestern students' study abroad experiences in order to explore the impact on identity of travel and living in a "different" culture for a short period of time. Informed by past research, this study hypothesized that the increased interactions with non-U.S. cultures afforded by the travel abroad experience would play a role in identity development. Further, the study also hypothesized that through travel/study abroad emerging adults (college students) develop certain knowledge and skill set, in particular cultural relativism and cross-cultural competencies, that can enable them to be more successful in a global world. Students who travelled to various countries abroad were interviewed about their experiences before, during and after their travels. Analysis and coding of these interviews show that students who study abroad often gain a salient personal experience of otherness that causes them to become more aware of their own privileges and social location. This experience of (often for the first time) being in the out-group has implications for empathy development. Additionally, when students step away from their lives in America/Northwestern they develop perspective that facilitates reflection on and reexamination of their priorities and values. This shift in sense of time, priorities, and values can have implications for student to recognize their own agency/control in their decisions.

Nishant Subramani

Identifying the Best Predictors of Unmet Health Care Needs in Patients with Disruptive Behavior Disorder

Disruptive behavior disorders (DBD) include conduct disorder (CD), oppositional defiant disorder (ODD), and disruptive behavior disorders not otherwise specified (DBD-NOS). These diseases have fundamental consequences such as severe academic underachievement and reduced social competence and mental health disorders. The objective of this study is to identify the best predictors of unmet health care needs in children 6-17 years of age with disruptive behavior problems. Data were obtained from the 2011-2012 National Survey of Children's Health (NSCH), a population-based, cross-sectional telephone survey, and only children with disruptive or conduct disorder were selected. Four different methodologies were implemented: a full multivariate logistic regression model, a Wald Chi Square screening method followed by a multivariate logistic regression model, logistic groupwise regression model, and random forest classification model. Children not meeting the criteria for having a medical home were 6 times more likely to have unmet health care needs than those with, children having interrupted or no health insurance were 5 times more likely than those with constant insurance, and children having experienced adverse family events were 4 times more likely than those without experience. As a result, these are the best predictors of unmet health care needs in children 6-17 years of age with disruptive behavior disorders. The hope is that this analysis can provide insight into what factors specifically are most associated with disruptive behavior disorder in an effort to provide rationale for health care reform to alleviate much of this problem for these children and their families.

Rex Tai

Faculty Advisor: Dalton J. Surmeier

Chronic administration of methamphetamine induces progressive loss of substantia nigra pars compacta dopaminergic neurons in a dose-dependent and withdrawal time-dependent manner

Parkinson's disease (PD) is a progressive neurodegenerative disease characterized by the selective loss of dopaminergic neurons in the substantia nigra pars compacta (SNc). Methamphetamine (meth) is a potent and highly addictive psychostimulant that is used illicitly but also prescribed with FDA-approval for treatment of exogenous obesity and ADHD; recent clinical evidence indicates that meth abuse can increase the risk for developing PD by two to threefold. Meth is known to be neurotoxic to dopamine neurons in the SNc but the dose-response relationship as well as the persistence and progression of dopamine (DA) neuron degeneration remains unclear. This study compared counts of tyrosine hydroxylase (TH)-expressing DA neurons in the SNc and in the ventral tegmental area (VTA), the latter which does not deteriorate in PD. Chronic meth administration resulted in a dose-dependent delayed and progressive degeneration of dopamine neurons selectively in the SNc, sparing VTA dopamine neurons. The results of this study provide insight into a very recently characterized risk factor for development of PD, showing that selective meth-induced toxicity in the SNc resembles true PD pathology and not just general DA neuron loss. Characterization of the chronic meth dose- and

withdrawal time-dependence relationship described here opens the doors to future research of finding mechanisms of selective SNc degeneration and ultimately development of novel therapeutic drugs that can protect against PD pathology.

Abhinav Veerina

Faculty Advisor: Sarah H. Jacoby

Transcending the Mundane: Examining Master-Disciple Relationships in Sufism and Vajrayana Buddhism

In my study of Buddhist and Sufi communities, literature, and doctrine I have come across countless parallels in both theory and practice of the two religious traditions. In this project, my aim was to hone in on these apparent similarities and examine the veracity of my observations through the lens of the master-disciple relationship, a facet that is indispensible to both traditions. Furthermore, through the application of the philosophical religious theory of Søren Kierkegaard in his postulations regarding ethical versus religious behavior, I was able to add nuance in understanding this cross-religious comparison. This was done by utilizing primary and secondary sources surrounding the master-disciple relationship within these traditions, particularly focusing on the epic Sufi poem by Farid ud-Din Attar, *Mantiq al-Tayr* and examining the stories and biographies of two enlightened Buddhist masters, Yeshe Tsogyel and Sera Khandro. After a thorough analysis of these sources culminating in an 18-page paper, I found that although these traditions are truly distinct, they do share similar aspects of the master-disciple relationship namely the transmission of esoteric knowledge, complete submission to the master and mutual benefits between both parties of the relationship. Ultimately, I concluded that through focusing on the similarities between the two traditions rather than the differences, one could more easily make sense of the human experience of religion vis-à-vis Kierkegaard's theory of individual religious experience and ethical behavior.

Linzy Wagner

Faculty Advisors: Mary Desler and Simone Ispa-Landa

Barriers to Mental Health Resource Utilization at Northwestern University

This study aims to understand students' decisions to seek mental healthcare at academically rigorous schools like Northwestern University in response to the high rates of psychological stress often reported by students at these institutions. By employing a qualitative analysis of focus group data from five different groups, this study aims to answer the questions: (a) what do the students' suggestions for improving mental health resources on-campus say about their mental health needs; (b) which dimensions of system-based, provider-based, and patient-based barriers deter students from seeking mental health care on Northwestern's campus; and (c) among the identified barriers how prevalent is stigma? The data was coded and analyzed in three phases all completed with Atlas software. The conclusions of this study will serve to inform Northwestern administration on methods for best addressing the increasing prevalence of mental health issues on campus as well as reveal aspects of

campus culture that negatively or positively impact student mental health and subsequent care-seeking behavior.

Karen Wilber

Faculty Advisor: Lilah Shapiro

Religion and Family in Cochabamba, Bolivia

This study seeks to utilize the experiences of people in Cochabamba, Bolivia as a case study to construct a more holistic theory on family influences on religion in Bolivia. Using an ethnographic model and a grounded theory approach, this study will use the festival of Urkupiña, an annual Christian-Pagan religious celebration just outside of the city of Cochabamba, as a lens through which we can understand the relationship between family and religion. Although sufficient research exists surrounding the theories on how family influences the individual, much of that research is based on Western definitions of family as being a nuclear heterosexual structure that functions in a top-bottom manner. Seeking to expand upon the limited and biased research on Bolivia, which is most often limited to a narrative of being colonized, struggling, impoverished, and violent, I sought to hear from Cochabamban people about their own realities. I conducted interviews with thirteen people currently living in Cochabamba, Bolivia about the festival of Urkupiña, family, and religion. My research utilizes my interviewees' reflections on their lived realities to complicate the dominant Western conceptualizations of family. After creating coding schemes from the data and analyzing the narratives being told, I find that the way in which family is understood and lived out in the festival of Urkupiña suggests that further research must be done to create a more holistic understanding of family in the lives of Bolivian people.

Carrie Willis

Faculty Advisors: Mark Hauser and Matthew Johnson

Dynamic Landscapes: The Spatiality of Social Relations at Ightham Mote

Since the 1950s, medieval landscape archaeology has explored "designed landscapes," landscapes which have been modified through human intervention to serve a particular purpose. The search for this purpose has led to the formation of three perspectives: landscape as aesthetic pleasure ground, landscape as place of work, and landscape as reflection of social status. Using the work of Pierre Bourdieu and borrowing from spatial theory, I will critically explore and challenge the three dominant perspectives and the concept of designed landscapes themselves. I provide an alternate framework with which to explore the way that barriers and constraints on movement in physical space reflect boundaries in social space. Through geospatial modeling and topographical analysis of the landscape at Ightham Mote, a moated manor house in Sevenoaks, Kent, England, I illustrate how the topography of the landscape constrains movement and facilitates the creation of both a public and a private road. The control of access to the property by the creation of a private road renders Ightham Mote as privileged social space only open to some, and reinforces relational power dynamics which maintain hegemonic social hierarchies. Using this new approach, we can view the topography of landscapes as

active agents in the reinforcement of social identities through control of movement through the landscape. Rather than labelling a landscape aesthetic or practical, we can identify the dynamism of landscapes and their active role in social relations.

Deborah Wu

Faculty Advisor: Wendi Gardner

Stereotypes in Hiring: A Racial Comparison

While it has increasingly become less acceptable to hold racist tendencies in the U.S., people still harbor racial stereotypes. Studies show that people judge individuals of the same race differently based on their racial prototypicality, or how closely their appearances resemble racial stereotypes. For example, more prototypical Asian faces have flatter noses and smaller eyes. In this study, we tested the effect of racial prototypicality on people's opinions in job hiring. We ran 129 participants who were employed in business and STEM and had them rank Asian and white applicants for business and STEM jobs. Each job listing had 3 equally qualified applicants: one was white, one looked stereotypically less Asian, and one looked more stereotypical Asian. Each listing also had one gender in order to offset any possible gender bias. In our results, we found that there was no difference for all applicants in STEM jobs for the male and female conditions. For business, there was a significant bias against white females while the other Asian female applicants were ranked similarly. These results were not replicated for the male business applicants. While we did not find evidence of racial prototypicality prejudices, this bias against white women in business brings up questions about possible negative stereotypes surrounding white women about their abilities in business. Thus, while the data shows racial equality in STEM positions, there is still evidence of inequality in the hiring system in the business field which should be acknowledged and addressed for creating equality in the U.S.

Angela Yang and Kruti Patel

Faculty Advisors: Sumitrajit Dhar and Sriram Boothalingam

The Evaluation of Contralateral Acoustic Stimulation on the MOC Efferent System

The medial olivocochlear (MOC) efferent system consists of the neural pathway that spans the brainstem and bridges the two cochleae in human ears. It plays a large role in determining how we perceive sounds, and it is theorized that it may help protect against hearing trauma by attenuating cochlear gain. Learning more about the MOC is important because it is still a mystery in many ways. One method of determining cochlear health is the measurement of a noise-evoked response known as distortion product otoacoustic emissions (DPOAEs). DPOAEs are sounds produced by the cochlea and are considered to be biological markers of cochlear health. This experiment consists of five phases: the first four measure the amount of acoustic crossover between ears for various sounds and multiple frequencies while the fifth phase examines how this crossover affects DPOAEs. Previous experiments, such as those conducted by Dr. Dhar and the Northwestern University Auditory Research Lab, have studied the effect of MOC on OAEs using broadbands of noise whereas this

study involves the use of sounds at specific frequencies. We predict that the MOC will produce greater responses at specific narrow frequency ranges. Without the MOC efferent system to dampen the activity in the cochlea, hearing damage due to loud noises would occur far more often. Researchers have barely uncovered exactly how it works and how specific the frequency tuning is.

Jeong Yun (John) Yang

Faculty Advisor: Thomas V. O'Halloran

Investigating the mechanism of piperazine-derived microtubule binding compound cytotoxic action

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 an important therapeutic target in cancer cells. Piperazine-derived drugs have shown promising anti-tumor effect in animal models, such as the Piperazine Microtubule Inhibitor 4194 (PIM4194). However, its potential is limited due to toxicity. Herein, we attenuated the toxicity by encapsulating PIM4194 in a liposomal drug delivery system called nanobins, making a new encapsulated drug IM-1. We established the IC50 value of IM-1 via cellular cytotoxicity study. Then, we hypothesized that the induction of apoptosis of human glioblastoma cell lines U87 and GBM-811 by IM-1 through M-phase arrest explains the cytotoxic mechanism of IM-1. After treating U87 and GBM-811 human glioblastoma cell lines with various concentrations of IM-1 and for various time points, we stained with 4', 6-diamidino-2-phenylindole (DAPI) or propidium iodide and conducted cell cycle analysis using flow cytometer. We observed increase in the apoptotic cell population after 48 hours and 72 hours of treatment at 10, 100, and 1000 nM IM-1. Our future studies include Annexin V assay and Western Blot analysis to deepen our understanding of IM-1 mechanism of action in vitro, then expanding the investigation of the IM-1 antitumor activity in vivo through tumor growth studies on tumor xenografts in mice.

Simon Yang

Faculty Advisor: Sumitrajit Dhar

Modular Production of Her2-UCHT Bispecific Antibodies using fusion proteins

Antibody drugs have become one of the most important classes of targeted cancer therapy because of their ability to specifically bind to receptors on tumor cells and activate downstream processes that disrupt their proliferation. Numerous large pharmaceutical and small biotech companies have invested a significant amount of effort in developing new and more effective platforms based on antibody therapeutics. The majority of these approaches use *monospecific* antibodies (mAbs), meaning that the antibody drugs recognize only one target. In contrast, *Bispecific* antibodies (bsAbs)– antibodies that bind to two different targets – are a new class of antibodies that have a distinctly different mode of action and therefore offer a greatly expanded therapeutic potential. The production of bsAbs however,

remains challenging. My project focuses therefore on developing a more efficient modular method to produce bsAbs via using enzyme-assisted assembly methods. Specifically, the project investigates building the Fc-fusion fragment.

Yang Yu

Faculty Advisor: Christopher Wolverton

Redox Thermochemistry of Transition Metal Sulfides with GGA+U Calculations

Sulfurization reaction energies of fifteen transition metal sulfide (TM-S) systems including TM = Ti, Mn, Fe, Co, Ni, Cu, Mo, Rh, Pd, Ir, Pt, La, Ce, Th and U are evaluated using generalized gradient approximation (GGA) +*U* calculations. Our results indicate that unlike TM-oxides and halides, GGA reaction energy predictions can be improved consistently only if separate energy corrections are used for S in sulfide anion (S^{2-}) and disulfide anion (S_2^{2-}) because of the existence of covalent $^{-}S\text{-}S^{-}$ bonds in the latter anion. Enumerating all possible sulfurization reactions between pairs of TM-sulfides within each TM-S system, we predict effective *U* values for GGA+*U* thermochemistry and confidence intervals for these *U* values. We find that applying *U* on the *d*- or *f*-orbitals of TM ions consistently improves the GGA reaction energy predictions for most of the systems, except for the reactions where S performs the redox, where we find the reaction energies to be often insensitive to U value. We show that GGA+*U* calculations with the predicted *U* values and anion-dependent systematic energy corrections provide a significant improvement over plain GGA in predicting cell voltages of a variety of TM-S based battery systems including Li/FeS_2, Li/TiS_2, Li/Mo_6S_8, and Mg/Mo_6S_8.

℘ Guide to Oral Presentations

℘ Oral Presentation Session One

11:00-12:30

Advancements in Science and Engineering I

Lake Room (203)

Moderator: Amy Rosenzweig, Molecular Biosciences Department

Nicholas Geisendorf, "Metallic Architectures from 3D-Printed Oxide Inks"

Joseph Hurley, "Structural Basis for Copper Uptake in Methanotrophic Bacterium Methylosinus Trichosporium OB3b"

Kelly Hyland, "Impact of Cell Type: Scaffold Material and Printing Parameters on Cell Viability in 3D Cell-Encapsulated Hydrogels"

Jonathon McBride, "Role of the Sodium Leak Channel NALCN in Mammalian Circadian Physiology"

Albert Song, "Viral Fusion Proteins: The Role of Metastability in Viral Fusion and Entry"

Kevin Zhao, "Chemical Probes for Drug Development and Target Identification in Amyotrophic Lateral Sclerosis"

Engaging in the Struggle

Arch Room (206)

Moderator: Mary Dietz, Political Science Department

Elizabeth Larsen, "Tackling Childhood Malnutrition: An Investigation of Innovative Grassroots Approaches Around the World"

Zaynab Quadri, "'A Slave of a Slave': Discourses of Slavery and Genocide in the Abortion Debate Among Black Women Activists"

Kenneth Mok, "Challenge to Senegal's Democratization: Youth Incorporation into the Formal Political Process"

Susie Neilson, "Yellowbone: A Video Foray into the Under-covered Practice of Skin Bleaching in South Africa"

Larry Svabek, "A World Itself Not New: Assessing Neoliberalism with a Tocquevillian Sensibility"

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

Gender and Race
Rock Room (207)

Moderator: John Alba Cutler, English Department

Hazim Abdullah-Smith, "Visual and Spatial Practices of Race Governance in Invisible Man"

William Ejzak, "Hideously Incompatible: Solipsism and Gendered Selfhood in the Fiction of David Foster Wallace"

Chelsey Moler, "The Politics of Narration: Reading Stranger-Suitors in Austen and Burney"

Jacqueline Torgerson, "The Liberating Consciousness of Radical Hip-Hop: Going Beyond the Culture Industry"

Emily Vernon, "Women's Rights Are Human Rights: Hillary Rodham Clinton, the Fourth World Conference on Women, and the Role of First Ladies in U.S. Foreign Policy"

The Advancement of Learning
Armadillo Room (208)

Moderator: Paul Reber, Psychology Department

Anna Cassell, "Something is Really Wrong": Evaluating Concussions and Early Retirement in Women's Collegiate Soccer

Danbee Chon, "Motivational Effects on Implicit Learning"

Hannah Fishkin (Evanston Township High School), "Unclenching the Feminist Fist: Rebranding The Movement"

Courtney Marcusson, "Social Cues Enhance Word Learning by 30- to 42-Month Old Children"

Fortunato Medrano, "Hypothesis Testing in a Children's Museum"

℘ Oral Presentation Session Two

1:00-2:30

Advancements in Science and Engineering II

Lake Room (203)

Moderator: Neal Blair, Earth and Planetary Science and Civil and Environmental Engineering Departments

George Baker, "Co(III)-Schiff Base Complex for Targeted Inhibition of Gli Pathway"

Robert Cavanaugh, "Investigating the Impact of Ionic Impurities on Skeletal Growth Mechanisms through a Biomimetic System"

Elizabeth Conger, "Biodiesel from Spent Coffee Grounds: Producing Fatty Acid Methyl Esters (FAMEs) from a Waste Stream for Fuel"

Jessie Moravek, "The Fatty Acid Content of Chitin: Characterizing the Carbon Storage Potential of Biological Soil Compounds"

Emily Northard, "Microgravity Freeze-Casting Improves Microstructure in Dye-Sensitized Solar Cell Electrodes"

Kristen Omara, "Microgravity Freeze-Casting Improves Microstructure in Dye-Sensitized Solar Cell Electrodes"

Lauren Wustenberg, "Assessing Sustainability of Astrocaryum Chambira Palm Management in Handcraft Economies of the Rural Peruvian Amazon"

Exploring National and Political Identities

Arch Room (206)

Moderator: Nitasha Sharma, African American Studies and Asian American Studies Departments

Syed Owais Ali, "Embedding Identities in Animation: A Case Study of Pakistan's Burqa Avenger and U.A.E's Freej Series"

Josh Boxerman, "Catbird Seat Diplomacy: Henry Kissinger and the Creation of the US-Egypt Strategic Partnership"

Aozora Brockman, "The Paradox of a Global and Homogeneous Nation: Korean-Japanese in Contemporary Japan"

Qingjia Jiang, "Political Legitimacy in China: China's Use of Drama of Resistance Against Japan"

Yujin Maeng, "The Asian American Political Incongruity: Disillusioned with the Vote"

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

Performance and Play: Arts in the World
Rock Room (207)

Moderator: Helen Schwartzmann, Anthropology Department

Alex Benjamin, "Interactive Theatre: Recasting the Audience"

Moira Geary, "Citizenship and the Playground's Place: American Values at Play in Penny Park"

Nathan Lamp, "Embodying Narrative: Performative Transformations of the 'Self' in the U.S. and Bali"

Danica Rosengren, "How Spectacle, Immersion, and Text Are Used in Theatre for Young Audiences in the UK"

Katherine Scott, "Dance Like Nobody's Watching: Impact of Objectifying Cues in the Dance Studio"

Bias and Its Impact
Armadillo Room (208)

Moderator: Renee Engeln, Psychology Department

Sarah Bridgewater, "Media Analysis of the Chicago Public School Closings"

Olivia Foster-Gimbel, "Fat Chance! Anti-Fat Bias in the Gay Community"

Rachel Leshin, "Blissfully Ignorant?: Implicit and Explicit Biases in Preschool-Aged Children"

Margaret Shavlik, "The Writing On the Wall: Body Image Concerns and Objective Measures of Facebook Use"

Jasmine Stephens, "Different Strokes: BDSM Involvement as an Alternative Organizational Schema in Partner Choice"

Oral Presentation Judges

Emma Adam, School of Education and Social Policy
Kate Baldwin, American Studies
Michael Deas, Journalism
Jaime Dominguez, Political Science
Deborah Douglas, The OpEd Project
Rachel Riedl, Political Science
Galya Ruffer, International Studies

Oral Presentation Abstracts

Alphabetical by presenter's last name

Hazim Abdullah-Smith

Faculty Advisor: Barnor Hesse

Spatial Practices & Violence in Invisible Man

This project analyzes the battle royal scene of Ralph Ellison's Invisible Man, in which the unnamed narrator is coerced into joining a fight-to-the-finish brawl amongst fellow Black men in front of his town's upper-class white audience. I use a close reading to explore how the battle royal scene reflects the spatial practices of race. Since race is a system of taxonomy and hierarchy manufactured through the practices of colonialism, slavery and the regulation of subaltern bodies, the battle royal exemplifies how practices produce a space intertwined with race-based power relations. The interplay between the white audience's consumption of the brawl and the Black men's positions as racialized and objectified subjects is significant to interrogating how space mediates the production and reproduction of racialized and gendered hierarchies. Using a critical understanding of space grounded in a Black Studies framework, I argue that space in the battle royal scene produces and maintains colonial constitutions of race and gender by casting white elites as spectators and Black men as objects entrapped in order to brutalize one another's bodies for white pleasure. Though published in 1952, understanding Ellison's literary portrayal of anti-Black racism in Invisible Man and particularly how space in the novel mediates racialized, gendered hierarchies is crucial in a contemporary analysis of the continuing forms of colonially-derived forms of oppression faced by Black populations today.

Syed Owais Ali

Faculty Advisor: Scott Curtis

Embedding Identities in Animation: A Case Study of Pakistan's Burqa Avenger and U.A.E's Freej series

An artist's hand-drawn animation is unique because of the degree of randomness in the in-between frames. With the introduction of computer animation, that randomness is attenuated, creating a challenge for animators to set themselves apart. Yet the significantly lower cost for producing CGI animation has introduced new players in the market; how do these new producers differentiate their product?. Pakistan's *Burqa Avenger* and U.A.E's *Freej* series are excellent case studies for this question, especially because they are ground-breaking animations in their home countries, which previously did not have strong national traditions in this form. This paper explores how narrative and pictorial elements in these animated series express national and cultural identity. Both the narratives and pictorial style of *Burqa Avenger* and *Freej* are motivated by local context and funding sources. The paper also identifies how off-screen space plays a very important role in creating a unique identity in these animation series. Therefore, the attention to detail on screen and off screen is now a critical component of computer generated animation and how artists try making their product as unique as possible.

George Baker

Faculty Advisor: Thomas J. Meade

Cobalt(III)-Schiff Base Complexes for Inhibition of Gli in the Hedgehog Pathway

Basal cell carcinoma (BCC) is the most commonly diagnosed cancer, affecting 2.8 million people annually in the United States and 3 out of every 10 Caucasians in their lifetime. Representing 75% of non-melanoma instances of skin cancer, the disease forms tumors usually found on the head and neck. Currently, effective treatments involve surgical removal of the tumorous tissue, though this leaves significant scarring. Alternatives include topical treatments, but are less widely used due to decreased efficacy when compared to surgical removal. At the molecular level, topical treatments have been ineffective because the pathway most responsible for BCC tumor growth and progression, the Hedgehog (Hh) pathway, readily develops resistance when targeted upstream. Because of this, seeking downstream protein targets in the Hh pathway is highly desirable. The Meade lab has designed a highly-selective cobalt(III)-Schiff base complex (CoGli) to inhibit Gli protein, the final step in the Hh pathway. The octahedral cobalt complex and a targeting oligonucleotide sequence are used in tandem to bind to and disrupt Gli protein with high specificity. After synthesizing the complex, cancer cell lines were dosed with 150nM CoGli. This reduced Hh signaling to healthy baseline levels. Future work will seek to conjugate CoGli to gold nanoparticles as a method of transcutaneous drug delivery. The therapeutic will first be tested in a 3D skin-like model, then on mice with BCC tumors. This method of treatment has broad implications for a variety of cancers as Gli is a known oncogene..

Alex Benjamin

Faculty Advisor: Amanda Lower

Interactive Theatre: Recasting the Audience

As a theatre director, playwright, and actor, I had a question: why does the audience usually sit in the dark and listen? Is this kind of physically removed intake the most revelatory way to experience a theatrical story? I began to research non-traditional audience formats and storytelling techniques, sometimes called immersive or interactive theatre, and became curious about how theatre design and actor training are adjusted to tell a story through audience interaction. I was also interested in how playwrights and directors adjust their processes to give the audience an active role in putting the pieces together. To explore these questions, I traveled to New York City for one week to observe rehearsals and workshops, attend performances, and conduct personal interviews with theatre artists--actors, directors, writers, and company leaders--engaging in immersive theatre. Why put the audience at the center of the experience? Why push for intimate psychological exchanges between performer and audience? Every interview revealed a different facet of the work, but most came back to a larger point about the human condition: the artists identified their basic human instinct to connect and share in an increasingly isolating and hostile world. These artists want more eye-to-eye connections rather than text message conversations, more unforgettable sensory experiences than binge-watching TV marathons, more emotional transformation revealed to an audience member at close range than a distant or impersonal portrayal of the human experience on a stage. The work is about empowering

audience members to seek out their own connections in life and art, a conclusion I feel is important to share with the Northwestern campus community.

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Josh Boxerman

Faculty Advisor: Carl Petry

Catbird Seat Diplomacy:
Henry Kissinger and the Creation of the US-Egypt Strategic Partnership

For decades, Egypt has been one of the United States' primary allies in the Middle East. Egypt has received billions in U.S. economic and military aid during this period, and has been a linchpin of U.S. strategy in the region. The origins of this essential partnership, however, receive little attention. Many scholars point to the 1979 Egyptian-Israeli peace treaty brokered by the Carter administration and backed by significant U.S. monetary guarantees. This thesis will argue, based on extensive examination of declassified State Department and White House documentation housed at the National Archives and the Ford Presidential Library, that the origins of the relationship can best be found in the diplomatic foment following the 1973 Arab-Israeli war. Egypt had fought Israel with significant Soviet support, while Israel was squarely in the U.S. camp. But by 1975, Egyptian President Anwar Sadat was being fêted at the White House, and by 1976, the first shipment of American military materiel arrived in Egypt. After the war, Secretary of State Henry Kissinger realized that the U.S. was in "the catbird seat," possessing significant diplomatic opportunities in the region. His subsequent attempts in the postwar period to mediate comprehensive peace in the region through step-by-step diplomacy necessitated, facilitated and led to a parallel effort to build a bilateral relationship with Egypt that Carter would ultimately inherit. The dynamics of this process are essential for understanding Carter's diplomacy and factors for U.S. diplomatic success in the Middle East."

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Sarah Bridgewaters

Faculty Advisor: Mary Pattillo

Media Analysis of the Chicago Public School Closings

The implications of mayoral control of the Chicgo Public School system (CPS) extend further than the controversial appointments of the school board. The Emanuel administration has a strategic and controlling press philosophy that limits the flow of information, not just for reporters and journalists, but also to the general public – the students, teachers and parents who are directly affected by unilateral decisions like mass school closings and budget cuts. The limitations on the availability of information and the cloak of secrecy surrounding decision-making negatively impacted the ability of the press to fulfill its function as a watchdog during the latest round of school closings. The restriction of information by the mayor's office also made it intentionally hard to understand the extreme

implications of the school closings on children, specifically homeless children and children of color. In this study, I conducted a media analysis of the CPS school closings in order to understand how the media represented the school closings and the repercussions for students, schools, teachers, neighborhoods and families. I created a database of approximately 480 newspaper articles that referenced school closings from the following sources: Chicago Reader, Chicago Defender, Extra, Chicago Tribune, Sun-Times, and Catalyst Chicago. Newspapers dedicated to social or educational justice took on the bulk of investigative reports, while 'mainstream' newspapers highlighted political plays or power over the implications of the school closings on communities and students.

Aozora Brockman

Faculty Advisor: Nitasha Sharma

The Paradox of a Global and Homogeneous Nation: Korean-Japanese in Contemporary Japan

How do Korean-Japanese hāfus—or individuals with both a Japanese and Korean parent—internalize and/or combat the myth of a homogeneous and monoracial Japanese nation? My ethnographic research on Korean-Japanese offers the rare opportunity to examine the pressures of assimilation in contemporary Japan. Since Korean-Japanese—unlike other "mixed" Japanese whose bodies may mark them as "foreign"—look ethnic-Japanese, revealing their Korean-Japanese backgrounds may be a choice, not an obligation. In this presentation, I explore the various ways in which six Korean-Japanese hāfus I interviewed understand their ethnic, cultural, and national identities in order to examine the ongoing effects of Japanese nationalism on the broader populace. My research project draws on the scholarly work of Harumi Befu, Eiji Oguma, Maruyama Masao and others to reveal the oftentimes conflicted experiences of Korean-Japanese, whose negotiation of implicit anti-Korean racism uncovers the paradoxical state of Japanese nationalism today. The myth of Japan as a homogeneous nation exists in tandem with the country's need to globalize and become international, and hāfus—often those who are white and Japanese—are celebrated in the Japanese media as symbols of multicultural modernity. Yet the inability of most Korean-Japanese interviewees to fully criticize Japanese policies exposes the ways in which assimilation pressures are sustained through educational systems and cultural understandings of morality. Ultimately, my work reveals how globalization and multiraciality are embraced as solutions to racial discrimination, and how this very trend makes clear the pervasive power of colonial nationalist ideology.

Anna Cassell

Faculty Advisors: Helen Schwartzman and Mark Sheldon

"Something is Really Wrong": Evaluating Concussions and Early Retirement in Women's Collegiate Soccer

The topic of concussions has captured the attention of the American public. While most of the media discourse on concussions focuses on football, it is not the only major sport where concussions are

both common and their effects devastating; women's soccer is another sport in which concussions have become an increasingly problematic health concern. Indeed, countless female soccer players have suffered concussions, and growing number of women have had to leave the sport due to these injuries. Although concussions have become an increasingly common injury, there remains a great deal of uncertainty with regard to their diagnosis, treatment, and prognosis. Additionally, the way that scientific and medical information regarding concussions is communicated to players is wrought with ambiguity, which can make players' medical decision-making especially challenging. My research brings an anthropological lens to the study of concussions sustained in women's collegiate soccer. I do this by combining ethnographic research, specifically focused on the narratives of players who have had to medically retire from soccer, with an in depth evaluation of the NCAA's "Sport-Related Concussion Guidelines, which are assessed in light of the most recent and relevant scientific and educational literature on this topic. My research suggests that there is a major lack of understanding about the long-term impacts of concussions at all levels, and when this is combined with player narratives, which indicate that players often do not report their concussions and continue to play or they lie about their symptoms in order to be cleared to play, it is obvious that "something is really wrong." However, despite the severity of persistence of some of these long-term symptoms that can result from concussions, participation in collegiate soccer—and indeed all levels of soccer—has tremendous value for women and girls. The value of athletic participation that remains in spite of these injury risks compels this ultimate paper's recommendations relating to improvements in the management of concussions in women's collegiate soccer.

Jack Cavanaugh

Faculty Advisor: Derk Joester

Investigating the impact of ionic impurities on skeletal growth mechanisms through a biomimetic system

Many organisms generate skeletal structures through the crystallization of an amorphous precursor phase. Organisms are thought to control the crystallization of this phase using impurity ions, proteins, and other macromolecules in order to produce a strong and tough crystalline composite. We have investigated the role of impurity ions on the stability, structure, and transformation of amorphous calcium carbonate (ACC), a widely used precursor in the biological processing of bone minerals. In our *in vitro* model system, nanoparticles of ACC nucleate and remain stable at larger sizes and for longer than previously reported. The prolonged stability of ACC in our system facilitates studying the phase and subsequent phase transformations to crystalline mineral. For instance, we have shown that when barium or strontium ions, indistinguishable from calcium for many organisms, are substituted in the intervesicular solution, the amorphous nanoparticles crystallize at expedited rates and form different polymorphs as a function of impurity concentration. Time-lapse videos captured using polarized light microscopy identified the formation of crystalline nanoparticles by their strong birefringence. The induction time before crystallization increased from 1 hour to several days with decreasing barium concentration. Analysis with confocal Raman spectroscopy indicated that the initial impurity concentration impacted the structure of the amorphous precipitate and determined the final nanoparticle crystal structure. The impact impurity ions have on the amorphous precursor phase has implications for our understanding of skeletal growth, which may impact how we develop climate

models using historic temperature profiles drawn from impurity ion concentrations in fossilized skeletons.

Danbee Chon

Faculty Advisor: Paul Reber

Motivational Effects on Implicit Learning

Implicit learning is a type of memory in which previous experiences assist in the performance of a task without conscious awareness of what is gained from experience. Previous research has indicated that better implicit learning may occur on a state of regulatory misfit, as regulatory fit seems to induce better learning on conscious tasks. To investigate this idea of regulatory misfit, this study utilized the approach-avoid motivation theory, of which approach motivation seeks to be rewarded, and avoidance motivation seeks to avoid punishment. The project's key question is to examine the effect of cognitive origin of motivation. We hypothesized that the regulatory misfit groups (positive + avoid & negative + approach) will exhibit better implicit learning than the fit groups (positive + approach & negative + avoid). 128 participants were randomly assigned into one of the four conditions before completing an implicit motor sequence learning task, which measures learning on a covertly embedded 12-item repeating sequence by comparing participants' performance on the repeating sequence with unpracticed sequences. A factorial ANOVA revealed that our hypothesis was partially supported, as participants primed with avoid motivation displayed significantly better sequence-specific learning than the approach motivation group. We relate these findings to the research regarding the motivation theory, which indicates that avoid motivation is generally more powerful than approach motivation and discuss implications for motivation effects on skill learning.

Elizabeth Conger

Faculty Advisor: Neal Blair

Biodiesel from Spent Coffee Grounds: Extracting Fatty Acid Methyl Esters (FAMEs) from a Waste Stream for Fuel

Anthropogenic climate change and the need for energy security have motivated the United States and other developed nations to find new resources for fuel production besides fossil fuels. For liquid fuels, biofuels could be an environmentally-friendly alternative. One potential source for biofuel is spent coffee grounds, a waste product that may contain a significant amount of useful biomass for biodiesel production. Conventional biodiesel is composed of fatty acid methyl esters (FAMEs), which can be produced from fatty acids natural to biomass. Spent coffee grounds are a waste stream with an appreciable fatty acid content, varying from 11 to 20 weight %, which is comparable to other biodiesel feedstocks such as soybean oil (20%), and corn (<10%). Various chemical methods of extracting and converting these fatty acids to biodiesel were developed and refined to produce the highest yields of FAMEs. The conventional chemical reaction used, transesterification, does not convert all of the "tightly bound" fatty acids covalently bound to non-extractable cellular components, such as the cell membrane. The FAME yields of this chemical method were compared to those of two unconventional

methods, saponification/esterification (S/E) and tetramethylammonium hydroxide (TMAH) application. The resulting FAME yields from these two chemical methods were identified and quantified through the use of gas chromatography/mass spectrometry (GC/MS). The TMAH method was deemed unsuccessful in producing clean FAMEs without extensive cleaning methods. The S/E method did produce clean fuel samples of an appreciable amount, but implementation of this method may be difficult due to increased processing time and resources.

Will Ejzak

Faculty Advisor: Juan Martinez

Hideously Incompatible: Solipsism and Gendered Selfhood in the Fiction of David Foster Wallace

Given the significant body of literary criticism devoted to David Foster Wallace, it is difficult to explain why gender issues have been so consistently overlooked. In Infinite Jest, Brief Interviews with Hideous Men, and The Pale King, Wallace deals extensively with gender-specific problems of selfhood, demonstrating not merely an interest but what Clare Hayes-Brady describes as an "almost-pathological consciousness of gender politics" (132). While solipsistic isolation plagues Wallace's male characters, his females prove incapable of establishing selves at all. Denied solipsism's privileged "ownership of self," Wallace's women are condemned to a compromised, marginal subjectivity — one that matches their marginal roles in his fiction. These asymmetrical models of gendered selfhood are jointly responsible for the symbiotically harmful and irreconcilably disconnected relationships between men and women that pervade these works.

Hannah Fishkin (Evanston Township High School)

Faculty Advisor: Makoto Ogura (ETHS)

Unclenching the Feminist Fist: Rebranding The Movement

During this semester I spent my time researching and rebranding the idea of feminism. I wanted to discover the misconceptions, learn more about feminism, become a better, more informed feminist, and put all of this into my graphic design. I created 6 posters that corresponded with 6 units that I split "feminism" into and then held focus groups to see their effectiveness as well as just discuss feminism. I compiled 740 pages of research both for and against feminism and I have learned more about myself and feminism during this semester than I ever could have imagined. I ended up becoming a very new kind of person/feminist, I learned so much about our society as a whole, and I have decided after much thought, focus grouping and research, that feminism is just humanism, and that's what I am, a humanist.

Olivia Foster-Gimbel

Faculty Advisor: Renee Engeln

Fat Chance! Antifat Bias in the Gay Community

Antifat prejudice has increased steadily in the U.S. over the past 10 years. Previous research has indicated that the gay community may be especially vulnerable to antifat bias. Although popular culture has indicated that antifat bias may be a particularly serious problem for the gay community, no studies have examined this issue empirically. In Study 1, we explored experiences of antifat bias among gay men. Participants (181 gay men, ranging in age from 1878) completed measures of antifat bias, body image disturbance, and open ended questions about their experience with antifat bias. Over one third of gay men reported experiencing antifat bias. These experiences were correlated with body image disturbance. The most common type of antifat bias reported was rejection by potential romantic partners on the basis of weight. In Study 2, we compared gay and heterosexual men's expectations of antifat bias in their community. Participants rated how likely certain outcomes would be if they saw an overweight man attempt to hit on an attractive man or woman. Heterosexual men rated the overweight man as heavier and less attractive than gay men and rated the attractive person as more attractive. However, gay men reported greater likelihood that the overweight man would be blatantly ignored, treated rudely, or mocked behind his back by an attractive man. These studies indicate that antifat bias is an issue in the gay community and that gay men expect other gay men to show these antifat biases when looking for a romantic partner.

Moira Geary

Faculty Advisor: Helen Schwartzman

Citizenship and the Playground's Place: American Values at Play in Penny Park

Children's play is integral to the process by which children become adults, and play in America is inseparable from the playground. Anthropologists and Sociologists have increasingly used the playground as a site for research on children's culture since the 1970's, while work that has been done on American playground structures themselves has been limited to a handful of scholars and has focused on the history of post-1950 playground characteristics and building methods. This research situates the playground itself as the subject of ethnographic inquiry, incorporating a social history of the American playground with a contemporary case study of a dispute over the future of a local one. Penny Park is an all-wood playground in Evanston, Illinois built by community members in 1990, whose preservation is being staunchly defended by many current residents. Data for the case study ranges from historical records and news coverage to interviews with residents, and reveals that the structure contains more than just wood. For the residents that publicly defended Penny Park, the playground was integral to their definitions of community, children's play and development, and even their neighborhood's boundaries. Playgrounds across the country are built, torn down, and rehabilitated daily, and this research demonstrates how the physical (re)construction of playgrounds coexists with the production and (re)inscription of values about childhood play and future American citizenship. Future scholarship on children's interactions within constructed spaces can be advanced

by an examination of how adults construct those spaces to move children physically toward their future social selves.

Nicholas R. Geisendorfer

Faculty Advisors: Ramille N. Shah and Adam Jakus

Metallic Architectures from 3D-Printed Oxide Inks

Traditional metal 3D-printing techniques make use of a metal powder bed and a power source to selectively sinter or melt the powder into the desired objects. These methods are disadvantageous in that metal powders are costly and difficult to produce and are often unstable and even toxic, and that powder bed methods have limited capabilities in terms of the internal structure of the metal object. Metal oxide powders on the other hand are stable, inexpensive and safer compared to their metallic counterparts, but their high melting point makes them incompatible with energy-based manufacturing technologies. Here we demonstrate a novel system for 3D-printing metals by extruding a liquid, particle-laden ink into structures which undergo subsequent thermochemical reduction and sintering into metallic objects. The ink is comprised of metal oxide powder and a biocompatible elastomer and immediately solidifies upon deposition, permitting large, high-aspect ratio, and hollow objects to be rapidly fabricated at high speed. The 3D-printed oxide objects are mechanically robust and can be manipulated prior to thermochemical processing. 3D-printed oxide sheets can be rolled, folded, cut, or fused to achieve higher levels of complexity. This process is also versatile; we demonstrate that inks comprised of oxides of iron, copper, nickel, cobalt, and alloys thereof can be 3D-printed into a variety of architectures and transformed into metallic counterparts via thermochemical reduction at materials-specific sintering temperatures and times. This work lays the groundwork for expanding the number of 3D-printable metals and alloys by a novel technique not based on selectively sintering or melting.

Joseph D. Hurley
Faculty Advisor: Amy C. Rosenzweig

Structural basis for copper uptake in methanotrophic bacterium *Methylosinus trichosporium* OB3b

Biological methane oxidation can be performed by two enzymes in methanotrophic bacteria: the iron-containing soluble methane monooxygenase (sMMO) and the copper-containing particulate methane monooxygenase (pMMO). Expression of these proteins is controlled by a mechanism known as the ""copper switch"", i.e. sMMO is primarily expressed under low- copper conditions (<5 μM) whereas pMMO is upregulated under high-copper conditions. The expression of pMMO creates a large demand for intracellular copper. It is hypothesized that the influx of copper is facilitated by a CopC, which neighbors 75% of sequenced pMMO operons. CopC has well-characterized homologs in the genomes of *Escherichia coli* (pcoCD), *Pseudomonas syringae* (copCD), and *Xanthomonas campestris* (copCD), where it serves to export toxic excess copper from the periplasm. In most methanotrophic bacteria, however, the canonical Cu(I) binding site is completely missing. Sequence clustering reveals the so-called canonical Cu(I) site is in fact absent from the majority of CopC protein sequences. Here we

present the crystal structure, metal-binding properties, and biological diversity of this unique Cu(II) chaperone.

Kelly Hyland

Faculty Advisor: Ramille Shah

Impact of Printing Parameters, Scaffold Material and Cell type on Cell Viability in 3D Cell-Encapsulated Hydrogels

The accelerating field of regenerative engineering requires a diverse breadth of materials for scaffold design, in order to tailor mechanical and chemical properties to a specific tissue target, varying from bone to brain. Among the most popular methods to construct scaffolds is 3D printing. Because 3D printers can deposit different inks to produce materials with spatially organized properties, for example a region of vasculature next to a region of hepatocytes, it is a very attractive method for building printable scaffolds, including cell-laden hydrogels. However, the impact of scaffold material, cell type and printing parameters on cell survivorship has not been systematically documented, due in part to the difficulty of quantifying cell viability for 3D structures using nondestructive assays. Using live/dead stain and confocal imaging, this study quantifies the impact of several parameters, including cell type, scaffold material, extrusion pressure and extrusion needle diameter, on cell viability. After preparing gel and fibrinogen inks encapsulated with human umbilical endothelial cells (HUVEC), human dermal fibroblasts (HDF), and rodent-derived muscle stem cells (MSC), it was found that HUVEC cells have the highest Day 1 and Day 7 viabilities. All cells types showed decreased viability when subjected to printing. For a given cell type, viability does not vary significantly between gel or fibrinogen scaffold materials, but viability is very sensitive to extrusion pressure and needle diameter. Therefore, printing parameters and cell type should be carefully considered as they dramatically alter cell viability, whereas material choice, gel or fibrinogen, does not.

Sophie Qingjia Jiang

Faculty Advisor: Jocelyn Sage Mitchell

Political Legitimacy in China: China's Use of Drama of Resistance Against Japan

The project to explore China's political legitimacy is a written work produced in an independent class. China is the biggest authoritarian regime in the world, standing out for its success in the effort of maintaining relative stability and ensuring its continuity despite domestic challenges and international pressures. And this project is an in-depth case study on how China has been able to win consent and maintain its legitimacy beyond all forms of coercion commonly adopted in authoritarian regimes. I did research on mainly five sources of legitimacy, including economic performance, popular support, ideology, sports, and nationalism. And I found that nationalism in contemporary China is one of the most important but underestimated sources of legitimacy. Particularly, in this study, I used the underexplored example of state-sponsored "drama of resistance" against Japan, including films and TV shows, to show that the government is creating and perpetuating nationalism and how it has

greatly granted political legitimacy. The project took 15 week of study, combining both primary research, including study on the "drama of resistance" against Japan, and secondary research, including researches on past studies about China's political legitimacy. And this study fills the gap of one under-explored area about "drama of resistance" against Japan, revealing the importance of Chinese nationalism. It also indicates the correlation between "drama of resistance" against Japan and the anti-Japanese sentiment among the Chinese population, as well as functions of Chinese media to facilitate the shaping of Chinese nationalism.

Nathan Lamp

Faculty Advisor: Rebecca Seligman

Embodying Narrative: Performative Transformations of the 'Self' in the U.S. and Bali

Across the world, peoples of a wide variety of cultures utilize drama and performance in healing. Growing interested in the possibility for healing through theatre, this project was conducted to explore the connections between drama, performance, and mental health therapies, examining different theories for how performance can be used as therapeutic tool, as well as how performance functions and produces positive effects as a treatment. I have conducted a review of interdisciplinary historical, theoretical, and ethnographic research on the use of performance in mental health therapies, exploring the ways in which ritual healing and drama therapy can be avenues through which individuals, as well as communities, can activate performative transformations of their narrative understandings of "self", leading to positive change. I briefly trace the history of Western therapy in ritual performance, in order to ground the practice's philosophical, theatrical, and historical foundations. This is followed by a comparative focus on the therapeutic rituals of two areas of inquiry, ritual healing and spirit mediumship in Bali and contemporary drama therapy in the United States. Finally, I examine the various theoretical models for how ritual forms of healing "work", as well as drawing on information gleaned from interviews I conducted with local drama therapists. In my research, I have uncovered interesting, well-supported links between the use of drama-based therapies and positive psychological change. This project helps to bridge the gaps between theatre and performance studies, applied theatre, and cultural/medical anthropology, demonstrating areas of convergence, overlap, and mutual reinforcement.

Elizabeth Larsen

Faculty Advisor: William Leonard

Tackling Childhood Malnutrition: An Investigation of Innovative Grassroots Approaches Around the World

As of 2013, approximately 161 million children under the age of 5 years old suffer from stunted growth globally (WHO). Malnutrition has profound negative consequences on children's physical and cognitive growth and development. This cross-regional study aimed to investigate the effectiveness of alternative grassroots nutrition interventions for combatting childhood growth stunting. The study

was carried out over three months across ten case study sites in Guatemala, Peru, Rwanda, Uganda, Nepal and Cambodia. A mixed method, comparative study design was used, and data was collected using interactive interviews and qualitative field observations. The data were analyzed using NVivo qualitative data analysis software, Microsoft Excel software, and manually. The study revealed four elements that were important for improving growth outcomes across the programs. First, agricultural solutions tend to be the most cost effective, sustainable, and high impact nutrition interventions. Second, targeting new mothers produces better nutrition outcomes in young children. Third, group education classes help to establish social bonds that increase program impact. Lastly, government partnerships promote long-term sustainability. This study also uncovered numerous challenges facing the field of nutrition, including vast variability in the efficacy of nutrition innovations, little cohesion in monitoring and evaluation indicators among programs, and difficulty finding ongoing, apolitical funding sources. Further research into how to effectively scale grassroots interventions, while preserving their impact is needed.

Rachel Leshin

Faculty Advisor: Sandra Waxman

Blissfully Ignorant?: Implicit and Explicit Biases in Preschool-Aged Children

Given the persistence of racism in contemporary American society, a wealth of research has sought to uncover the origins of racial bias. While numerous studies have found evidence of implicit and explicit biases among adults, few studies have examined the existence of these phenomena in younger populations. For this project, we researched two exploratory questions: Can implicit racial biases be detected in four- and five-year-old children, and, if so, are such biases predictive of explicit prejudicial behavior? In the first of our two studies, we administered a measure of implicit bias (the Affective Misattribution Procedure) to four- and five-year-old children at Northwestern's Project on Child Development laboratory. After validating this measure for participants in the lab, we sought to explore the generalizeability of this measure outside of the lab as well as the relationship between implicit bias and prejudicial behavior. To investigate these issues, we ran a second study with four- and five-year-old children at a local preschool. In this study, we administered the implicit measure from before in addition to a new sticker allocation task designed to index prejudicial behavior. While participants from the laboratory study showed an implicit bias for white faces, this effect was not replicated for the preschool population. Preschool participants did, however, show a pro-white bias in the explicit behavioral task. These data have a number of provocative implications: most importantly, these findings suggest that implicit and explicit racial biases develop at a very young age, though the existence of implicit biases may be context-dependent.

Yujin Maeng

Faculty Advisor: Monica Prasad

The Asian American Political Incongruity: Disillusioned With The Vote

How do recent Asian American immigrants conceptualize and understand citizenship and political participation? This study attempts to explore recent Asian American immigrants understanding of citizenship in reference to the reconfiguration of public spaces and political subjectivities of the DREAM Act and the DREAMer movement. I hypothesized that exposure to the Act and the movement would be associated with a non-conventional understanding of citizenship and political participation. Both the Act and the movement are examples that worked to deconstruct the idea of the political public sphere and to reconfigure political identities in sites that had previously been ignored. I conducted semi-structured, in-depth interviews with 23 recent Asian American immigrants located in the Chicago area and discovered that there was an association between having unconventional beliefs about citizenship and political engagement and knowledge of the DREAM Act and the DREAMer movement, but that the association was not necessarily directional. I also found that those who held unconventional methods of political engagement and understandings of citizenship also shared a greater sense of political efficacy and greater frequency of personal political participation than their counterparts. Though the effects of the DREAM Act and the DREAMer movement on Latino/a communities have been studied, there has been very little research conducted on its effects on the Asian American community. This study then attempts to fill some of the gap in the literature regarding the DREAM Act, DREAMers, and Asian Americans.

Courtney Marcusson

Faculty Advisor: Casey Lew-Williams

Social cues enhance word learning by 30- to 42-month-old children

This project used online-processing measures to explore how 30- to 42-month-old children use discourse continuity and social cues to learn words from overheard, adult-directed speech. Children frequently hear adult conversations, and these conversations could be important sources of knowledge. However, prior research does not specify the social cues that must be present for children to learn from this type of input. To address this issue, we tested 30-42-month-old English-learning children's' (n=20) abilities to learn novel words in a combination of child- and adult-directed discourse that either did or did not contain discourse continuity and invitations into adult-directed discourse. Participants watched a video of two adults labeling four novel objects to the participant, and then to each other. Participants were then tested on their knowledge of the new words. Their eye movements during the test were coded to assess learning via accuracy and reaction time. Only when the target was presented in a discourse-continuous stream of sentences, and when participants were invited into the adult-directed conversation, did children learn the target words ($M=66\%$), $t(19)=4.7$, $p<.01$). This experiment showed that social cues via discourse continuity and invitations into adult-directed discourse influence how children learn from overheard adult-directed speech, bringing research on word learning closer to the naturalistic input in a child's daily life, and highlighting how social cues may facilitate learning.

Jonathon McBride

Faculty Advisors: Matthieu Flourakis and Ravi Allada

Role of the Sodium Leak Channel NALCN in Mammalian Circadian Physiology

In mammals, daily rhythms of sleep and wake are controlled by rhythmic changes in the electrical properties of a subset of neurons located in a region of the hypothalamus called the suprachiasmatic nucleus (SCN). The underlying mechanistic basis of high amplitude rhythms in neural activity in the SCN remains unclear. In *Drosophila*, a sodium leak channel (NARROW ABDOMEN: NA) has been shown to drive neuronal rhythms in circadian pacemaker neurons and to regulate circadian behavior. The mammalian NA homologue (NALCN) is expressed widely in the mammalian brain, including the SCN. It is unknown whether NALCN is essential in mammalian circadian physiology. Here, I generated a brain specific knock-out of NALCN in mice. To do so, I used two parallel approaches with the LoxP-Cre recombinase system. First, I used the CamKIIα promoter to drive the expression of the CRE-recombinase in most of the forebrain. The CamKIIα specific NALCN knock-out caused death around day 23 of development probably due to respiratory failure. The second approach was to use a more restricted CRE driver: VIP-cre. VIP is highly enriched in a subset of SCN neurons (~15%). VIP specific NALCN knock-out animals showed normal development but displayed a significant variance in onset of activity in regular light-dark cycles. In constant darkness, knockout animals had an abnormal period and were less active than control mice. Thus, this study reveals a crucial role of NALCN in controlling circadian behaviors such as sleep-wake cycles.

Fortunato N. Medrano

Faculty Advisor: David Uttal

Hypothesis Testing at a Children's Museum

Creating learning opportunities for informal learning of science and engineering concepts and practices may be of critical importance for fostering interest and engagement in the STEM fields (NRC, 2009). Hypothesis testing in particular is an essential skill in STEM education and science in general. Thus, we focus on hypothesis testing behavior during a problem solving task in a museum construction exhibit. Specifically, we explore if and how children are engaging in the essential skill of hypothesis testing by examining their behavior and comments. Children (M_{age} = 5.5 years) worked to repair a wobbly bridge and skyscraper with parents. Analysis focused on behaviors and conversation indicative of hypothesis testing, i.e. "shaking" the structure to test stability. Out of 66 child participants, 74% of children performed this Stability Check behavior. Three patterns of preceding behavior emerged: Stabilizing additions (32.9%), Non-Stabilizing additions (18.72%), and Nothing Added (48.32%) to the structure. A significant correlation between these stabilizing behaviors and the ratio of structural pieces added occurs, indicating the use of hypothesis testing. Conversationally, the Stabilizing and Nothing Added Stability checks are similar in frequency and proportion of talk about construction and sturdiness. Together, these results imply that Stabilizing and Nothing Added Stability Checks are indicators of hypothesis testing. A strong parallel between children's behavior and

comments in regards to hypothesis testing exists, which together provide evidence of early STEM reasoning. Additionally, naturalistic play in an informal environment seems to be a rich area to explore for evidence of hypothesis testing and STEM learning.

Kenneth Mok

Faculty Advisor: Rachel Riedl

Challenge to Senegal's Democratization: Youth Incorporation into the Formal Political Process

This research seeks to measure the effects of a major social movement on young people's trust in government institutions, specifically in Senegal. Often regarded as a model of democracy for the sub-Saharan region, Senegal faces a youth bulge and unemployment issue that has been correlated with non-institutional methods of political behavior and a fervent distrust of government. Although plenty has been written on African youth unemployment, there is a void in literature that closely examines the relationship between youth and formal political actors. In order to fill this void, I surveyed a random sample of 90 Senegalese people aged 18 to 30 years old in ten different neighborhoods within the capital city, Dakar. Consisting of 40 multiple choice and open-ended questions, this French-written survey requested young people's opinions of various political actors and overall political climate since 2012. These questions include "Do you believe the [new] President's political reforms have made a difference?" and "Do you believe the Senegalese Democratic Party is based on a clear set of ideas or on individual leadership?" Preliminary analyses of the survey results demonstrate that young people's trust in government has remained relatively poor despite a recent social movement. Measures of external political efficacy, or one's belief that the government will respond to his or her demands, were low across different socioeconomic, demographic, and geographic lines. These findings have potential implications for the question of youth engagement in politics for Senegal and similarly developing nations.

Chelsey Moler

Faculty Advisor: Emily Rohrbach

The Politics of Narration: Reading Stranger-Suitors in Austen and Burney

My project (which began as an Undergraduate Research Grant and is now a complete Honors Thesis) centers on the critical vacillation surrounding the politics of Jane Austen's novels. In Mansfield Park and many of her other novels, Austen directly encourages readers to acknowledge her own narrative divergence from the predominant representations of women in late eighteenth-century courtship novels (including novels by Fanny Burney, Maria Edgeworth, and Charlotte Smith). Despite such self-proclaimed divergence, scholars have disagreed about whether her representations of women conformed to the conservative norms of courtship novels, or instead revealed an underlying, progressive force in favor of the rational education of women. While these critics decidedly view Austen's contemporary, Mary Wollstonecraft, as a radical protofeminist who pushed relentlessly for

progress in female education, they have not yet concurred about the implied and explicit gender politics of Austen's novels. My project seeks to solve this problem by using narrative theory to show how Austen shapes her readers' encounters with the classic courtship story in politically significant ways. Determining when the narrative techniques of dissonant and consonant narration are being used in Burney and Austen's fiction helps me draw attention to moments when the authors are simply providing moral guidance (as do conduct books) and when they are leaving the authorial perspective ambiguous so that the reader is encouraged to judge for herself. Ultimately, I found that while Austen's novels do resemble her predecessors' courtship novels in plot and theme—young marriageable girls face challenges in the corrupt world while being courted by men of varying safety and worth—through her unique consonant narrative style, Austen, like her radical contemporary Mary Wollstonecraft, encouraged women rationally to make their own decisions and judgments. Austen's narration exposes the unstable grounds of any absolute claims of narrative authority and thus supports the notion that, with nowhere to turn for an easy set of prescriptive rules, exercising one's own judgment offers the best means of navigating the potentially treacherous waters of courtship. Austen's novels therefore can, with Wollstonecraft's works, be counted among the protofeminist texts of the long eighteenth-century.

Jessie Moravek

Faculty Advisor: Neal Blair

The fatty acid content of chitin: Characterizing the carbon storage potential of biological soil compounds

The biological compounds contained in soils are a large reservoir of carbon and a critical component of the global carbon cycle. Understanding the origin, properties, and carbon storage capacity of these compounds is essential for characterizing how soils respond to future climate and land use changes. In particular, soils contain non-extractable, long-chained, carbon rich fatty acids, but their origin is often unknown. I hypothesize a potential source of soil fatty acids is chitin, a structural carbohydrate found in fungal cell walls and arthropod exoskeletons. Even though fatty acids are not typically considered part of the chitin structure, previous analysis showed that commercially available chitin contained an unexpectedly high amount of fatty acids, which suggested an association between the two compounds, possibly through covalent bonding. To confirm the existence of the association between chitin and fatty acids, this study imitated a commercial purification method using a traditional methane-sulfonic acid dissolution and re-precipitation treatment, after the chitin was exhaustively extracted with organic solvents to remove non-bound fatty acids. The fatty acid content of the purified chitin will be quantified using Gas Chromatography-Mass Spectrometry (GC-MS). If fatty acids are found in the purified chitin, this would provide further support for the hypothesis that acids and chitin are covalently associated. Such a result would motivate further studies to identify the chemical nature of this relationship. An association between fatty acids and chitin would be a novel observation about the structure of chitin and a potential explanation for unidentified soil fatty acids.

Susie Neilson

Faculty Advisor: Loren Ghiglione

Yellowbone: a video foray into South Africa's underreported skin lightening problem

This summer, I researched, reported and filmed the beginnings of a feature-length documentary looking into the prevalence of skin bleaching in South Africa, particularly among black women, as the 20-year democracy struggles to embody the progressive values of its new constitution and earn its title, "Rainbow Nation", meant to highlight the country as a unique locus of racial diversity and tolerance. Over four weeks (not including preliminary research and reporting for a feature story in the spring), I conducted dozens of interviews, retrieved archival photos and observed the country's racial politics from an everyday perspective. I concluded the following: Over the last five years, South Africa has seen a massive resurgence in skin lightening, a phenomenon observed by celebrities, ordinary citizens and academics. Most of these people blame the increased prevalence of western media, particularly in the iPhone era with media at our fingertips. While South Africa is slowly moving toward its goal of becoming a "Rainbow Nation," lighter skin remains the prevailing beauty standard and the fast track to success. The growing popularity of skin bleaching products in South Africa, India, Korea and many other developing nations suggest white supremacy is alive and well all over the world.

Zaynab Quadri

Faculty Advisor: Michael Allen

"A Slave of a Slave": Discourses of Slavery and Genocide in the Abortion Debate Among Black Women Activists

In the 1960s through the 1980s, both anti-abortion and abortion rights activists utilized rhetorical comparisons between abortion, slavery, and genocide. The heightened urgency implicit in these historical metaphors, as well as the ubiquity of the comparisons, begs the question: how have histories of slavery and genocide come to be injected into conversations about abortion, and what purposes do such links serve? After consulting secondary historiography and primary source anthologies on abortion and reproductive politics, as well as primary archival research at the Sophia Smith Collection at Smith College in Northampton, MA, I highlight and analyze these racialized discourses amongst several actors and groups in my thesis. In this presentation, however, I focus on the way that black women abortion rights activists have engaged the history of slavery in order to distinguish themselves as a distinct political entity with their own communities and priorities. I situate these activists within the black feminist movement of the 1970s and 1980s, carving out a political space for black women apart from the civil rights movement and the mainstream feminist movement, apart from black men and white women. Unable to rely on either the civil rights movement or the feminist movement for support for their particular needs, black women activists established organizations and a voice for themselves through an invocation of the collective trauma of the slave past.

Danica Rosengren

Faculty Advisor: Rives Collins

How Spectacle, Immersion, and text are used in Theatre for Young Audiences in The UK: Stage to Engage

The field of Theatre for Young Audiences (TYA) constantly strives to create new, exciting, and imaginative non-patronizing art. However, cutting edge TYA is hard to find in America because theatres rely on ticket sales, whereas in the UK government funding supports the theatres. Therefore, I traveled the UK, interviewing playwrights, artistic directors, directors, families, and designers to discover just how these companies stretched the boundaries of TYA. I discovered that in order for the outcome to be most engaging, each element of spectacle must tie directly to the storytelling. However, storylines loosen in theatre for the very young and theatre for children with disabilities. Engagement in children decreases as soon as winks and jokes for solely adults are added. Many artistic directors also argued that there is no topic that needs to be censored; it all depends on the way one presents it. Therefore, while America doesn't have the means right now to create this new age work on our own, we must try to encourage parents, teachers and mentors to take children not just to *Annie* or *Seussical*, but also lesser known titles such as *Skitterbang Island* or *Babble*.

Katherine Scott

Faculty Advisor: Renee Engeln

Dance like Nobody's Watching? Impact of Objectifying Cues in the Dance Studio

The presence of mirrors in dance studios may trigger self-objectification among a group already at increased risk for eating disorders. We report experimental evidence that dancing in a room with mirrors (in comparison to a room without mirrors) decreased dancers' state-level body satisfaction. Dancers are considered an at-risk group for body dissatisfaction and eating disorders (Abraham, 1996). Objectification theory (Fredrickson & Roberts, 1997) suggests that self-objectification is key to the development of poor body image, which can often lead to disordered eating (Cash & Pruzinsky, 2002). Although self-objectification is often conceptualized as a trait (Grippo & Hill, 2008), specific situations can increase self-objectification in women by providing contextual cues (Fredrickson et al., 1998). One specific feature of the dance training environment that has been linked to objectification is the presence of full-length mirrors (Radell et al., 2002). The current study involved a novel test of the impact of a self-objectifying cue on dancers' body image. We examined the impact of dancing in a room with or without mirrors. We predicted that dancers' body satisfaction would be lower after dancing in the mirror condition compared to the non-mirror condition, after controlling for trait-level body dissatisfaction. Twenty-one male and female dancers (M_{age}= 20.20, SD= 0.93) completed an online pre-test of including demographics, questions about their dance history, and trait body dissatisfaction using the body dissatisfaction subscale of the EDI-3. They then completed two in-person sessions (one to two weeks apart) during which they danced for five minutes alone in a studio. For one session, the mirrors in the studio were revealed; in the other, the mirrors were hidden. Order of sessions was randomly assigned. Immediately after dancing, participants completed a measure of state body satisfaction. Data were analyzed using a repeated measures analysis of covariance, with trait

body dissatisfaction as a covariate, condition (mirror or no mirror) as the repeated measures factor, and state body satisfaction as the dependent variable. Trait body satisfaction was a significant covariate, $F(1, 19)= 4.81$, $p= .04$, $\eta_p^2= .20$. There was a significant effect of mirrors on state body satisfaction, $F(1, 19)= 6.20$, $p= .02$, $\eta_p^2= .25$, with higher satisfaction in the non-mirror condition ($M= 6.63$, $SD= 1.09$) than the mirror condition ($M= 6.36$, $SD= 1.25$). This is the first test of the impact of objectifying cues on dancers' body image outside of the structure of a ballet class. Results suggest that reducing mirror time might be an effective intervention to increase dancers' body satisfaction.

Kristen Scotti and Emily Northard

Faculty Advisor: David Dunand

Microgravity Freeze-Casting Improves Microstructure in Dye-Sensitized Solar Cell Electrodes

Freeze-casting, a novel material fabrication technique, utilizes ice dendrites as pore templates in the final material. The process consists of solidifying particles suspended in water directionally. The introduction of a thermal gradient during solidification causes ice dendrites to nucleate at the surface of the freezing substrate and subsequently grow directionally, away from the advancing solidification front. As the dendrites grow, they reject suspended particles into interdendritic spaces. Upon removal of the ice dendrites, elongated pores, encased by the rejected particles, remain. The simplicity of this technique–and the employment of water as a solvent–enables scalable and low-cost production of this material. This process was utilized to solidify titanium oxide slurries for the fabrication of highly-ordered, three-dimensional dye-sensitized solar cell electrodes aboard microgravity flights. By masking the forces of Earth's gravity, we aimed to expand the scientific understanding of the solidification process, and in particular, the growth behavior of dendrites, in an effort to improve terrestrially-based fabrication techniques. For optimal electron diffusion, a dye-sensitized solar cell electrode should exhibit mesoporous channels aligned in parallel with each other and perpendicularly oriented with respect to the current collector. In comparison materials solidified terrestrially, materials solidified in microgravity better met this requirement; pore alignment was nearly perpendicular with the freezing surface and average tortuosity was significantly reduced. Additional microgravity flight research is planned for June 2015 to expand upon initial results and to prepare for experimentation on the International Space Station, where freeze-casting will be demonstrated as a promising space-based manufacturing technique.

Margaret Shavlik

Faculty Advisor: Renee Engeln

The Writing On the Wall: Body Image Concerns and Objective Measures of Facebook Use

Research on the impact of media on women's body image has focused on traditional forms of media, but the average adolescent spends at least 26 minutes a day on social-networking sites (Rideout et al., 2010). In adolescents and college-aged women, social media usage is associated with body

dissatisfaction (Hargreaves & Tiggemann, 2004) and self-objectification (Harper & Tiggemann, 2008). However, no research has examined these associations using objective measures of Facebook use. The current study employed both subjective and objective (e.g., number of photos of self-posted) measures of Facebook use to examine the association between specific types of use and body image disturbance. One-hundred sixteen college women (18-25 years old) completed an online survey including measures of body image disturbance. Participants also self-reported frequency and type of Facebook use, and provided a .pdf of 30 days' worth of their Facebook "activity log" (which documents all Facebook activity). We created a Facebook Usage Scale assessing 26 types of activity. The scale comprised questions from previous scales (Tiggemann & Miller, 2010) and novel questions. All items were entered into a factor analysis using principle axis factoring with direct oblimin rotation. Results suggested a four-factor structure. Factor 1 included items such as 'liking' or commenting on a friend's post. Factor 2 comprised posts by oneself. Factor 3 included joining 'groups' or creating events. The fourth factor included posting photos of oneself or others. One objective measure of Facebook-use was the length of participants' activity logs, which showed small to moderate correlations (ranging from .28 to.46; *ps* < .004) with the self-reported factors 1, 3, and 4 (above). The correlation between self-reported 'daily minutes' and objective 'number of pages' was surprisingly low, $r(114) = .19$, $p = .04$. Self-reported daily minutes did not correlate with any body image measures (all *ps* > .39). However, the objective measure of daily use was significantly correlated with body surveillance, $r(111) = .21$, $p = .02$ and marginally correlated with body dissatisfaction, bulimia, and drive for thinness (all *ps* < .081). These data highlight two methodological concerns for studies of social media use and body image: a need for objective measures of social-media activity and the need to consider different types of social media activity separately.

Albert Song

Faculty Advisor: Robert Lamb

Viral Fusion Proteins: The Role of Metastability in Viral Fusion and Entry

Parainfluenza Virus 5 (PIV5) is an enveloped, single-stranded, negative-sense RNA virus of the *Paramyxoviridae* family. The Paramyxovirus family includes many biologically and economically significant pathogens, such as mumps, measles, respiratory syncytial virus (RSV), and the emerging zoonotic Hendra and Nipah viruses. The most recent outbreak of zoonotic Ebolavirus highlights our need to understand the mechanism of viral infection and pathogenesis; zoonotic paramyxoviruses, such as Hendra and Nipah virus, remain serious societal hazards with mortality rates upwards of 90 percent. Investigation of the related PIV5 viral entry and infection propagation mechanisms ultimately provides many new avenues to generate novel and effective antiviral therapies against high-risk viruses. In order for enveloped viruses to reproduce, they must have a means of fusing their viral membrane with the target host cell membrane. PIV5 fusion and entry are mediated by two surface-expressed glycoproteins: Hemagglutinin-neuraminidase (HN) and the Fusion (F) protein. HN is responsible for binding the virus to target cells and triggering F to begin the fusion reaction. Upon activation, F undergoes an irreversible, ATP-independent conformational rearrangement in which a hydrophobic fusion peptide inserts into the target membrane. As F proceeds to rearrange to a low-energy postfusion structure, the viral membrane and the target cell membrane merge to create a pore through which viral RNA can be transmitted. Here, through the resolution of an atomic structure, biochemical data, and

molecular dynamics simulation, we highlight a necessary early step that appears to be required for successful PIV5 fusion activity.

Jasmine Stephens

Faculty Advisor: Benjamin Gorvine

Different Strokes: Different Strokes: BDSM Involvement as an Alternative Organizational Schema in Partner Choice

In the US today, we tend to organize potential sexual partners by gender. One's own gender and the gender(s) one is interested in form the basis of the dominant organizational schema 'sexual orientation' (Sedgwick, 1990). "Kinksters", or members of the BDSM (Bondage/Discipline, Dominance/Submission, Sadism/Masochism) community sometimes report using an alternate schema, here referred to as "BDSM orientation", organizing potential partners into "kinksters" and "vanilla folk" (those not interested in BDSM; Savage, 2014; Thorn, 2012). My research attempts to begin disentangling sexual orientation and BDSM orientation, while exploring "BDSM orientation" further. As part of a longer survey, participants answered a "false dichotomy" question, regarding whether an ideal partner would match their preferred gender, or preferred sexual activity. Kinksters showed greater gender ambivalence than vanilla participants, while straight participants weighed "preferred gender" more heavily than queer participants. There were also main effects of BDSM orientation and sexual orientation when participants responded to the prompt, "When I look for an ideal partner, I look first at their gender". Straight participants endorsed the statement more than queer participants, and vanilla participants endorsed the phrase more than kinksters. In response to the item "When I look for an ideal partner, I look first at their interest in BDSM", there was no effect of sexual orientation, only BDSM orientation, with kinksters providing higher levels of endorsement. The results suggest that, amongst at least a segment of people involved in BDSM, more schemas than just 'sexual orientation' work to distinguish potential sexual partners from the general population.

Lawrence Svabek

Faculty Advisor: Mary Dietz

A World Itself Not New: Assessing Neoliberalism with a Tocquevillian Sensibility

Political science research has spent a considerable amount of effort trying to diagnosis America's contemporary problems with civic engagement and political participation. One of the 'culprits' of the changing political dynamics is an often used, but less often explained term, neoliberalism. At the forefront of the discipline's interest in neoliberalism is Wendy Brown's theoretical work. Brown conceives of neoliberalism as a political formation that is displacing the liberal democratic order. The strictly oppositional positioning of neoliberalism against democracy results in an implicit privileging of democracy as equivalent with liberty, equality, and political self-rule. However, a turn to the history of political thought may in fact reopen the possibilities available within democratic society. Through the theorization of democracy by Alexis de Tocqueville in his work *Democracy in America*, I aim to

complicate the unwavering positive connotation that Brown gives to democracy and demonstrate democracy's own potential to harbor nefarious psychologies that make neoliberalism's features a reality. By doing so I hope to complicate the unalloyed conception of democracy popular in some political theory as well as transform Brown's understanding of the potential for reform.

Jacqueline Torgerson

Faculty Advisors: Rachel Zuckert and Axel Mueller

The Liberating Consciousness of Radical Hip-Hop: Going Beyond the Culture Industry

For my senior philosophy thesis, I studied contemporary radical hip-hop in relation to Adorno's conception of the culture industry. I analyzed the history of hip-hop in the United States in order to argue that while mainstream hip-hop may be commoditized and considered a part of the culture industry, one cannot ignore the radical, oppositional and critical independent hip-hop movements that encourage a disruptive and liberating, rather than passive and conforming, consciousness of those who engage with it. Furthermore, I assert that radical hip-hop cannot be limited to the scope of Adorno's analysis, because he fails to recognize the effect popular culture can have on identity formation. I learned that many hip-hop artists and listeners think critically and self-reflexively about the negative and positive effects of culture on identity formation. Such hip-hop communities are focused on shaping a critical awareness of cultural identity outside of the traditional political system and prioritize consciousness and identity formation as a way to liberate the mind from historical oppression. Ultimately, I believe that contemporary experimental hip-hop movements in the United States may constitute a form of critical theory, rather than mass art, through content and form. While it is unlikely that these movements fit into what Adorno would label critical theory due to their congruencies with popular art and complex relationship to what could be labeled the culture industry, Adorno's approval is far from imperative. Forms of African American liberation should not be limited to Frankfurt School notions of critical theory, which avoided racial discourse almost entirely.

Emily Vernon

Faculty Advisor: Michael Allen

Women's Rights Are Human Rights: Hillary Rodham Clinton, the Fourth World Conference on Women, and the Role of First Ladies in U.S. Foreign Policy

In her 1995 address before the United Nations Fourth World Conference on Women in Beijing, Hillary Rodham Clinton famously declared, "If there is one message that echoes forth from this conference, let it be that human rights are women's rights and women's rights are human rights once and for all." Twenty years later, feminists around the world point to this speech as a defining moment for international women's rights and a key stepping-stone in Clinton's subsequent political career. Although many scholars have written about Clinton's polarizing tenure as first lady, few have examined the significance of her Beijing address in depth. My project contextualizes Clinton's speech within the culture wars of the 1990s, examines how its rhetoric spoke to multiple audiences, and

probes its relationship to transnational feminism. I argue not only that Clinton's speech was a deliberate act of U.S. foreign policy, but also that it dramatically expanded the first lady's political domain beyond soft issues to power politics. My research draws upon archival records at the Clinton Presidential Library in Little Rock, Arkansas, which I visited with the help of an Academic Year Undergraduate Research Grant. I also incorporate textual and rhetorical analysis of the speech itself, contemporary news accounts, and Clinton's memoirs. By appealing to maternal values and setting at centrist tone in her address, Clinton was able to channel first ladies' traditional concern for women and children's issues into a more active foreign policy role, and thus to broaden the policymaking sphere for first ladies.

Lauren Wustenberg

Faculty Advisors: Nyree Zerega and Diana Alvira

Assessing sustainability of *Astrocaryum chambira* palm management in handcraft economies of the rural Peruvian Amazon

Decreasing deforestation in the Amazon rainforest requires shifting rural economies from reliance on timber extraction to the harvest of non-timber forest products (NTFPs). One NTFP that is an increasing source of economic development in the region is *Astrocaryum chambira*, a palm species that is a renewable source of fiber used in the rich and expanding handcraft economy of rural communities in northern Peru. Rapid increases in harvest of this palm have developed a network of local artisans, NGOs, and governmental bodies aiming to manage the use of chambira sustainably through reforestation programs. Two criteria of a sustainable chambira management plan are that harvesting intensity doesn't outstrip natural abundance of local fiber and that managed populations are not unduly susceptible to harsh weather events like floods. This research is the first attempt made to assess the impact of these management practices on the average age and population density of chambira held in secondary forests that are owned and harvested by handcraft artisans. Compelling evidence exists for a strong relationship between chambira density, reforestation practices, and elevation and this information will provide necessary data for the adaptation of reforestation strategies to specific communities throughout the region.

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. My project works on designing and developing better therapeutics for ALS. Furthermore, I will utilize the general chemical scaffold to perform a target-identification study to understand the mechanism of action of our lead compounds. From high-throughput studies, we have

previously identified arylsulfanyl pyrazolones as a hit drug scaffold for alleviating cell death caused by mutations in Cu-Zn superoxide dismutase 1 (SOD1), which is known to be linked to some cases of ALS. Further drug development has shown that changing the sulfur into nitrogen significantly increases potency. My project works with this lead arylazanyl pyrazolone scaffold, and further modifying this compound to identify better treatments for ALS. Following this, I have designed a probe compound utilizing a scaffold in this drug development process to serve as a covalent marker in locating where in the cell this compound interacts. This would identify the protein that this molecule most likely interacts with. Certain requirements must be followed when designing this probe, such as comparable activity and selective activations. This experiment has identified heat shock protein 27 as a potential target for this drug action. Further experiments will demonstrate this direct protein-ligand interaction. Functional effects will also be tested in order to observe how this interaction affects cellular toxicity in ALS models.

Guide to Creative Arts Festival

In scheduled order of appearance

☙ Creative Arts Festival

8:00-9:30pm, Struble Theatre

In scheduled order of appearance

❧

Katherine Scott

Traditions

"Traditions" investigates the patterns, traditions, and dynamics of a family through partnering, gestural work, and movement connected to a family dinner table. This dance originally started as an exploration of what it means to feel rooted, to feel at "home," to be a part of a community, and to be both figuratively and literally tied to a group of individuals. In this piece, the dancers both support and manipulate each other, displaying how our most intimate, precious relationships can also be our most destructive relationships. Through tender moments of connection and aggressive moments of disconnection, the dancers journey through the highs and lows of family. Dancers: Aric Barrow, Katherine Scott, Iris Hsu, Katie Ippolito, Megan Legault, Sarah Morimoto. Music: "I Only Know (What I Know Now)" and "I Never Learnt To Share" by James Blake, "Lisbon, OH" by Bon Iver. Very special thanks to original cast members: Benton Bailey, Alex Frankenthal, Cami Goldstein, Emma Hill, and Pam Kranyak.

❧

Mahalia Sobhani

Conversation in Three Poems

"Conversion in Three Poems" is a spoken word performance of three separate pieces ("This time last year," "I don't like vigils," and "Conversion") that loosely trace a young person's loss of religious faith and consequent struggle with identity. Although I have written poetry for years, I only became involved with slam poetry and spoken word when I came to Northwestern and joined the Slam Society. This medium has given me a wonderful way to explore heavier topics, especially given recent world events and my own changing identity as an American Muslim. Although spoken word gives me the freedom to write longer, looser pieces, my training as a more traditional writer makes me more inclined to restraint and shorter pieces. I believe that the tension between a conservatively raised young woman's desire to maintain decorum and a young college student's desire to shake the world lends itself to such a style of writing.

❧

Kyle Varwig

A Pair of Poems on Issues of Import and Interest

I wrote these poems during a study break from writing one of my final papers. As I weary of the mundane, formulaic task of essay writing, I occasionally become inspired to ease my mind by writing something creative. The result is my submission to the exposition. The poems I've submitted are Elizabethan sonnets. The first poem expresses feelings of college angst while the second addresses the cruelty of war. I chose the first topic since it might relate to Northwestern students who feel uneasy entering the working world. I chose the second since it is a poignant reminder of an oft ignored, harsh reality of war. In a world that is in constant conflict, I found this topic relevant as well. I hope you all enjoy the works that I've presented, and I thank you for your time in reading my brief abstract.

Susie Neilson

Yellowbone: a video foray into South Africa's underreported skin lightening problem

This summer, I researched, reported and filmed the beginnings of a feature-length documentary looking into the prevalence of skin bleaching in South Africa, particularly among black women, as the 20-year democracy struggles to embody the progressive values of its new constitution and earn its title, "Rainbow Nation", meant to highlight the country as a unique locus of racial diversity and tolerance. Over four weeks (not including preliminary research and reporting for a feature story in the spring), I conducted dozens of interviews, retrieved archival photos and observed the country's racial politics from an everyday perspective. I concluded the following: Over the last five years, South Africa has seen a massive resurgence in skin lightening, a phenomenon observed by celebrities, ordinary citizens and academics. Most of these people blame the increased prevalence of western media, particularly in the iPhone era with media at our fingertips. While South Africa is slowly moving toward its goal of becoming a "Rainbow Nation," lighter skin remains the prevailing beauty standard and the fast track to success. The growing popularity of skin bleaching products in South Africa, India, Korea and many other developing nations suggest white supremacy is alive and well all over the world.

Adam Hittle

How Do You Moralize on a Sinking Ship? Pt. 1 Interim Ghosts

My work is a video essay in that it is similar to a documentary in the formal techniques I employ, yet the role of the author is made ambiguous and a subjective (i.e., non-objective) argument is made. It incorporates found and recorded footage, preexisting and original music, cited and original aphorisms, as well as original multimedia visual art. It is influenced by the video art of Stephen Reinke, Erik Bunger, Agnès Varda and Jean-Luc Godard as well as the thought of Deleuze (on what constitutes a philosopher), Cioran (on the dangers of ideas), Derrida (on encounters with the Other), Kant (on autonomy), Kierkegaard (on indirect communication), Lacan (on the mirror stage of ego

development) and Socrates (on conceptions of the soul and recollection). The essay itself explores:, the social formation of the self, what one can hope for when studying philosophy today, and a possible function of art, among other things. Everything to think has been thought. What is worth thinking anymore? What should take precedence: knowing thyself or thy neighbor? The train is barreling ahead with no sign of stopping. The mangled tracks ahead spell certain annihilation. What do we do now?

Alex Benjamin

The Zone: a play about the night the world exploded

What if the items and animals left behind in Pripyat, Ukraine, could tell us what happened when the Chernobyl Nuclear Power Plant exploded on April 26, 1986? It released an amount of radiation "hundreds of times larger than the fallout from the atomic bombs dropped on Hiroshima and Nagasaki" (Yablokov), and Pripyat's citizens were unaware until they started experiencing headaches, nausea, and a metallic taste in their mouths (Knauer). The nineteen-mile Exclusion Zone still observed around Chernobyl is guarded by checkpoints under military control and locks away everything left behind by the humans, who suffered thyroid and lung failure, genetic mutations, and forced abortions (Yablokov). Despite the nearly thirty-year human desertion of the area, wildlife has begun to regenerate, making Pripyat "the largest, if unintentional, wildlife sanctuary in Europe" (Helmuth). It is possible that "mankind's disaster gave nature a second chance," cleaning out an invasive human population and allowing wildlife to return to natural symbiosis (Radioactive Wolves). The scope of the nuclear spill paired with the growing number of species in the Zone baffle scientists, who are unsure how life can continue in the area. I want to use research on the nuclear accident paired with contemporary studies of regeneration in the surrounding marshlands to tell a unique story about the endurance of life in the face of disaster. I will imbue objects, animals, and human characters with the stories of Chernobyl in a play to be workshopped with fellow students. The play will explore the universality of life and the power of the survival instinct in an unpredictable world. Performers: Jason Clark (stage directions), Jenna Levin (Irina), and Hannah Verdon (Natalka)

Kaela Walker

A Joycean Imitation of Dilly Dedalus on the Day to Day:
An En-Gendered "Proteus" Brought into a Contemporary Context

Inspired by the philosophical stream of consciousness style, characteristic language, and immersive synesthesia of the "Proteus" episode in James Joyce's *Ulysses*, this creative piece explores contemporary times through the imagined perspective of Dilly Dedalus (sister of Stephen Dedalus, narrator of "Proteus.") The Dilly of *Ulysses* is a slight but poignant figure: a young girl who forgoes a meal so that she may instead purchase an educational book. Dilly's contemporary analogue is a girl similarly starved of physical and intellectual nutrition and whose self-worth comes from all *but* herself. Whether factual or perceptual, her 'reality' is formed and informed by the opinions of people who are—via digital interfaces—at once physically separated and socially connected. Contemporary

fragmentation of 'subjectivity' and 'reality' is complicated by technology—a schismatic *'virtuality.'* This piece differentiates these modes of digital interactions with visual, instrumental changes in typography. Lacking a traditional narrative arc, the thoughts progress thematically: amplifying dissonance between lived experience and theoretical abstraction in order to reveal digital and social constructs as illusory but powerful nonetheless. Echoes of Millennials' woes orient contemporaneity as the nostalgic musings mature into adolescence. Then, with ripening self-consciousness, *childhood engenders girlhood.* Faced with a gendered practical reality, the thoughts work through states of recollection and recognition, finally indulging in imagination. The persistent aversion to direct, representational thoughts and alternative affinity for fidgeting with protean, mental abstractions is variously expressed: through extensive allusion (and detailed annotations,) the rejection of linear temporality, and resistance to traditional literary modes and syntax. This piece is an expression of both encounters *with* and proliferation *of* the equally *elusive* and *allusive* natures of thought, language, and reality.

Katherine Nagasawa and Leah Varjacques

Beyond the Seal

"Beyond the Seal" is an interactive web documentary that follows the fair trade banana supply chain from Ecuador to Boston, investigating how this model challenges the controversial history and structure of the US-Latin America banana industry. The piece explores the potential of a grassroots movement to change how bananas are sourced, traded and consumed. The legacy of bananas in South America is a highly political one, but many U.S. consumers do not know that this nutritious breakfast fruit also happens to be the symbol of twentieth century U.S. involvement in Latin America, the region's capitalist transformation and intense popular struggle. Transnational fair trade efforts attempt to amend the course of the food industry's contentious legacies, and the fair trade coffee movement has been a pioneering success. When it comes to bananas, however, deep-rooted industry structures present challenges to fair trade's success. For our project, we investigated a unique partnership between Equal Exchange, a US-based fair trade importer, and Asoguabo, a banana-farming cooperative in Ecuador. "Beyond the Seal" tells the story of a percolating movement uniting visionaries and fifth-generation banana farmers going against all odds for a more just food system. Weaving text and audio-visuals, "Beyond the Seal" informs U.S. consumers about where their favorite fruit comes from and deepens our understanding of the grassroots movements working to renegotiate our global food system.

Kalina Silverman

"Before I die…" | BIG TALK

"What do you want to do before you die?" This past summer, I asked this question to complete strangers as I began a social experiment called "Big Talk" – a method of meeting new people and skipping the small talk to engage in deeper, more meaningful conversations instead. I filmed my conversations with a homeless man, an elderly woman, a teenage boy – with a businessman in a tailored suit who broke down into tears and lamented that he should spend more time with his

family instead of working. I posted the first video online, and a few weeks later, was shocked to receive personal inquiries from people across the globe whom resonated with the vision behind Big Talk. I eventually hope to grow Big Talk into a movement that inspires people to connect meaningfully with one another, no matter who they are or where they may be. This is the beginning of a social experiment/video project called Big Talk. I wanted to be able to go out, meet new people, and instead of just make small talk, actually have deeper, more meaningful conversations with them. So, as I filmed this video, I went out of my way to approach - rather than walk by the strangers I pass by every day. Then, I skipped the small talk, and cut right to the "big talk." If you are interested in learning more about Big Talk and/or getting personally involved, please visit me at www.makebigtalk.com!

Jacqueline Ovalle, Fatima Gomez, Emily Schraudenbach, Jessie Mayhew, Rebecca Perez

Cabrona

After spending years in male-dominated bands laced with ego competitions and sexist gender dynamics, multi-instrumentalist, songwriter, and NU undergrad Jacqueline 'Loca' Ovalle (BIEN '16) decided it was time to reattempt to form the all-woman rock band she dreamed of since high school. She wanted to create a band that could empower femininity, express and perform silenced narratives, and remembers lineages to Latin America through sound and lyrics. After a sour breakup from a male dominated band on campus, she began to search for the perfect group of talented female musicians. Guitarist Rebecca 'Basura' Perez and classical violinist Fatima 'Fatale' Gomez (WCAS '17), both former bandmates, were immediately on board. By luck, Loca found Emily 'Empress' Schraudenbach (WCAS '15) playing drums in a Jazz Community band outside of a campus dorm and recruited her on the spot. As soon as the new school year started, rehearsals and jam sessions were underway. Jessie 'Mayhem' Mayhew (WCAS '15) joined the group as bassist after reaching out to record the band for a music tech assignment, and being invited to replace Loca as bassist in order to allow for a two-guitar, 5-woman band. With influences in punk, rock, folk, jazz, classical, Latin styles, and the Riot Grrl Movement, Cabrona is fresh with energy and ready to continue to shape a unique sound that speaks to underrepresented narratives on stage and in the music world. But for now, it's all about having fun and being unapologetically badass.

Visual Arts

9:00 am – 4:30 pm, Louis Room (205)
and 8:00 – 9:30pm, Struble Theatre

Will Ejzak

Won't You Play Me a Song?

The illustrations (colored pencil/pen, 9" x 12" or smaller in original size) accompany a short children's picture book. In the story, a young girl who spends much of her time singing and practicing her mandolin in the privacy of her bedroom cannot bring herself to perform in front of others. Her parents encourage her, her relatives cajole her, and her teachers insist that she bring her instrument for show-and-tell; but performing is terrifying, and the girl avoids it at all costs. Hers is a private gift—or it would be, if she had her way. But her guardian Music Spirit has other plans. One day, while taking her mandolin for a walk in the park, the girl is visited by a friendly old man who asks her to play him a song. When she refuses, he splits open to reveal a terrible monster! It soon becomes apparent that it only be soothed with a song. Left with no other option, she plays for the monster, who listens peacefully and attentively. Afterwards, it magically transfigures into a bird and flies away. From that day on, the girl finds it much easier to play for others (though she still gets a little nervous sometimes). And while she never sees the bird again, she often wakes up to find a bright yellow feather on her window sill…

Jen Reese

Ascent

This work was inspired by the unseen grueling journeys many have made over these mountains. The stark black and white nature of the image allows us to observe the surreal nature of the quest. These climbers are struggling to achieve their goal. Only through teamwork and determination will they be able to reach the peak. 'Ascent' forces us to question the sanity of their journey, and in turn, question our own journeys through life. This photo was captured while I was visiting the Alps. The fact that it was taken on my Galaxy S3 cell phone sets 'Ascent' apart from many other photographs; it was never meant to be professional. I set out to take a photo that was representative of the majesty of the mountains. Instead, I captured a photo that focuses on the human struggle to conquer nature. This photograph inspired me on a lifelong journey to capture people interacting with our natural world. When I see 'Ascent", I am reminded everyone's unique journey through the world.

Creative Arts Festival

Jury

Tara Mallen, Rivendell Theatre

Mickie Pascal, Pascal-Rudnicke Casting

Jennifer Rudnicke, Pascal-Rudnicke Casting

Joe Zarrow, Playwright

Stage Manager

Alexandra Goodman

Master of Ceremonies

Alejandro Marichal

℘ 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. **Revanth Bellam,** "Antibacterial Efficacy Of Three Essential Oils On Staphylococcus epidermidis and Escherichia coli: An In Vitro Study." Advisor, Christina Palffy.
2. **Rohan Bhattaram,** "Effects of Neurogenic Orthostatic Hypotension on QTc Interval Over Time. "Advisor, Christina Palffy.
3. **Kevin Cao**, "The Possible Effect of Induced Multiple Sclerosis on Testosterone Concentration in Male Mice." Advisor, Christina Palffy.
4. **Han Song Huang,** "Effect of GluRIIA[AD9] on Activity-dependent Growth in D. melanogaster." Advisor, Christina Palffy.
5. **Jaymo Kang,** "Modeling and Characterization of mTG-Gelatin Hydrogel Crosslinking." Advisor, Christina Palffy.
6. **Sannidhi Sarvadhavabhatla,** "Effect of the Type of Herbal Tea on Dissolving Kidney Stones." Advisor, Christina Palffy.
7. **Haji Seferian**, "X-cention." Advisor, Justin Zummo
8. **Alexandra Shafran,** "The effect of alternative heat therapy on the regeneration of Planerea cells." Advisor, Christina Palffy.
9. **Shreya Sriram,** "Social Media is in the Eye of Society." Advisor, Christina Palffy
10. **Ajay Varadhan,** "Development of Therapeutic Drugs to Combat Cardiovascular Disease." Advisor, Christina Palffy.

Community South High School

11. **Austin Balinski, Brett Cohen, Thomas Matysik, Yvonne Szustakiewicz and Rachele Wen,** "The Effect of Phosphorus on Nickel and Zinc Uptake in Red Lettuce Leaves." Advisor, Theresa Quain.

Downers Grove North High School

12. **Matt Metzler and Nuria Asad,** "Testing the Bernoulli Fuselage." Advisor, Keith Dvorkin.
13. **Mahima Patel,** "The Effects on BPA Leaked from Plastic when exposed to Temperature Changes." Advisor, Jackyln Naughton.

Evanston Township High School

14. **John Hruska,** "Applications of an Expanded Fractal Frame Model." Advisor, Mark Vondracek.

℘ NU High School Project Showcase
Poster Presentations, continued

Glenbrook South High School

15. **William Okuno,** "Arduino in the real world." Advisor, Michael Sinde.
16. **Lucas Pauker,** "Arduino Drone Control." Advisor, Michael Sinde.
17. **Michael Montemurro, Will Thoelecke, Aiden Sully and Luke Chirayil,** "Quad Copter Drone." Advisor, Michael Sinde.

Illinois Math & Science Academy

18. **Nicholas Inocencio,** "The Effect of Caffeine and Taurine on Learning and Locomotion in Drosophila melanogaster." Advisor, Vandana Chinwalla.
19. **Pranav Sivakumar and Janani Sivakumar,** "A Hybrid Photometric and Spectral Algorithm for Efficient Detection of Gravitationally Lensed Quasars." Advisor, Judith Scheppler.

Lane Tech College Prep

20. **Marcelina Puc,** "Mechanism of Apoptotic Action of Colloidal Silver and Bromelain on PC12 & HeLa Cells." Advisor, Kathryn Anderson.

Lindblom Math & Science Academy

21. **Andrea Martinez,** "The Effect of Temperature on Solar Panels." Advisor, Elizabeth Copper.

Metea Valley High School

22 **Kavya Anjur,** "Secondary Structure Changes caused by ADAR in ALS, Leukemia, and Schizophrenia." Advisor, Jacklyn Naughton.

Neighborhood Engineering Club

23. **Bowen Pearson, Andy Schramaka, Andrew Hosack and James Ramicone.** Advisor, Celeste Pearson.

℘ NU High School Project Showcase
Poster Presentations, continued

Neuqua Valley High School

24. **Trisha Prabhu,** "ReThink - An effective way to stop Cyberbullying." Advisor, Jacklyn Naughton.

New Trier Township High School

25. **Tayyaba Ali,** "One drop could save a life." Advisor, Alexander Howe.
26 **Hanna London, John Dolan, Kelli Schmidt and Graham Ikler,** "Automated Chocolate Bar Maker." Advisor, Nathan Silvers.

Niles North High School

27. **Rubab Hyder,** "The Effect Of Temperature On Seismic Activity." Advisor, Christine Camel.
28. **Kiana Lee,** "Characterization of Ruthenium and Organic Based Dye Sensitized Solar Cells with Time Dependent Dye Loading." Advisor, Christine Camel.
29. **Zainab Shah,** "Comparing the viability of Ag-doped photocatalytic compounds with Sulfidation and Ultrasound in the detoxification of carcinogenic heavy metal contaminants, and determining its effects on Girardia Tigrina and Lemna Minor." Advisor, Christine Camel.
30. **Sharmain Siddiqui,** "Coronal Mass Ejection Year Two: Properties in Relation to Active." Advisor, Christine Camel.
31. **Sara Siddiqui**, "The Effect of Salinity on Soluble Carbohydrate Concentration in Brassica napus, Linnaeus." Advisor, Susie Posnock.
32. **Sana Zaidi,** "Assessing the Affect of Bisphenol A and Bisphenol S on the Developmental Toxicity of Caenorhabditis elegans." Advisor, Richard Thielsen.

Northside College Preparatory High School

33. **Gabriel Tavas,** "Reshaping Magnetic Levitation." Advisor, Ana Vites.

Taft High School

34. **Bhavin Bhatt,** "Distance vs Voltage." Advisor, Meeta Agrawal.

℘ NU High School Project Showcase
Poster Presentations, continued

Von Steuben Metro Science Center

35. **Bukuru Anaclet,** "Partial shading and Pv Cell Output." Advisor, Carrie Kaestner.
36. **Emily Conde,** "Cleaning Up Oil Spills." Advisor, Carrie Kaestner.
37. **Angelica Rose Galvan,** "The Structural Integrity of Platonic Solids." Advisor, Jennifer Roden.
38. **Stacy Lam,** "Go Green, Go Friendly, Go Biodiesel." Advisor, Carrie Kaestner.

Waubonsie Valley High School

39. **Aarush Gupta,** "The impact of the Halls Effect." Advisor, Jacklyn Naughton.

Wheeling High School

40. **Zalman Faltushanskiy,** "The Effect of Academic Testing on Blood Oxygenation." Advisor, Barry Hanrahan.
41. **Irene Keselman,** "The Effect of Ambient Lighting on Mood." Advisor, Barry Hanrahan.
42. **Jacob Sweetow,** "The Effectiveness of Video Learning versus Direct Teaching." Advisor, Barry Hanrahan.

Whitney M. Young Magnet High School

43. **Alexander Pei,** "Role of miR-143 in Intestinal Tumorigenesis in Apc Mutant Min Mouse." Advisor, Lynne Muhammad.

Judges for the NU High School Project Showcase, Poster Presentations

Adam Dempsey, Northwestern University Graduate School
Adam Weingarten, Northwestern University Graduate School
Albert Xue, Northwestern University Graduate School
Ashty Karim, Northwestern University Graduate School
Bola Adeniran, Northwestern University Graduate School
Dongxu Huang, Northwestern University Graduate School
Jennifer Greene, Northwestern University Graduate School
Kavita Chandra, Northwestern University Graduate School
Louisa Savereide, Northwestern University Graduate School
Marc Royster, Northwestern University Graduate School
Matthew Peters, Northwestern University Graduate School
Monica So, Northwestern University Graduate School
Rachel Watson, Northwestern University Graduate School
Sara Yacob, Northwestern University Graduate School
Taylor Page, Northwestern University Graduate School
Thomas Wytock, Northwestern University Graduate School

NU High School Project Showcase Planning & Organization

Office of STEM Education Partnerships

Amy Pratt, Michelle Paulsen, Phong Luu

NU High School Mentors

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