

UNCOVER,
PROSPECT, **PROBE**,
COME ACROSS, EXTRICATE,
DISCOVER, PONDER, FIND, **SIFT**,
UNEARTH, **BRING TO LIGHT**, EXTRACT
INVESTIGATE, ROOT, SHAKE DOWN, **SURVEY**,
EXAMINE, EXCAVATE, SEARCH HIGH AND LOW,
LOOK OUT FOR, **DIG DOWN**, GO INTO,
TURN UPSIDE DOWN,
SCRUTINIZE, **RESEARCH**,
HYPOTHESIZE,
COME UP WITH, LOOK UP, RETRIEVE,
TURN INSIDE OUT, EXPERIMENT WITH,
SEARCH OUT, TAKE NOTE,
CONTROL, **TEST**, CHECK INTO,
INTERROGATE, **INSPECT**,
WONDER, LEAVE NO STONE UNTURNED,
ANALYZE, REVIEW,
QUESTION, DELIBERATE,
THINK, CHALLENGE,
EXPOSE, INQUIRE, VIEW,
BRAINSTORM, **STUDY**,
EXPLORE,
GOING OVER,
LOOK, **SEARCH**,
QUERY, SCOPE,
DIAGNOSE,
REASONING,
HARD WORK

Undergraduate Research Symposium

LOYOLA UNIVERSITY CHICAGO • APRIL 21, 2012

Showcasing the Research, Scholarship, and Creative Endeavors of Loyola's Undergraduates

LOYOLA UNIVERSITY CHICAGO



WEEKEND OF
EXCELLENCE

WELCOME TO LOYOLA'S 2012 UNDERGRADUATE RESEARCH SYMPOSIUM

On behalf of Loyola's Undergraduate Research Opportunities Program (LUROP) in the Center for Experiential Learning, we are pleased to welcome you to the 6th-annual Undergraduate Research Symposium.

Loyola's Weekend of Excellence is meant to "celebrate transformative education," and we believe no event captures this objective better than the symposium. These undergraduate students, from all disciplines across the university, spend hours outside of their classes to conduct hands-on, original research that not only escalates their own education but also has real potential for impacting research advances in their disciplines.

We continue to be impressed with ever-growing interest and participation in the event from students conducting research through fellowships, capstone projects, and volunteer positions at Loyola and across Chicago. We are responding to this growth, in part, by piloting oral presentations this year, in order to provide students with a different format for presenting their research. We highly encourage you to visit these oral presentations in addition to the poster presentations.

We would like to thank the Office of the Provost and the College of Arts and Sciences for their support of this event. In addition, we are very grateful to the faculty, alumni, staff, and graduate students who are serving as judges this year and ensuring an enriching experience for our undergraduate students.

If you would like to learn more about the undergraduate research program at Loyola or the funded fellowships through LUROP, please visit www.luc.edu/lurop. For more information about the Loyola's Center for Experiential Learning, visit us at www.luc.edu/experiential.

Kelly Christopher, M.A.
Program Manager, Undergraduate Research

Patrick Green, Ed.D.
Director, Center for Experiential Learning



Cover designed by Laura Wilkens, a junior majoring in Visual Communication and International Film & Media Studies: Production. Laura's design was selected as the first winner of LUROP's design contest.

2012 SYMPOSIUM SCHEDULE

Oral Presentations, Session 1..... (Mundelein 403 & 404)	11:45AM
Oral Presentations, Session 2..... (Mundelein 403 & 404)	12:40PM
Poster Session..... (Mundelein Auditorium)	1:30pm
Reception and Awards Ceremony (Sullivan, Multi-Purpose Room) <i>Loyola University Libraries Research Paper Award</i> <i>Program Design Award</i> <i>Langerbeck Award for Undergraduate Research Mentoring</i> <i>Student Poster Awards</i>	3:30pm

The Loyola Undergraduate Research Opportunities Program (LUROP)

Most undergraduate researchers fall under the umbrella of the Loyola Undergraduate Research Opportunities Program (LUROP), which encompasses a variety of disciplines and experiences. The LUROP fellowships and opportunities are described below; for more information on the program, go to www.luc.edu/luop. Undergraduates also work with individual faculty members on research projects that fall outside the realm of LUROP fellowships.

Biology Research Fellows Program

The Biology Research Fellows Program funds long-term independent research projects under the direction of a faculty mentor in the Department of Biology. Students work for 2-3 years on their respective projects both during the academic year and in the intervening summers. At least a 10 week time commitment on the project is expected during the summers.

Biology Summer Research Fellowship Program

The Biology Summer Research Fellowship funds research projects with Department of Biology faculty. A ten-week time commitment is required, and specific dates are negotiated with the faculty mentor.

Carbon Undergraduate Research Fellowship Program

The Carbon Fellowship offers a full two-year, interdisciplinary research opportunity for science and math majors to work closely with faculty mentors. This program is designed for students who plan to pursue research in graduate or professional schools.

Center for Urban Environmental Research and Policy (CUERP) Undergraduate Research Fellows Program

The focus of the CUERP Fellowship is for students to conduct interdisciplinary research on issues related to unsustainable natural resource uses in the greater Chicago land region. The Center encourages research projects to combine elements of ecosystem structure and function, impacts on human health, public policy, behaviors, and other environmental factors.

Center for Urban Research and Learning (CURL) Fellowship Program

The CURL Fellowship is intended to facilitate involvement of students in collaborative research projects with community-based organizations, social service agencies, health care providers, businesses, and government. Fellows are active participants in efforts to improve the quality of life of all members of the Chicago metropolitan community.

The Joan and Bill Hank Center for the Catholic Intellectual Heritage (CCIH) Undergraduate Research Fellowship

The Joan and Bill Hank Center for the Catholic Intellectual Heritage (CCIH), in support of the Catholic Studies minor, offers a research fellowship to undergraduate students who are currently enrolled in the Catholic Studies minor program. This fellowship is dedicated to support for CCIH-funded faculty research projects, as well as CCIH's international research projects.

Mulcahy Scholars Program

The Mulcahy Scholars Program is designed for College of Arts and Sciences majors in the hard sciences, who are interested in working on an individual project with a faculty mentor,

serving as a research assistant, or engaging as a member of a collaborative research team to support ongoing faculty projects throughout the academic year.

Provost Fellowship for Undergraduate Research

The Provost Fellowship is designed for undergraduate students in any academic discipline who are interested in either establishing an individual project with faculty mentorship or working with a faculty member on their ongoing research as a research assistant.

Research Mentoring Program (RMP)

RMP is designed to partner graduate students who are working on their dissertation research with undergraduates who are interested in participating in research. This summer program is designed to support doctoral students in their dissertation research while providing an opportunity for undergraduates to learn more about graduate studies and graduate-level research.

Ricci Scholars Program

The Ricci Scholars Program is an innovative research and cultural immersion program organized around the theme of the meeting of East and West. The program awards selected students with scholarships for travel, research and exploration during a junior year of study divided between two of the world's most important cities: Rome, Italy, and Beijing, China.

Rudis Fellowship Program

The Anthony and Mary Rudis Fellowship provides scholarships to students whose research focuses on the comparative study of constitutions. Recipients of the scholarship will write a 20-25 page research paper during the academic year under the guidance of a faculty member in the Department of History or the Department of Political Science.

Women in Science Enabling Research (WISER)

WISER is designed for undergraduate women seeking to explore research science, work closely with faculty, learn how laboratory work is conducted, and build a sense of community.

Oral Presentation Abstracts

Session 1: 11:45-12:30

Mundelein 403 (11:45-12:30)

A Comparison of Sagittal vs. Axial Micro-Computed Tomography Analysis in Mice Femurs

Mumtaj Chand, Biology and Psychology (Dec 2011), Provost Fellowship

Mentors: Dr. Margaret A. McNulty, Rush University; Dr. Rick Sumner, Rush University; and Dr. F. Bryan Pickett, Biology

A common form of evaluating bone morphology in mice is micro-computed tomography (CT). The main purpose of this study is to analyze ten samples of intact mice femurs using two different methods: (1) the sagittal analysis, which involves evaluating vertical cross-sections of the femur, and (2) the axial analysis, which involves evaluation of the horizontal cross-sections of the femur. Both types of trabecular analyses involve parameters such as bone volume (BV), total tissue volume (TV), BV/TV, and connectivity density. As predicted, the data from both methods depicts a high correlation of similarity. However, the axial method differs in that it includes cranial and collateral portions of the bone and thus should be the preferred type of analysis if those regions are of interest. Otherwise, both methods are interchangeable, allowing flexibility in analysis.

Individual Differences in the Effects of Chronic Stress on Memory: Neuropeptide Y and Anxiety as Biobehavioral Correlates of Resiliency

Brian Sweis, Biology and Psychology (2012), Carbon Scholar

Mentors: Dr. Louis Lucas, Biology and Dr. Robert Morrison, Psychology

Repeated exposure to stress generally impairs memory in rodents. However, the extent to which memory is impaired is often variable. Stress is a subjective experience and differences between individuals and their coping-mechanisms determine the impact and severity of a stressor. Individual differences in particular behaviors including anxiety may reveal underlying neurobiological mechanisms that could be driving such differences in stress resiliency and may serve as early indicators of susceptibility to stress. In this experiment, rats were appetitively trained in a spatial memory task before undergoing 10 consecutive days of immobilization stress. Memory retention was tested post-stress, after which brain tissues and blood samples were collected for neurochemical analyses. Characterizing behaviors such as anxiety were monitored longitudinally throughout the experiment. Neurochemical markers including Neuropeptide Y a key player in stress and anxiety pathways may be targets for pharmacological interventions that can serve to ameliorate the negative effects of stress on memory.

Characterizing the Potential of Great Lakes Wetland Invaders to Produce Biogas

Erin Throop, Biology (2012), Center for Urban Environmental Research and Policy Fellow

Mentors: Dr. Beth Lawrence, CUERP, and Dr. Nancy Tuchman, Biology

Invasive species spreading throughout the Great Lakes region alter wetland function and reduce native species diversity, necessitating wetland restoration. Traditional methods of controlling invasive species are both environmentally and economically costly, and are typically only short-term solutions. In order to work towards a more sustainable approach to wetland restoration, we propose the possibility of combining the mechanical harvest of invasive species biomass with anaerobic digestion to produce biogas, a renewable energy source. We have developed an experimental approach to test the capacity of com-

mon invasive species, to produce methane during anaerobic digestion to provide a baseline for the development of ecological and economic models evaluating the efficacy of this restoration approach. Our first trial compared the methane production potential of *Typha x glauca* and *Phragmites australis*; preliminary analysis suggests that *P. australis* yields significantly more biogas per unit biomass than *T. x glauca*, indicating its potential utility as a biofuel. We will also test the methane production potential of *Myriophyllum spicatum*, and relate biogas production rates to nutrient characteristics of the plant tissue (C, N, P). Our experimental methods can be used to analyze other invasive species as potential biofuels and will improve the sustainable management of our natural areas.

Mundelein 404 (11:45-12:30)

The Origins, Growth, and Implications of Liberation Theology in Latin America

Zachary Hugo, Philosophy and Theology (2012)

Faculty Mentor: Dr. Gunes Tezcur, Political Science

This project examines the origins, development, and socio-political implications of Liberation Theology in Latin America in the late 20th and early 21st centuries. It first contextualizes the history of the Catholic Church in Latin America by identifying the socio-political zeitgeist from which the movement emerged. It second explores the intellectual roots of the movement by tracing the ways through which new perspectives on social reality arose from the synthesis of the European Catholic theology and the leftist tendencies in Latin America. It finally discusses the struggles characterizing the movement and their lasting implications. The project suggests that Liberation Theology was neither a byproduct nor a precursor to Vatican II. Instead it argues that Liberation Theology presented an entirely different approach to the primary role of the Church in the world and challenged both classical theology and the hierarchy of the Church.

Gendered Body of Perception

Sumaya Noush, Political Science (2013)

Faculty Mentor: Dr. Hanne Jacobs Philosophy

In an age that welcomes scientific theory and accuracy of evidential data, it is critical that the foundation of the sciences, that is philosophy, be able to continue its reign. Phenomenology amounts to be the greatest sustained attempt to revive metaphysics on an ontological mode where philosophy can exist and perpetuate into the sciences and successfully correct for possible scientific flaws. The French phenomenologist Maurice Merleau-Ponty's understanding of the significance of phenomenology rests in establishing contact with basic experiences and wonder of the world that precedes all kinds of formal and de-formalized research. Consciousness is a project of the world rather than the world being a project of us. The body becomes the mediator between consciousness and the world and Merleau-Ponty in particular criticizes the representationalist theory of consciousness that predated him. From this point on, phenomenological investigation quickly becomes a commitment to understanding the awareness of the possibilities for world engagement as feasible through the human body. This investigation however has taken on the narrative of the masculine bodies that have developed it into philosophical discourse. The tropes of the masculine body inadequately represent the common-sense assumptions of the everyday experiences examined in phenomenology since it deprives half of the population of their sexed bodies, that is, women. The prerogatives of phenomenology, a study investigating consciousness as experienced individually, have unfortunately been insensitive to the peculiarities of the female narrative and have therefore inconvenienced the study in general. The inherent discriminatory elements of socially defined gender roles that limit women and privilege men do not originate with phenomenology but surely

permeate the very theories of the study. Existentialist and fellow French phenomenologist Simone de Beauvoir articulates the evidential male-perspective of the study as requiring correction, or at the very least acknowledgment, since phenomenology is promoting itself to be the foundation for the rest of the empirical sciences, and therefore the only appropriate arena for such a projection.

The Re-Education of Women in Zadie Smith's White Teeth

Karissa Taylor, English and International Studies (2012), Research Mentoring Program
Mentor: Cynthia Wallace, PhD student, English

Since its publication in 2000, the novel *White Teeth* by Zadie Smith has received much attention and praise. Scholars have especially favored the themes of bi-racialism, multiculturalism, hybridity and gender, especially masculinity. Few, if any, talk about women and femininity in the novel, in spite of the plethora of female characters. Moreover, some have argued that the lack of struggling female characters is a reflection of social change. However, the process of "shifting identities" scholars have used to discuss male characters in the novel applies to women as well. I argue that Smith uses female characters to call attention to the obstacles that women continue to face today, especially for post-colonial women. I also look at how Smith uses the theme of education to critique whether society has really changed in its treatment of women and gender roles.

Session 2: 12:40-1:25

Mundelein 403 (12:40-1:25)

Cloning, Expression, and Purification of a Putative Oxidative Stress Sensing Protein in the Malaria Parasite Plasmodium

Kyle Haselton, Psychology (2012), Mulcahy Scholars Program
Faculty Mentor: Dr. Stefan Kanzok, Biology

Plasmodium, the organism that causes malaria, is exposed to cytotoxic reactive oxygen species (ROS) throughout its complex life cycle. It possesses highly effective antioxidant proteins for protection against endogenous as well as exogenous ROS which are upregulated in response to changes in the environment. It is not well understood how Plasmodium senses ROS, a prerequisite for the upregulation of the respective antioxidant proteins. Here I present the cloning, recombinant expression and purification of thioredoxin-dependent glutaredoxin -1 (TPxGL) of the malaria parasite Plasmodium, which we hypothesize to be an ROS sensor. The protein shows high similarity to Orp1, an oxidative stress sensor in yeast. Orp1 binds a transcription factor. Upon oxidation by hydrogen peroxide Orp1 releases the transcription factor, which then traverses into the yeast nucleus and up regulates antioxidant genes. We hypothesize that TPxGL functions similarly to Orp1 as a ROS sensor in Plasmodium.

Investigating DNA Structural Properties as Gene Regulatory Signals in Plasmodium

Bryan Quach, Bioinformatics (2012), Carbon Scholar
Mentors: Dr. Catherine Putonti, Biology and Computer Science; Dr. Stefan Kanzok, Biology; Dr. Konstantin Laufer, Computer Science

The genus Plasmodium contains the parasitic species responsible for causing over 200 million cases of malaria each year. Despite research efforts to elucidate the mechanisms of transcriptional regulation in Plasmodium species, few DNA regulatory elements in the parasite's genome have been characterized. Furthermore, the ~80% AT-biased genome makes current motif prediction algorithms ill-suited for analyzing Plasmodium. Due to the inability of current computational methods to accurately identify regulato-

ry motifs in Plasmodium, we are developing an algorithm to find these elements in promoter sequences of Plasmodium genes. Herein we discuss the challenges of motif detection in Plasmodium and the potential for DNA structural properties such as curvature and bendability to aid in the discovery of DNA regulatory elements. Knowledge of cis-regulatory elements in Plasmodium would contribute to a deeper understanding of the parasite biology and could potentially lead to the discovery of new targets for controlling Malaria.

Microscopic Investigation into the Dynamics of Falling Chains

Unleen Kiverskis, Physics (2012), Mulcahy Scholars Program

Lacy Simons, Molecular Biology (Fall 2013), Mulcahy Scholars Program

Faculty Mentor: Dr. Asim Gangopadhyaya, Physics

We are examining the dynamics of a falling chain, a classic textbook physics problem that has never been explained on the microscopic level. The motion of the chain when released has previously been described as free falling, although studies have been conducted showing the chain is actually following conservation of energy laws. Our preliminary experiments confirm that the chain is conserving energy as it falls. The purpose of our project currently is to show how energy is conserved at the microscopic level. We worked mathematically and experimentally to define the forces acting upon the masses in the chain and describe their motion.

Mundelein 404 (12:40-1:25)

Associations Between Teachers Depressive Symptoms and Children's Academic Achievement

Jessie Duncan, Psychology (2012)

Donna Flores, Psychology (2012), Provost Fellowship

Mentors: Dr. Christine Li-Grining, Psychology and Jackie Lennon, Research Associate

Teachers depressive symptoms have been linked to students behavioral problems, but little research has studied relations with students academic achievement. This study aims to help fill this gap by examining the link between teachers depressive symptoms and preschoolers academic skills. Data was drawn from the Seeds for School Success Project. Teachers reported on their own characteristics, including depression, and preschoolers (n= 84) quantitative and literacy skills were measured through direct assessment. Analyses included multiple linear regressions predicting childrens academic skills from teachers characteristics. Results indicate that teachers depressive symptoms did not significantly predict preschoolers quantitative or literacy skills. However, teachers experience was negatively related to preschoolers quantitative skills. It could be that preschoolers with fewer quantitative skills are matched with more experienced teachers in order to help them make academic progress. Future studies should further investigate childrens academic achievement in relation to preschool teachers characteristics.

Conceptions of Cultural Competency

Pauline Lacson, Sociology and Anthropology (2013), Provost Fellowship

Faculty Mentor: Dr. Adam Kennedy, Education

The need for culturally responsive educators has expanded with the growth of cultural, linguistic, and ethnic diversity in classrooms around the United States. This qualitative research aims to inform and expand the literature on the cultural responsiveness of early childhood teachers by examining their perceptions and conceptions of cultural competence. In-depth interviews were conducted with four early childhood educators in Chicago. Analysis of the resulting transcripts revealed several themes which illustrate the complexity of culturally competent teaching.

Linkages Between Teachers Depressive Symptoms and Children's Executive Functioning and Attention/Impulse Control

Sophie Mir, Psychology and Biology (2012) , Provost Fellow

Sarah Pekoc, and Psychology (2013)

Faculty Mentor: Christine Li-Grining, Psychology

Parents depression has been negatively associated with children's self-regulation. Therefore, it is not surprising that teachers stressors are negatively linked to classroom quality, which predicts children's self-regulation. Little research has examined the relation between teachers stressors and children's self-regulation. This study investigates the relation between teachers depressive symptoms and preschoolers attention/impulse control and executive functioning, which are higher-order cognitive processes that are involved in the regulation of attention, behavior, and emotions. Data were drawn from the Seeds for School Success Project. Information was collected on preschoolers (n = 73-83) self-regulation through direct assessments and assessor reports. Teachers reported on their own characteristics. Results from regression models suggest that children with less executive functioning had teachers with more experience. It could be that children with less self-regulation are intentionally placed with teachers who are more experienced. Future studies should further investigate preschoolers self-regulation in the context of classrooms.

Poster Presentation Abstracts

◆ 1 ◆

Effects of Shear Thickening Properties in Oscillating Non-Newtonian Fluids

Roxanne Able, Biophysics and Music (2012), Mulcahy Scholars Program and Provost Fellowship

Yogi Patel, Physics (2013)

Faculty Mentor: Dr. Jon Bougie, Physics

We study the behavior of a shear-thickening, non-Newtonian fluid when shaken at a variety of accelerational amplitudes and frequencies. Mixing corn starch with water, using cesium chloride to match density and prevent separation, produces a fluid with shear thickening properties. When a thin layer of this fluid is vertically oscillated, it can produce Faraday waves as well as other phenomena that are characteristic of non-Newtonian fluids, such as stable holes and time-dependent, delocalized regions that grow from small initial disturbances in the fluid layer. We investigate how the concentration of cornstarch (and as a result the shear-thickening properties of the fluid) affects which phenomena are observed, and we demonstrate that this concentration does have a significant effect on the fluid behavior.

◆ 2 ◆

*Phylogeography of *Brachypteryx Montana*, A Widespread Bird Across the Islands of the Philippines*

Bushra Alam, Biology and History (2012), Mulcahy Scholars Program

Mark Wojdyla, Biology (2013), Biology Research Fellowship, Mulcahy Scholar

Faculty Mentor: Dr. Sushma Reddy, Biology

The rich and unique biodiversity of the Philippine archipelago has been shaped by past climatic and geological conditions. We conducted a phylogeographic analysis of a widespread bird species, *Brachypteryx montana*, in order to examine its diversification across the islands of the Philippines. This study is important because the tropical Asian avifauna has been the center of little modern systematic study. To better understand the numbers of differentiated species and how these species evolved, we examined genetic variation in individual birds by examining the mitochondrial ND2 (1041 bp) and ND3 (351 bp) genes. For a sample set of 202 individuals from various islands throughout the Philippine archipelago, we extracted DNA and amplified and sequenced these genes using PCR and Sanger sequencing. We conducted a phylogenetic analysis of the data and examined the patterns in relation to the geography of the samples. The results were consistent with those found in other vertebrates such that most islands hosted unique clades. Populations on geographically proximate islands, some of which were connected in the past, are closely related. Preliminary results show that the population on Palawan, the only island that was physically connected to Asia in the past, is the most divergent in comparison to the other island populations. Larger islands, such as Luzon, have several populations showing complex divergence patterns. With this analysis, we reconstructed the evolutionary history of divergence in these tropical montane forest birds and contributed to the knowledge of past connections between Philippine islands.

◆ 3 ◆

MLL Gene Expression

Sara Alessi, Biology (2013), Research Mentoring Program

Mentor: Gayathree Raman, PhD student, Molecular Biology

Examine the relationship between histone demethylase JARID 1b and Multi-Linkage Leukemia (MLL) gene expression. JARID 1b and MLL have PHD finger domains recruiting a H3K4Me3 (try-methylated Histone 3 at Lysine 4) mark on their PHD3 finger. PHD3 finger on MLL reads the methylation mark,

binding to it at HOX gene promoters, positively influencing gene transcription. PHD3 finger of JARID 1b can recruit H3K4Me3 instead, erasing the methylation mark at the HOX promoter as MLL accidentally recruits JARID 1b in order to bind H3K4Me3. JARID 1b then recruits fellow co-repressors histone deacetylase and Cyp-33 transforming MLL to a transcription repressor. Determine whether JARID1b PHD3 binding to H3K4me3 is required for JARID1b recruitment at the target genes and if JARID1b PHD3 binding to H3K4me3 is required for the transcriptional repression of the target gene MLL by creating a mutant W1512 A JARID 1b that does not bind H3K4Me3.

◆ 4 ◆

Understanding and Improving Sexual Discourses on LUC's Lake Shore Campus

Elizabeth Anderson, Women's Studies & Gender Studies, International Studies (2012)

Brandie Rae Madrid, Women's Studies & Gender Studies, English (2012)

Yoni J. Siden, Social Work, and Women's Studies and Gender Studies (2012)

Yasmeen Shaban, Women's Studies & Gender Studies, Sociology (2012)

Faculty Mentor: Dr. Elizabeth Myers, Director, Women and Leadership Archives

Sexual discourse is inextricably linked to the ability of students to be fully represented within campus dialogue, policy, and culture. This study seeks to understand the perceptions and experiences of sexual discourse present at Loyola University Chicago (LUC) amongst undergraduate students on the Lakeshore Campus. Utilizing feminist action-research methodology, focus groups were conducted to bring students together to document both sexual discourses they engage in, as well as critical absences within their ability to facilitate, participate in, or be aware of greater dialogue on campus. The study sample, while small, provides in-depth qualitative data from students who feel underrepresented within sexual discourses. Results from the study indicate that students feel LUC does not have a holistic sexual discourse. Furthermore, students lack spaces, resources, and education for full expression of their sexual lives. Students report feeling alienated by the lack of discourse, leading them to feel uncomfortable seeking resources, information, and sexual dialogue on campus. Thus, students either forgo these elements of their sexual lives or seek them out elsewhere. Our research has significant implications for the campus community regarding policy, program development, and campus activism. This study, as action research, encourages the continual creation of safe spaces for sexual discourses on campus

◆ 5 ◆

Characterization of the Subtelomeric Region of HC21p

Shamsa Baaj, Molecular Biology (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Jeffrey Doering, Biology

Telomeric and subtelomeric regions are poorly characterized on the short arms (p) of human acrocentric chromosomes. The main focus of our lab is to develop a detailed physical map of HC21p. Previous studies in our lab have identified a 6kb repeat in the subtelomeric region of HC21p which contains a weakly conserved tandemly repetitive 147bp sequence and a 580bp sequence found in the subtelomeric regions of all human acrocentric chromosomes that was isolated due to its abundance in cancer cells. In this project, the 6kb DNA fragment found in the HC21p lambda phage library was isolated, sequenced using the technique of primer walking and annotated. Copies of the 6kb repeat are highly conserved (98%) on HC21p and bear 96% similarity with the subtelomeric regions contained in BACs of HC22 identified in the NCBI database. This is the first detailed characterization of an acrocentric p arm subtelomere.

◆ 6 ◆

*Understanding Embryo Patterning: Fetal Alcohol Effects & the Roles and Regulation of the Gene *raldh2**

Miguel Barajas, Biology (2013), Carbon Scholar

Faculty Mentors: Dr. F. Bryan Pickett, Biology; Dr. Catherine Putonti, Biology and Computer Science

Fetal Alcohol Effects are serious and costly public health issues caused by fetal exposure to ethanol. In model systems, an ethanol metabolite interferes with production of the embryonic signaling molecule retinoic acid (RA) by competing with the enzyme's endogenous substrate for the active site of the enzyme RALDH2, coded by its eponymous gene, *raldh2*. This lowers RA levels and precipitates developmental defects. In an attempt to elucidate the regulation of *raldh2*, we have dissected out a portion of the zebrafish *raldh2* promoter and have observed reduced expression of a reporter gene, *yfp*. In forthcoming work, we hope to uncover possible epigenetic regulation (methylation) of *raldh2*. This is suspected, since such regulation of *raldh2* has been observed in cancer cells. Discovery of epigenetic modification would open doors to possible future work to prompt overexpression of *raldh2* by changing the *raldh2* promoter's methylation status. Promisingly, *raldh2* overexpression has been shown to rescue embryos from ethanol's effects.

◆ 7 ◆

"We Can't Only Show Them Half of God": Engaging Experiences of Conscience, Inclusion and Exclusion in the Dialogue About the Ordination of Women in the Catholic Church

Annemarie Barrett, Communication Studies (2012)

Faculty Mentor: Dr. Elizabeth Lozano, Communications

In the Roman Catholic Church tradition, women are prohibited from receiving the Sacrament of Holy Orders. However, there is a community of Catholics who have determined through their experience of conscience that the exclusion of women from the call to the priesthood is not the will of God. This community, as they publicly act on their conscience, are threatened with excommunication from the Catholic Church. Therefore, through interviews and observations within the community, this research seeks to represent the experiences of these Catholic individuals who support the ordination of women. The objectives of the study are (1) to represent the experiences of inclusion that these members have had within their Catholic communities, (2) to represent the experience of choosing to follow one's conscience in contradiction to the teaching of the Catholic Church, and/or (3) to represent the experiences of exclusion that these members have had within their Catholic communities in following their conscience and supporting women's ordination.

◆ 8 ◆

Characterizing the Composition of Biofilms in Drinking Water Distribution Systems

Kesha Baxi, Biology (2012)

Faculty Mentors: Dr. John Kelly, Biology; Alessandro Culotti, Northwestern University; and Dr. Aaron Packman, Northwestern University

Drinking water provided by public utilities in the United States generally contains low numbers of bacteria, but it is not sterile. Similarly, drinking water distribution systems have been designed to limit bacterial growth, but the pipes that make up these distribution systems do contain bacteria growing on the pipe surfaces in communities known as biofilms. Drinking water pipes are very challenging habitats for bacteria, as the water typically contains disinfectants such as chlorine or chloramines, and the water includes very low levels of organic and inorganic nutrients. Beyond the detection of pathogens, biofilm communities within drinking water distribution systems have not been extensively studied, so the ecology of these communities remains poorly understood. We received a 1 meter section of pipe that had been removed from a drinking water distribution system in Pinellas County, FL. We removed biofilm from three separate sections of this pipe and extracted DNA from the bacterial communities using a commercially available kit. This DNA was analyzed by tag pyrosequencing of bacterial 16S rRNA genes. The MOTHUR software suite was used to analyze these sequences. Our results indicated that the most numerically dominant bacteria within these biofilm communities were methanotrophs, a group of bacteria that obtain carbon and energy by eating single carbon compounds such as methane and methanol. These results

suggest that methanogenic archaea and methanotrophic bacteria may be key players in these biofilm communities. We are currently analyzing additional pipe samples from this same utility that were collected during different times of year to assess possible seasonal effects on these communities.

◆ 9 ◆

The Oil Curse: A Political & Economic Analysis

Garrett Bonofiglio, Economics, Finance (2013)

Austin Nugent, Economics, Finance and International Business (2013)

Faculty Mentor: Dr. Marc Hayford, Economics

A nation's oil discovery is not always a God-send, it can be curse. Most nations that find and develop oil reserves are negatively affected by their actions. When a developing nation discovers oil, two major events occur: an authoritarian government forms as well as export/manufacturing industries suffer. The following project investigates how these events occur, why Norway avoided the oil curse, and how global, third party banks can play a major role in ending the oil curse.

◆ 10 ◆

Parental Warmth and Monitoring as Predictors of Peer Pressure Perception

Jenai Booker, Psychology (2012)

Faculty Mentor: Dr. Maryse Richards, Psychology; Devin Carey, PhD student, Psychology

Parental monitoring is a consistent predictor in preventing problem behaviors, such as overt anti-social behavior and also plays a part in positive adolescent development, as it encourages voluntary disclosure from adolescents to their parents and reinforces monitoring. However, past studies do not examine whether parental warmth and monitoring affect sensitivity to peer pressure in African American adolescents. This study examined the effects of parental monitoring and children's perception of their parents (parental warmth) on perceptions of peer pressure in African American adolescents. Data used for analysis were collected during 1999-2003 in public schools within low income areas of Chicago. Participants were African American adolescents, followed from 6th into 7th grade. Perceptions of parental monitoring and warmth were measured by the Parental Monitoring and Relationship Survey. Perceptions of peer pressure will be measured using subscales within the Peer Pressure Survey. Analyses were conducted both cross-sectionally and longitudinally. Independent samples t-test looked for differences in gender and revealed that females reported more pressure to participate in conformity behaviors in 6th grade and higher perceptions of parental warmth from their mother in 7th grade. Boys reported higher perceptions of parental warmth from their father in both 6th and 7th grade. Regression analyses revealed that feelings for father in 6th grade predicted perceptions of pressure to be more socially involved in 7th grade for boys. Parental monitoring predicted pressure to participate in misconduct behaviors for girls in 7th grade, with more monitoring predicting less misconduct. Results suggest that perceptions of parental warmth in a father is important for social involvement of African American adolescent boys, and parental monitoring is more effective in preventing negative behaviors in young African American girls.

◆ 11 ◆

Insight Follows Incubation in the Remote Associates Task

Kelly Brandstatt, Psychology (2012)

John Molony, Psychology (2012)

Leonidas Skiadopoulos, Psychology (2012)

Faculty Mentor: Dr. Robert G. Morrison, Psychology

Problem solving through insight is characterized by a sudden conscious awareness of an answer of which the participant is confident. Various studies of insight problem solving suggest that a period of time away from the problem (i.e., incubation) can sometimes help to facilitate insight. In this study we

use a Remote Associates Test in which participants were to identify a single word that formed a compound phrase with each of three unrelated words. To study incubation we divided solution time into two epochs. On some trials the second epoch was preceded by a brief incubation period during which the participants performed a simple working-memory distractor task, while on others the second epoch directly followed the first. Incubation did not result in participants solving more problems; however, when they did solve a problem after incubation they were more likely to report experiencing insight.

◆ 12 ◆

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

Kelly Brandstatt, Psychology (2012)

Pamela Holtz, Psychology (2012)

Jenna Little, Biology (2013)

Lindsey Peters, Psychology and English (2013)

Cara Ray, Psychology (2013)

Lenel Reuther, Psychology and Criminal Justice (2013)

Faculty Mentor: Dr. Robyn Mallett, Psychology

Becoming immersed in a story can cause people to merge the self with fictional characters. For example, people who read about wizards in Harry Potter psychologically became wizards (Gabriel & Young, 2011). Two popular young-adult novels, The Hunger Games and Twilight, portray contrasting qualities of the female protagonist. The Hunger Games, Katniss is agentic and independent whereas Twilights Bella is communal and dependent. This study tests whether reading about Katniss versus Bella causes female readers to incorporate the characters qualities into their self-concept. Two-hundred twenty-four (147 White) women were randomly assigned to read an excerpt from Twilight (N = 110) or The Hunger Games (N = 114). Endorsement of character-specific agentic and communal qualities was measured by examining participant responses to the statements I can protect myself in times of danger (an agentic Katniss quality) and I would be interested in dating a vampire (a communal Bella quality). Items were measured on a scale of 1 strongly disagree to 7 strongly agree. A t-test showed that participants who read The Hunger Games (M = 5.31) were more likely to agree with the agentic statement I can protect myself in times of danger than those who read Twilight (M = 4.93), $t(222) = -2.52$, $p < .05$. Participants who read The Hunger Games (M = 2.75) were less likely to agree with the communal statement I would be interested in dating a vampire than those who read Twilight (M = 3.25), $t(222) = 1.97$, $p = .05$. These results support research showing that reading narratives influences the self-concept. Furthermore, our results offer preliminary evidence that reading popular works of fiction that contain stereotypic versus counter-stereotypic female characters affects how women see themselves. These changes to the self-concept may have important implications for their future behavior, including interpersonal interactions and career-related decisions.

◆ 13 ◆

The Influence of Spirituality on Self-Esteem of Adolescents in Violent Urban Environments

Matthew Brickl, Psychology (2012)

Mentors: Dr. Maryse Richards, Psychology and Edna Romero, PhD student, Psychology

This research will examine whether the spirituality of adolescents living in areas of Chicago known for high levels of violence is positively related to self-esteem compared to adolescence with no religious affiliation. Enhanced religious involvement, may promote a positive self-image with which adolescents are able to identify and positively appraise their self-worth (Regenerus, 2003). Adolescents with significant spirituality in their lives are able to gain structure from religious norms and gain acceptance and support from their religious communities (Jones, Pearce, Ruchkin, & Schwab-Stone 2003). The data used for this analysis have been collected from both public and parochial schools in Chicago located in high violence areas. The student sample consists of seventh and eighth grade participants. Self esteem will be measured with the Rosenberg Self Esteem scale (reference) and spirituality will be measured

with a subscale of the Africultural Coping Systems Inventory-Youth Version (reference) both of which will be completed by the adolescents. The relationship of the Rosenberg Self Esteem and Africultural Coping Systems Inventory-Youth Version will be examined with ANOVAs and Pearson correlations. Gender will be examined as a possible moderator of this relationship. When analysis is complete, results should show that students who identify with spirituality will have higher self-esteem than those with no or less religious affiliation. Future research and intervention work should further explore the role of spirituality as it is related to higher self-esteem.

◆ 14 ◆

A Dual Investigation in Urban Re-Invigoration

Rose Brickley, Anthropology (2013), Provost Fellowship

Faculty Mentor: Dr. Judith Wittner, Sociology and Dr. Charles White

Loyola's urban campus deprives the student of contact with natural environments and food sources. I sought to improve the tangible ways for students to connect to the environment, more specifically through the edible container garden that is in place on the Mertz Terrace. My research included constructing ten self-watering gardening containers with the goal of overcoming the challenge of continuous management and creating a system better suited to the campus lifestyle. I also studied human response to increased vegetation in blighted habitats, through a comparative study of urban environments that recently introduced food-producing zones with those that have not. From this aspect of the project I observed a heightened sense of community within a garden setting in an urban space compared to those spaces without gardens. This research has allowed me to see the possibilities for edible landscapes and further explore how I can improve gardening efforts on campus.

◆ 15 ◆

Influenza Prevention in Immunocompromised Patients

Kathryn Bro, Nursing (2012)

Anamaria Hosu, Nursing (2012)

Reba Kindle, Nursing (2012)

Kesha Patel, Nursing (2012)

Margaret Pavisich, Nursing (2012)

Nicole Stanczak, Nursing (2012)

Lacey Wichert, Nursing (2012)

Faculty Mentor: Dr. Annie Thomas, Nursing

Influenza (Flu) is an infectious disease caused by RNA viruses. Influenza spreads around the world in seasonal epidemics, resulting in the deaths of between 250,000 and 500,000 people every year (Center of Disease Control, 2011). The National Evidence Based Guidelines recommend vaccination against influenza for immuno-compromised patients, which is consistent with the systematic review article reviewed for our group research project. The review of policy available to us from Loyola University Health System focuses on all admitted patients with a suggestion to add detailed guidelines for immuno-compromised patients. The evidence supporting influenza vaccine for immuno-compromised patients is poorly quantified by substantial research evidence. The proposed study will compare the outcomes of influenza immunization in immuno-compromised patients that did not opt to get immunized versus those who opted to get immunized by using a comparative descriptive design. This study uses the Pender Health Promotion Model. The convenience sampling will draw subjects from a selected hospital receiving care in adult oncology, transplant, and HIV units. Physiological measurements will determine serum antibody concentrations at baseline, and 2-4 weeks after immunization. The outcome from this exploratory research is important in attempting to bridge the gap between existing influenza immunization protocols and evidence based clinical practice.

◆ 16 ◆

Subverting Gender Hegemonies: A Case Study Of Political Women on the Federal Level

Anne Burkhardt, Women's Studies/Gender Studies, Political Science (2013), Provost Fellowship

Mentor: Alison Staudinger, Political Science

This study intends to answer questions regarding modern issues in notions of citizenship and gender. Specifically, we are interested in understanding how female elected officials practice of gender has changed throughout time and whether they reflect acceptable gender roles in Western society. We also intend to examine the Internet's effect on production of gender in political discourse. We believe that knowing the answers to these questions is imperative to understand society today, especially in regards to socially acceptable positioning for women. Understanding why these changes are occurring and what they mean will inform feminist and democratic theory meaningfully - and provide models for the development of modes of civic activity that function in a globalized world. We are using publications both in print and in the virtual public sphere to discover these changes in Western culture.

◆ 17 ◆

Social Housing and Kappa Opioid System Activation in Rats Exposed to Chronic Social Stress

Nicholas Bush, Biophysics (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Louis Lucas, Biology

The Kappa Opioid System (KOS) has been previously implicated in both depressive-like symptoms and social behavior of the rat. In the present study, we investigate social housing's effect on the expression of depressive-like symptoms as well as KOS activation. We induce a depressive-like state through a chronic social stress known as the resident-intruder paradigm. Simultaneously, we either housed the animal individually or with another, familiar rat. Finally, we measured the mRNA levels of KOS and its endogenous ligand, dynorphin, in the brain. We also measured circulating levels of the stress hormone corticosterone. Although we found no significant expression of depressive-like symptoms in any group, we hypothesized that the repeated stress and the social environment affected the KOS. As the KOS is implicated in the saliency of negative affect in the rat, we expect KOS activation to be at baseline in the socially housed animals, but elevated in the isolated individuals. If this turns out to be true, it suggests a possible biological coping mechanism associated with positive social behavior that may play a role in alleviating depressive symptoms.

◆ 18 ◆

The Effect of Photodynamic Therapeutic Reagents on Zebrafish In Vivo

Andrew Canning, Biology and Economics (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Eric Schroeter, Biology

Photodynamic Therapy (PDT) is a method by which cells can be selectively killed in a tissue. In this experiment, the zebrafish, *Danio rerio*, is used as a model organism to test the efficiency of photodynamic therapeutic reagents in vivo using confocal microscopy. The reagents Malachite Green-BSA and Chlorin-BSA demonstrate photodynamic effects with varying degrees of efficiency when they are exposed to a specific wavelength of light. When these reagents are exposed to the correct wavelength of light in the zebrafish gut reactive oxygen species are generated within a predetermined target region. The reactive oxygen species is singlet oxygen, which is toxic in large amounts to cells ultimately rendering the target cell dead. Confocal microscopy and the regenerative characteristics of zebrafish make this experiment possible. The results indicate that confocal microscopy is a successful tool to selectively kill cells and monitor the effects of various photodynamic therapeutic reagents in the zebrafish gut.

◆ 19 ◆

A Comparison of Sagittal vs. Axial Micro-Computed Tomography Analysis in Mice Femurs

Mumtaj Chand, Biology and Psychology (2011), Provost Fellowship

Mentors: Dr. Margaret A. McNulty, Rush University; Dr. Rick Sumner, Rush University; and Dr. F. Bryan Pickett, Biology

A common form of evaluating bone morphology in mice is micro-computed tomography (CT). The main purpose of this study is to analyze ten samples of intact mice femurs using two different methods: (1) the sagittal analysis, which involves evaluating vertical cross-sections of the femur, and (2) the axial analysis, which involves evaluation of the horizontal cross-sections of the femur. Both types of trabecular analyses involve parameters such as bone volume (BV), total tissue volume (TV), BV/TV, and connectivity density. As predicted, the data from both methods depicts a high correlation of similarity. However, the axial method differs in that it includes cranial and collateral portions of the bone and thus should be the preferred type of analysis if those regions are of interest. Otherwise, both methods are interchangeable, allowing flexibility in analysis.

◆ 20 ◆

Neural Correlates of Relational and Featural Similarity Processing

Miraj Chokshi, Psychology (2012), Provost Fellowship

Faculty Mentor: Dr. Robert Morrison, Psychology

Relational reasoning is an essential mechanism for everyday learning that requires an appreciation of relational similarity in the face of distracting object features. Prior behavioral studies have suggested that when comparing sets of geometric objects, participants favor relations when making similarity judgments, but favor object features when deciding how sets are different. In this study, we investigated the neural mechanisms underlying this comparison. On each trial, participants were asked to rate two sets of geometric objects, for either similarity or dissimilarity, while their neural activity was measured using scalp electroencephalography (EEG). Event-related potentials calculated from the EEG signal suggested that participants engaged in analogical processing, as characterized by a frontal late positive potential, more when making similarity ratings than dissimilarity ratings. The effect appears to be strongest when sets of objects in problems are relationally similar then compared to sharing a common feature.

◆ 21 ◆

The Right to Know as a Human Right

Courtney Clark, International Studies and Religious Studies (2012)

Faculty Mentor: Dr. Barry Sullivan, School of Law

The right to know in other words, meaningful access to government information is an essential human right that is sometimes overlooked in rights discourse. This right is critical in democracies, where citizens vote based on the information about candidates and issues to which they have access; however, governments often claim confidentiality for national security purposes. Catholic philosopher Jacques Maritain's philosophy of human rights and natural law provides a compelling theory for the defense of the human right to know. His work partly influenced the Universal Declaration of Human Rights and its affirmation of the right to know. In addition to Maritain's theory, examples such as the sexual abuse crisis in the Catholic Church support calls for institutional transparency and accountability. Both the US government and the Church will benefit if officials and clergy improve communication and accountability to the citizenry and the faithful.

◆ 22 ◆

Branding the Loyola University Chicago's Coordinated Community Response Team (CCRT): Communication and Promotional Strategies Recommendation

Ashley Cole, Psychology, and Women's Studies and Gender Studies (2012)

Ruth Litzenberger, Advertising and Public Relations, and Women's Studies and Gender Studies (2012)

Sophia Rogstad, Social Work, and Women's Studies and Gender Studies (2013)

Faculty Mentor: Elizabeth Myers, Director of the Women & Leadership Archives

Our research concerns how communication methods surrounding sexual assault awareness are created and distributed through brochures by the Coordinated Community Response Team (CCRT) on campus. We noticed a perpetuation of gender stereotypes and wanted to conduct research on Loyola University Chicago's Lakeshore Campus to gather data about students' reactions and suggestions for the brochures. Today, branding and content design are fueled by co-creative elements, meaning consumers, clients, and users of a product or service are providing input or becoming actively involved with an organization to create relevant and effective images and messages, or a brand. We interviewed 30 undergraduate students on Loyola University Chicago's Lakeshore campus and had them select/describe colors and imagery that they considered would reflect the CCRT's mission. Through the use of co-creation, we now have a better understanding of what content resonates with the undergraduate student body.

◆ 23 ◆

Does Ephrin-B2 Control the Innervation of Lingual Epithelium by Geniculate and Trigeminal Axons?

David Collins, Molecular Biology (2013)

Faculty Mentor: Dr. M. William Rochlin, Biology

Eph/ephrin signaling guides axons during embryonic development. Preliminary observations in the Rochlin lab suggest that EphB/ephrin-B signaling controls the innervation of the lingual epithelium by taste axons from the geniculate ganglion and somatosensory axons from the trigeminal ganglion. EphB's are localized in sensory axons and ephrin-B2 is concentrated in and below the tongue epithelium, except at sites penetrated by axons. In mice lacking EphB receptors, trigeminal axons penetrate the epithelium prematurely. Axons from different types of sensory neurons are supported by a variety of growth factors during development, and may be differentially sensitive to Eph/ephrin signaling. To determine if ephrin-B2 is sufficient to guide lingual sensory axons, I carried out in vitro stripe assays. I show that during rodent embryonic stages, ephrin-B2 stripes repel neurites from both the geniculate and trigeminal ganglion, regardless of which neurotrophic factor is used to promote growth. This repulsion is dependent on the ephrin-B2 concentration, and analysis is underway to determine if different concentrations can promote or stabilize outgrowth. We are also analyzing the innervation of taste buds in mice lacking EphB receptors or ephrin-B2 signaling. Additionally, I am developing a method for culturing sensory ganglia directly on intact tongue epithelium, which would allow us to better study the role of Eph/ephrin signaling during target selection and penetration in situ.

◆ 24 ◆

Campus Sexual Violence Through the Eyes of Fraternity and Non-Fraternity Male Students at Loyola University

Katelyn Corrigan, Sociology and Women's Studies and Gender Studies (2012)

Mar Curran, Communications and Women's Studies and Gender Studies (2012)

Christopher Mihelich, Philosophy and Women's Studies and Gender Studies (2012)

Tyler Neeb, English and Women's Studies and Gender Studies (2012)

Emily Ross, Sociology and Women's Studies and Gender Studies (2012)

Faculty Mentor: Dr. Elizabeth Myers, Director, Women and Leadership Archives

Within the contemporary discourse on sexual violence, men are, in many ways left out of the discussion. The concept of males as aggressors taking shape in scholarly literature and popular imagination is fed by a statistical reality, meaning that gender roles within the dialogue of sexual violence (men as perpetrators, women as victims) become systematically entrenched. As noted by some researchers, the entrenchment has led to a polarization of gender roles (Mezey & King vi). Through conducting our own study through surveying during the Spring 2012 Loyola semester, we examine Loyola male student perceptions of sexual violence and how language frames their views on intervention and prevention, what sexual violence is, and how male student perceptions of sexual violence are potentially influenced by the differing social dynamics of male fraternity and non-fraternity members.

◆ 25 ◆

Generation of a Novel Transmission-Blocking Malaria Vaccine

Michael Czapka, Biology (2013), Research Mentoring Program

Mentors: Kathleen McGuire, PhD student, Microbiology and Immunology and Dr. Christopher Wiethoff, Microbiology and Immunology

Despite the advent of anti-malarial medications, malaria, a mosquito-borne disease, still remains a glaring global health issue: it causes one million deaths, and between 300 and 500 million new infections per annum. Our project involved generating an Adenovirus 5 (Ad5) construct ligated via Adenovirus protein IX to a malarial epitope, Pfs-25, for the purpose of developing a novel malaria vaccine. Adenovirus, a non-enveloped, double-stranded DNA virus, has been shown to induce a robust CD4 immune response required for development of humoral immunity. A synthetic DNA polynucleotide, pIX-pfs25, was stably transfected into HEK-293A cells. An immunofluorescence assay determined the Pfs-25 epitope was still in the correct conformation. We then infected the pIX-Pfs25 expressing 293A cells with Ad5, in order to incorporate the chimeric protein onto the virus in-trans. Recombinant virus was not detectable via western blotting technique; thus, other pathways of creating an Ad5-pfs25 immunogenic construct are currently being explored.

◆ 26 ◆

Enriching the Minds of Young Adults: Rewriting Greek Mythology into Contemporary Conversation

Angela Dao, English (2013), Provost Fellowship

Faculty Mentor: Dr. Edith Livermore, Classical Studies

This fiction manuscript is an investigation into the world of Greek mythology and its presence in our everyday world though its timeless lessons in morals. In this manuscript, vast gaps in time are closed between the twenty-first century character, Evia Steel, and the character and mind-set of Athanasius, Hades son. Furthermore, societal gaps in race and gender have been eliminated through the implementation of characters from diverse backgrounds and other traditional -- betimes exotic -- literary influences. With Athanasius reeling the audience back in time into the land of the mythological, and Evia grounding them solidly in the twenty-first century, readers are encouraged to explore the unknown, yet practice the lessons learned from the story in real life. The narrative reads exactly as though it is an entertaining fiction story. At the same time, it is saturated with careful research into Greek mythology, serving both to educate readers and increase their literacy rate.

◆ 27 ◆

*Influence of Oysters (*Crassostrea Virginica*) on Sediment Quality (Carbon:Nitrogen Ratio) in an Urbanized Coastal Environment*

Angeline David, Molecular Biology (2012), Provost Fellowship

Faculty Mentor: Dr. Timothy Hoellein, Biology

In eutrophic, or nitrogen (N) enriched waters such as urban and agricultural rivers and estuaries, phytoplankton growth can be stimulated to nuisance levels. By removing phytoplankton and delivering N-rich material to the sediment, filter feeders such as eastern oysters (*Crassostrea virginica*), may improve overall water quality. In New York City (NYC), oyster restoration has been proposed to improve water quality in the Hudson-Raritan estuary; however, it is unclear if oysters will be effective in highly eutrophic environments. We measured the effect of oyster density and water column nutrient load on sediment carbon to nitrogen ratio (C:N) at 4 locations and at 3 oyster densities in eutrophic Jamaica Bay, NYC. The carbon to nitrogen ratio (C:N) of phytoplankton, oyster wastes, and sediment indicates the quality of organic matter for microbial decomposers. All organic material is made of generous amounts of C and lesser amounts of N. If the C:N ratio is low, then N is abundant and the sediment is highly palatable for microbial decomposition as opposed to a high C:N ratio which states that the sediment is more recalcitrant for decomposers (high and low quality, respectively). We predicted the highest oyster treatment and the most eutrophic sites would show the lowest C:N. The data shows that in Motts Basin and Spring Creek, there is a small increase in sediment quality over time from July 2010 to April 2011 due to settling of phytoplankton from the first measurement. However, the many regression analyses that have been done do not show correlation between sediment C:N ratio and ash-free dry mass, % organic matter, exchangeable NH₄⁺, nitrification, ammonification, and denitrification enzyme activity. Our work suggests oyster wastes may not increase sediment quality for microbial decomposition, and therefore oysters may have little influence sediment dynamics in highly eutrophic environments. Water quality improvements may be more likely to result from engineering changes such as improvements in waste water treatment or combined sewer overflows.

◆ 28 ◆

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

Francis DeAsis, Biology, Music (2012)

Mentors: Ryan T. Crews, Rosalind Franklin University of Medicine and Science; Dr. Stephanie C. Wu, Rosalind Franklin University of Medicine and Science

A minimal amount of study has been conducted concerning the practicality of off-loading footwear for diabetic patients with forefoot ulcerations. This study further explores the viability of the CLEAR cleat designed by Klein et al. in 2008 for such use. Utilizing the cleat on their right foot only, 7 diabetic subjects at-risk for forefoot ulceration cycled on a recumbent stationary bike for a total of 10 minutes. Two different conditions were examined: an unmodified running shoe and the CLEAR cleat. This study further explored the viability of the CLEAR cleat for use with diabetic subjects at-risk of developing a forefoot ulcer. Results suggest that the CLEAR cleat is safe for use in such patients.

◆ 29 ◆

Body Image

Sarah Dejanovich, Psychology (2013), Research Mentoring Program

Mentor: Amanda O'Dell, PhD student, Developmental Psychology

This program was a pilot study on body image research for Amanda O'Dell's dissertation. The research was an exploratory examination of benefits of self-affirmation vs. purpose-priming against threats to body image. Body image is defined as the cognitive, affective, and perceptual inner experience of one's outer appearance. This study involved approximately 50 emerging adult females from the ages 19 to 29 enrolled in summer courses at LUC who were equally distributed across the three conditions: control, self-affirmation, and purpose-priming. Participants were prompted to fill out a questionnaire and were compensated with a \$10 gift card. The questionnaire consisted of various measures measuring momentary body image, a body image manipulation, and a writing task coordinated with the condition the participant was randomly assigned. This study provides a basis for Amanda's further research and provides valuable insight into protections against the dangers of a poor body image.

◆ 30 ◆

Sharp and Infinite Boundaries in the Path Integral Formalism

Philip Dluhy, Theoretical Physics and Applied Mathematics and Physics (2012), Mulcahy Scholar
Faculty Mentor: Dr. Asim Gangopadhyaya, Physics

Sharp and infinite potentials are difficult to handle in path integral formalism; all paths must be accounted for, and it is difficult to discriminate which paths would wander into a forbidden region. Goodman advocated the use of the image-point method to account for these paths that would wander into the forbidden region [1]. We revisit this class of potentials and attempt to provide the image method support. We show that the use of a complete set of energy eigenstates which satisfy the boundary conditions of an infinite wall, precisely generates the propagator proposed in Ref. [1]. We then show that the image method readily generates the propagator for the half-harmonic oscillator, a potential that has a sharp infinite boundary at the origin and a quadratic potential in the allowed region, and leads to the well known eigenvalues and eigenfunctions. Finally, we show the validity of the image method by employing supersymmetric quantum mechanics to relate a potential without a sharp boundary to the infinite square well and derive its propagator.

[1] Mark Goodman, Am. Jour. Phys. 49, 843 (1981).

◆ 31 ◆

Associations Between Teachers Depressive Symptoms and Children's Academic Achievement

Jessie Duncan, Psychology (2012)

Donna Flores, Psychology (2012), Provost Fellowship
Faculty Mentor: Dr. Christine Li-Grining, Psychology

Teachers depressive symptoms have been linked to students behavioral problems, but little research has studied relations with students academic achievement. This study aims to help fill this gap by examining the link between teachers depressive symptoms and preschoolers academic skills. Data was drawn from the Seeds for School Success Project. Teachers reported on their own characteristics, including depression, and preschoolers (n= 84) quantitative and literacy skills were measured through direct assessment. Analyses included multiple linear regressions predicting childrens academic skills from teachers characteristics. Results indicate that teachers depressive symptoms did not significantly predict preschoolers quantitative or literacy skills. However, teachers experience was negatively related to preschoolers quantitative skills. It could be that preschoolers with fewer quantitative skills are matched with more experienced teachers in order to help them make academic progress. Future studies should further investigate childrens academic achievement in relation to preschool teachers characteristics.

◆ 32 ◆

Early Detection of Diabetic Peripheral Neuropathy Using Obstacle Crossing

Nimra Elahi, Biology (2012)

Faculty Mentor: Dr. F. Bryan Pickett, Biology

This is a pilot study observing the effect of virtual reality techniques on the early detection of diabetic peripheral neuropathy. We predicted that DPN patients would show a misjudgment of foot position during obstacle crossing, an altered reaction time, and an impaired balance and stability.

◆ 33 ◆

The Heart of the Heart of the Writing Center: Defining a Community From Within

Claire Gaddis, English and Secondary Education (2012)

Justyna Obrzut, Biology (2012)

Diana Saavedra, Spanish (2014)

Beata Tunkevicius, Biology (2014)
Faculty Mentor: Dr. Michael Meinhardt, English

This poster explores proactive agency for changes in preparation, expectation, and collaboration with contemporary English Language Learners and Students with Disabilities in the writing center, specifically regarding the center community culture, organizational techniques, practice/center ideology relationship, dedication to collaborative practices, and alternative tutoring experiences.

◆ 34 ◆

Static Friction Revisited

Zachary Ganger, Biophysics (2014)

Paul Kleinmaier, Math (2014)

Ahmed Safdar, Physics (2015)

Brian Stone, Physics (2015)

Faculty Mentor: Dr. Aleksander Goltsiker, Physics

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

◆ 35 ◆

Carbohydrate Synthesis for Pathogen Detection and Capture

Jennifer Gomez, Biochemistry (2012), Carbon Scholar

Faculty Mentor: Dr. Daniel Becker, Chemistry

This project is designed to improve the detection of an infected host cell by bacteria dependent upon the specific carbohydrates present on the surface of that cell. The bacteria identify the host through detection and binding of specific carbohydrates on the cell. This specific binding has been validated in our lab through the use of the carbohydrate rhamnose in self-assembled monolayers (SAMs) on a gold surface which can be done using dip-pen nanolithography. This allows cultured bacteria to cling to the nanopatterned carbohydrates, enabling the bacterial lectin proteins to bind to the complementary carbohydrates. Bacterial binding to the synthesized carbohydrate SAMs will be verified using lateral force microscopy, as well as mass spectrometry. Mixtures of these carbohydrates will be explored to determine the specificity of different bacteria to designed carbohydrate mixtures.

◆ 36 ◆

Characterization of the Organization of Beta Satellite on HC21p

Laura Grenlin, Molecular Biology (2012), Provost Fellowship

Faculty Mentor: Dr. Jeffrey Doering, Biology

The heterochromatic regions were largely left out of the Human Genome Project. The short arm of chromosome 21 (HC21p) is our model for study of these regions. β satellite is a repetitive sequence family that is poorly characterized and found on HC21p as two distinct families, distal ? and proximal ? to the rDNA genes. Using PCR, I have begun characterizing the β 7 cluster. PCR primers were designed from

a short preliminary sequence of the region and clones obtained. HC21p specific primers were designed from the accumulated sequence data by analyzing for similarity to $\beta 2$ and $\beta 7$. I am currently performing chromatin immunoprecipitation and quantitative PCR to determine if there are chromatin structural differences between malignant and normal cells in the β satellite regions of HC21p.

◆ 37 ◆

Understanding the Activator Protein's Role in Assembly of the NHase Active Site.

Natalia Hajnas, Biology and Psychology (2013)

Faculty Mentor: Dr. Richard Holz, Chemistry

Nitrile hydratases (NHases) are enzymes that catalyze the hydration of nitriles to amides under gentle conditions compared to traditional industrial methods. Activator proteins are required for full catalytic activity of most NHases. They are widely thought to function as metallochaperones but may also be involved in cysteine oxidation of the active site, which is required for activity. It is unknown how the maturation mechanism works for NHase (i.e. how the activator functions to bring the metal ion to the active site). Current literature lacks proposals of tentative metal binding sites for Co-type activators. I propose to investigate the activator's function by studying activator and NHase alpha protein complexes. The knowledge gained from research on this enzyme and its activator will have applications across several fields such as medicine and advancing green chemistry.

◆ 38 ◆

Cloning, expression, and purification of a Putative Oxidative Stress Sensing Protein in the Malaria Parasite Plasmodium

Kyle Haselton, Psychology (2012), Mulcahy Scholars Program and Provost Fellowship

Faculty Mentor: Dr. Stefan Kanzok, Biology

Plasmodium, the organism that causes malaria, is exposed to cytotoxic reactive oxygen species (ROS) throughout its complex life cycle. It possesses highly effective antioxidant proteins for protection against endogenous as well as exogenous ROS which are upregulated in response to changes in the environment. It is not well understood how Plasmodium senses ROS, a prerequisite for the upregulation of the respective antioxidant proteins. Here I present the cloning, recombinant expression and purification of thioredoxin-dependent glutaredoxin -1 (TPxGL) of the malaria parasite Plasmodium, which we hypothesize to be an ROS sensor. The protein shows high similarity to Orp1, an oxidative stress sensor in yeast. Orp1 binds a transcription factor. Upon oxidation by hydrogen peroxide Orp1 releases the transcription factor, which then traverses into the yeast nucleus and up regulates antioxidant genes. We hypothesize that TPxGL functions similarly to Orp1 as a ROS sensor in Plasmodium.

◆ 39 ◆

Positive Peers: Exploring how and why to Incorporate Peers into HIV Prevention Services

Michael Heisler, Social Work (2012), Research Mentoring Program

Mentor: Alison Tan, PhD Student, Social Work

Prevention with Positives (PwP), is an HIV prevention, education, and support approach developed for HIV positive individuals. The hallmark of this intervention is the leverage of peers who are also HIV infected to deliver messaging. This study examines a sampling of seven programs which have been utilized a PwP approach in the past decade. Programs were selected which represented a difference in target populations, budget, size, and years of operation. This study makes clear that all PwP programs are unique in design and implementation, and provides advice for other institutions considering adding a PwP component to their education and prevention services.

◆ 40 ◆

Investigating the Effects of the Antibiotic Azithromycin on Algae Community Composition

Samantha Hertel, Environmental Studies (2012)

Perris Shaw, Environmental Studies (2012)

Mentors Dr. Nancy Tuchman, Biology and Lane Vail, M.S., Research Associate, CUERP

In recent years, pharmaceuticals and personal care products (PPCPs) have been appearing in our wastewater, rivers and drinking water (Kolpin et al. 2002, Jones-Lepp et al. 2004, Hawthorne 2009). One of the major sources of these emerging contaminants (i.e. hormones, antibiotics, antimicrobial additives) are from human waste, as many pharmaceuticals are not completely metabolized and enter wastewater treatment plants that are unable to remove them (Halling-Sorensen et al. 1998). However, few studies have investigated the effects of PPCPs at low concentrations on stream ecosystems, and the effects of these contaminants are not clearly understood. I examined stream biofilm samples that had previously undergone varying treatments (zero, low and high) of the frequently prescribed antibiotic azithromycin in order to determine the effect of azithromycin on stream algae composition.

◆ 41 ◆

Layer Depth Dependence of Shocks and Patterns in Shaken Granular Systems

Michael Hollowed, Physics (2012), Mulcahy Scholars Program

Stefanie Moertl, Mathematics (2013), Mulcahy Scholars Program

Faculty Mentor: Dr. Jon Bougie, Physics

Collections of macroscopic particles that interact via inelastic collisions are collectively known as granular media. When shaken, granular media can enter a fluidized state in which they exhibit properties characteristic of fluids, which we study in an attempt to find fluid-like governing equations for granular media. We simulate shaken granular layers using numerical solutions of continuum equations and use these simulations to study shocks and patterns in vertically oscillated layers of grains. When the accelerational amplitude of the forced oscillations exceeds that of gravity, the layer leaves the plate at some time during the cycle. When the grains collide with the plate later in the cycle, shocks are formed within the layer. If the accelerational amplitude exceeds a critical value, standing wave patterns also form. We investigate the interactions between shocks and patterns in these systems, as well as their dependence on layer depth.

◆ 42 ◆

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

Rachel Holowicki, Psychology (2014)

Rupal Joshi, Biology (2013)

Connie Kalble, Sociology (2012), Research Mentoring Program

Jori Rappaport, Psychology (2015)

Mentors: Dr. Scott Leon, Psychology and Ashley Rolnik, PhD Student, Psychology

Thin-depicting media has been shown to have a positive correlation with eating disordered behaviors and body dissatisfaction. The media has been criticized for the glamorization of celebrities with eating disorders, failing to illustrate the risks. One hundred and ten undergraduate women were recruited to participate in this study, which utilized an experimental design in order to conceptualize the effects of thin-depicting media on the body dissatisfaction, self-objectification, body shame, self-esteem, and affect on their disordered eating behaviors and attitudes. Women are constantly exposed to the thin ideal in the media, particularly magazine images and stories. The results of this study suggest that viewing media images that are accompanied by stories about eating disorders may be detrimental to women who have high levels of disordered eating. However, for women who do not exhibit disordered eating, viewing the image paired with a story about eating disorders may be beneficial.

◆ 43 ◆

The Use of Therapeutic Touch in Neonates for Pain Alleviation

Audrey Huang, Nursing (2012)

Clare Moeller, Nursing (2012)

Alexandra Pape, Nursing (2012)

Cynthia Sorellino, Nursing (2012)

Nisha Sud, Nursing (2013)

Emily Yeager, Nursing (2012)

Faculty Mentor: Dr. Annie Thomas, Nursing

Therapeutic touch has been identified as crucial for the development of parent-infant attachment and the general well being of infants. Studies have demonstrated that the use of therapeutic touch in addition to standard medical intervention is effective in lowering the Cortisol level and in maintaining the Oxytocin level, thereby reducing pain level in neonates. The National Evidence Based Guidelines (EBP) recommends non-pharmacologic measures such as therapeutic touch, to be used in minor routine procedures for the treatment of pain management for pediatric clients. The group research project examined Loyola University Health Centers current policy for pain assessment and treatment. The policy outlined a protocol for assessing pain by using the N-PASS scale in the neonates. A study is proposed based on the gap identified from policy review, literature review, and EBP guidelines recommendations. The study will assess the effectiveness of therapeutic touch on pain management in post-surgical neonates. Prescriptive theory of acute pain management will guide the study. Stratified random sampling technique will select 40 post-surgical neonates to conduct this experimental pilot study. A therapeutic touch practitioner will administer the treatment for 30 minutes and the N-PASS scale will assess pain level at baseline and at 60 minutes.

◆ 44 ◆

Artists of Artemisia Archives Website

Amelia Hudson, Visual Communication (2012), Provost Fellowship

Faculty Mentor: Nicole Ferentz, Director of Fine Arts

Artemisia Gallery Chicago was an artist-run gallery dedicated to showing the work of female artists. The gallery opened in 1973, a time when the art world was dominated by men, and in its thirty-year existence, Artemisia provided not only a space for female artists to show, but a supportive community in which women could take full control of their work and their careers. Artemisia played an important role in womens history and the history of Chicago, and its activity should be recorded and archived for future generations. For this project, I have created a website that documents the history of Artemisia and links the Artists of Artemisia Archives in the Women and Leadership Archives at Loyola University Chicago.

◆ 45 ◆

The Origins, Growth, and Implications of Liberation Theology in Latin America

Zachary Hugo, Philosophy, Theology (2012)

Faculty Mentor: Dr. Gunes Tezcur, Political Science

This project examines the origins, development, and socio-political implications of Liberation Theology in Latin America in the late 20th and early 21st centuries. It first contextualizes the history of the Catholic Church in Latin America by identifying the socio-political zeitgeist from which the movement emerged. It second explores the intellectual roots of the movement by tracing the ways through which new perspectives on social reality arose from the synthesis of the European Catholic theology and the leftist tendencies in Latin America. It finally discusses the struggles characterizing the movement and their lasting implications. The project suggests that Liberation Theology was neither a byproduct nor a precursor to Vatican II. Instead it argues that Liberation Theology presented an entirely different approach to the pri-

mary role of the Church in the world and challenged both classical theology and the hierarchy of the Church.

◆ 46 ◆

Hemoglobin as a Potential Blood Substitute

Sheena Hussain, Biochemistry and English (2013), Carbon Scholar
Faculty Mentor: Dr. Ken Olsen, Chemistry

Researchers have been searching for a usable blood substitute for decades; unfortunately, researchers have yet to produce a successful one. We are producing a bovine hemoglobin nanoparticle that takes advantage of thiol-maleimide chemistry, and that contains the antioxidants: catalase (Cat) and superoxide dismutase (SOD). Currently, myoglobin is being used instead of hemoglobin. Different concentrations of Mb-Mal and Mb-SH are being tested to find the optimal ratio. The final procedure will be tested with cross-linked hemoglobin instead of myoglobin and AFM images will be taken of the aliquots. After the chemical production of the hemoglobin nanoparticle is complete, both the myoglobin and hemoglobin nanoparticle will be tested on hemorrhaged rats in vivo at Dr. Scrogins lab.

◆ 47 ◆

Modeling the Motion of a Magnet in the Presence of a Conductor

Benjamin Irvine, Biophysics (2013), Mulcahy Scholars Program
Matthew Kemnetz, Physics, Mathematics, and Software Development (2013), Mulcahy Scholars Program
Mentors: Dr. Asim Gangopadhyaya, Physics; Thomas Ruubel, Physics; and Dr. Robert Polak, Physics

We have developed an analytical model of magnetic damping. Magnetic damping occurs when a magnet moves in proximity to a conductor. The changing magnetic field produces an electric field, which generates currents in the conductor. These eddy currents then produce a magnetic field that opposes the motion of the magnet. This phenomenon is utilized in the braking systems of hybrid cars, some trains, and roller coasters. The major benefit of magnetic braking is that an object can be slowed down without losing energy to friction. The kinetic energy of an object is converted directly into electrical energy. For this reason, magnetic damping is fundamental to the development of future technology in regenerative braking. Magnetic braking is extensively used in industry where computational methods are employed to accurately model magnetic braking. Our improved analytical model will provide an excellent benchmark for any computational models.

◆ 48 ◆

Investigation into the Expression of Three Thioredoxin-Like Genes During Malaria Parasite Development in the Mosquito

Blair Jones, Biology (2013), Mulcahy Scholars Program
Faculty Mentor: Dr. Stefan Kanzok, Biology

The Plasmodium parasite causes malaria, a vector borne infectious disease, which is transmitted between humans by mosquitoes. Plasmodium infects over 250 million people worldwide leading to over 1 million killed each year. Passage through the mosquito is essential for the malaria parasites because it provides the environment for sexual reproduction and the means for transport to the next human host. In the mosquito vector, the Plasmodium is exposed to a particularly challenging environment in the digesting bloodmeal. It takes several hours for the parasite to develop into a motile form, the ookinete, which can then escape this harsh environment. Prominent among the challenges in the blood meal are reactive oxygen and reactive nitrogen species, which originate from both digestion of hemoglobin, and the mosquito's immune response. To protect against these reactive oxygen (ROS) and reactive nitrogen species (RNS), the malaria parasite has active antioxidant defense systems. Our lab focuses on

investigating antioxidant gene expression during the parasite's development in the mosquito midgut in order to identify genes, which might play key roles in the parasite's survival within the mosquito vector. Using quantitative real-time polymerase chain reactions (qRT-PCR), we identified three target genes that showed mosquito stage specific expression patterns. These candidate genes comprise two novel putative antioxidant genes, namely thioredoxin-like protein 418 (tlp-418) and thioredoxin-like protein 469 (tlp-469), and also a thioredoxin-dependent glutaredoxin-like gene (TPxGI). In order to understand the function of these genes we plan to disrupt their open reading in the rodent model malaria parasites *Plasmodium berghei*. To this end I am now in the process of designing and constructing three knock-out plasmids, which upon completion will be sent to our collaborators for parasite transfection. Analyzing the phenotypes of these KO parasites will bring greater understanding to each gene's role for parasite survival in the mosquito vector.

◆ 49 ◆

Stream Health: A Comparison of Past and Present Fish Compositions in the North Branch of the Chicago River

David Jurak, Biology (2012)

Faculty Mentor: Dr. Terry Grande, Biology

The urbanization of the areas around the North Branch of the Chicago River has negatively impacted the health and biological productivity of the waterway. This project seeks to determine if there is a significant difference between historically gathered fish composition data and currently collected composition data, specifically the diversity and abundance of the various fish populations. The historical data is data that had been archived by various collections throughout the area. The current fish composition data was gathered over a span of two months via backpack electroshocking and dipnets. The fish were identified and measured then released.

◆ 50 ◆

The Evolution of Diet and Feeding Behavior in Birds

John Juranek, Biology (2012), Provost Fellowship

Faculty Mentor: Dr. Sushma Reddy, Biology

Our goal in this project is to determine the evolution of diet and feeding behavior in non-passerine birds. Using a recent phylogenomic study of birds, we mapped information about the diets and feeding behaviors of birds in order to determine how these characters evolved within the avian family tree. Our study is an important contribution to understanding these characteristics of diverse groups of birds in a phylogenetic framework. We looked at the diets and feeding behaviors of 99 families of birds representing all extant non-passerine birds. We classified diet into seven categories based upon the types of food eaten. Feeding behavior was categorized using a standardized classification of different behaviors and their related mechanisms of feeding. Our results indicate that certain diets are largely conserved throughout most orders of birds. We also found that some feeding behaviors remain conserved throughout all of birds, while others represent distinct adaptations within orders.

◆ 51 ◆

Varying Conversational Goals as Events Unfold: Impacts on Maternal Elaborativeness and Children's Recall

Navya Kamath, Psychology (2014), Provost Fellowship

Faculty Mentor: Dr. Catherine Haden, Psychology

Past research on mother-child reminiscing has established consistent links between maternal elaborativeness and children's remembering. One hypothesis about the differences in maternal conversational style is that mothers adopt different goals when conversing with their children, which in turn leads to dif-

ferences in what children remember about events. In this study, 80 mothers were provided with different conversational goals to either help their 4-year-old children understand or remember an event as it unfolds. We examined the impact these different goals might have on mother-child talk during an event, and children's subsequent event recall. In addition, we explored mothers' own reports about how they approached the task and what strategies they used in the service of fulfilling the goal provided to them.

◆ 52 ◆

Purification, Characterization, and Crystallization of Lactonase AiiB, an N-acyl-L-Homoserine Lactone (AHL) Lactonase From Agrobacterium Tumefaciens

Daniel Kechker, Chemistry (2012), Mulcahy Scholars Program

Mentors: Dr. Dali Liu, Chemistry and Rui Wu, Research Assistant

Bacteria use quorum-sensing to coordinate certain behaviors based on population density when invading a host or populating an infected area. Chemicals used by bacteria in quorum sensing are called autoinducers. Specifically, N-acyl-L-homoserine lactone (AHL) is an autoinducer used by many Gram-negative bacteria, and AHL is responsible for the regulation of virulence factor production (2). Proteins capable of degrading autoinducers are referred to as quorum-quenching enzymes, and can potentially be used in clinical, agricultural, and industrial applications. One type of quorum quenching enzyme is AiiB, a metal dependent AHL lactonase from *Agrobacterium tumefaciens*. My proposed studies focus on the extensive characterization of AiiB including the determination of the catalytic mechanism and the substrate specificity of the enzyme.

◆ 53 ◆

Tools for the Creation and Maintenance of Course Schedules

Ashton Kemerling, Computer Science (2012), Provost Fellowship

George Vasels, Computer Science (2012), Provost Fellowship

Faculty Mentor: Dr. Ronald Greenberg, Computer Science

A web tool is created in order to attempt to make it easier for departments to create schedules and maintain them. Through an algorithmic implementation on the cloud, the task for course creation has become simplified.

◆ 54 ◆

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

Samar Khan, Molecular Biology and Biophysics (2012)

Mentors: Dr. Bijan Najafi, Rosalind Franklin University of Medicine and Science; Michael Roum, PhD student, Molecular Biology and Biophysics, Rosalind Franklin University of Medicine and Science

This research project applied the knowledge from these previous studies in order to determine how much of an alteration there is in the EMG patterns of these lower extremity muscles in order to maintain balance. Furthermore how well balance is maintained by these alterations in those who have orthostatic hypotension by itself and orthostatic hypotension with peripheral neuropathy was determined. It was hypothesized that the more worse off the subject is (orthostatic hypotension vs. orthostatic hypotension and peripheral neuropathy), the less likely that any altered EMG patterns would be able to significantly aid balance control. However, It has been initially found that under the combined orthostatic hypotension and peripheral neuropathy condition, the patient either had worse balance control or better balance control but with increased muscle activity, particularly in the posterior group. More conclusions will be made once the data is fully analyzed

◆ 55 ◆

Methamphetamine Usage in the Context of Rational, Behavioral, and Neurological Models of Addiction: Implications for Precursor Control Legislation

Aaron Kirkman, Economics, Mathematics and Computer Science (2012)

Faculty Mentor: Dr. Timothy Classen, Economics

Within economics, there exists a large body of research that applies the principles of rational choice, utility maximization, and price elasticity to addictive consumption, but there is comparatively little research that applies these principles to methamphetamine, a drug known for its highly addictive nature. This interdisciplinary research seeks to understand methamphetamine addiction by exploring how it alters dopamine and serotonin re-uptake in the central nervous system and how these chemical changes support or contradict economic models of addiction. This paper also compares and contrasts the implications of rational models with more recent behavioral models. In addition, this research hopes to evaluate the efficacy of control legislation that targets ingredients in methamphetamine production by combining empirical studies of the price elasticities of highly addictive goods with analysis of data and reports from the Drug Enforcement Administration and the Substance Abuse and Mental Health Services Administration.

◆ 56 ◆

Microscopic Investigation into the Dynamics of Falling Chains

Unleen Kiverskis, Physics (2012), Mulcahy Scholars Program

Lacy Simons, Molecular Biology (Fall 2013), Mulcahy Scholars Program

Faculty Mentor: Dr. Asim Gangopadhyaya, Physics

We are examining the dynamics of a falling chain, a classic textbook physics problem that has never been explained on the microscopic level. The motion of the chain when released has previously been described as free falling, although studies have been conducted showing the chain is actually following conservation of energy laws. Our preliminary experiments confirm that the chain is conserving energy as it falls. The purpose of our project currently is to show how energy is conserved at the microscopic level. We worked mathematically and experimentally to define the forces acting upon the masses in the chain and describe their motion.

◆ 57 ◆

When Analogy is Like Priming: The N400 in Verbal Analogical Reasoning

Matthew Kmiecik, Psychology (2013), Provost Fellowship

Faculty Mentor: Dr. Robert G. Morrison, Psychology

Computational models of analogy have frequently relied on explicit relational representations and mechanisms for structured mapping. More recently, several connectionist models have attempted to provide an alternative explanation for 4-term verbal analogies. These models rely on forms of spreading activation and would predict activation more like semantic priming during verbal analogy solving. To test this claim we recorded EEG during a verbal analogy task. In our study we found that event-related potentials (ERPs) of analogy and semantic only trials diverged at the N400 with semantic only trials giving the more negative N400. The amplitude of the analogy N400 predicted participant performance. These results differ from previous studies of visual analogy that have shown only a late response-locked ERP predicting analogical mapping performance. Taken together these results suggest that under some conditions solving verbal analogies may use a mechanism similar to priming rather than that of analogical mapping.

◆ 58 ◆

Synthesis of Dyes as PDT agents

Anastasia Kozyleva, Biochemistry (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. David Crumrine, Chemistry

Cancer has always been a cruel mystery to its victims and to researchers. Yet, the information available today is aiding in the development of new resources to fight a more aggressive battle against the disease. Photodynamic therapy (PDT) is an evolving resource to combat tumor growth. It is non-surgical and offers to be non-toxic. This research project focuses on synthesizing novel photosensitizers (PS) from a phenothiazine base. When excited, PS can react with the cell membrane or with cellular oxygen, generating cytotoxic oxygen. The oxidative stress caused by this oxygen will kill local cells, leading to tumor death. In hopes of obtaining high yields, several different methods are being tried in producing the phenothiazine derived agents.

◆ 59 ◆

Reshaping the Non-Existent Nation: Themes in 18th Century Polish Memoir

Angelica Krajewski, English and International Studies (2013), Provost Fellowship

Faculty Mentor: Dr. Dan Vaillancourt, Philosophy

In 1795, Poland was partitioned by Prussia, Russia and Austria for the third time causing its political disappearance. Although the Polish autonomy disappeared, Polish culture, language and society remained. Tradition and experience were embedded in memoir, especially the memoirs of writers who went abroad to reflect on Polish culture such as Adam Mickiewicz and Nobel laureate Henryk Sienkiewicz. While Poland herself is central to every memoirists work, the Poland each writer envisions differs from the next. The experiences shared in these memoirs fall into two camps: one attempting to reclaim the nation through romance, the other through reason. Polish memoirs in the 19th century ask readers to wonder which route will lead them back to sovereignty.

◆ 60 ◆

Data Mining Techniques for Interpreting Metagenomic Data

Gina Kuffel, Bioinformatics, Biology, with a molecular emphasis (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Catherine Putonti, Biology and Computer Science

Advances in the amount of data which can be generated by next-generation sequencers provide us with a unique opportunity to assess not only the microbial members present within environmental samples, but also the genes being expressed. One of the current limitations to the new sequencing technology is referred to as the read mapping problem. Currently, available tools work best when there is little variation between the sequencing read and the reference genome for which the reads are being mapped. Variation, however, exists greatly for microbial sequencing projects. Recently, we have developed new software specifically for the mapping of short reads. The value of this whole pipeline is in the analysis stage for which I will be focusing my efforts. In order to analyze and interpret the vast amount of data delivered by high throughput sequencing it is necessary to automate the processes using bioinformatics techniques and available software. The Gene Ontology database will be used in conjunction with the Bioperl software package to assign gene function that appears in a metagenomic sample.

◆ 61 ◆

Preschooler Attention and Distractibility

Sahar Lewis, Psychology (2012), Provost Fellowship

Faculty Mentor: Dr. Kathleen Kannass, Psychology

This research project explored attention and distractibility in preschoolers. Participants were recruited

through phone calls and a letter mail out. Data collection is still in progress, and 3-year-olds and 4-year-olds are being tested. Children were randomly assigned to one of three conditions: control (no distraction), child-directed TV distraction, or adult-directed TV distraction. Children were given cognitive tasks to complete and in the distraction conditions a television show came on in the background. The content of the show was either child-directed (Sesame Street) or adult directed (Wheel-of-Fortune). Children's performance on the tasks, attention to the tasks, and looking to the distractor were measured. I hypothesize that the results of the study will show that children will be more distracted by the child-directed show. The theory behind this is that since this show is more comprehensible to them, it holds the child's attention more than the adult-directed show, and as a result they will be less focused on the cognitive task.

◆ 62 ◆

Modeling Reassortment in Bacteriophages

Jordyn Lucas, Biology and Math (2013), Biology Research Fellows Program
Faculty Mentor: Dr. Catherine Putonti, Bioinformatics

The reassortment of segments in RNA viruses has proved to be a common pathway in the change of viruses. Various reassortment-modeling techniques have shown to be innovative in predicting certain RNA reassortment patterns. With the help of these models, viruses can be further understood and more easily predictable. By comparing one strains lineage with another, a lot can be inferred about the environments effect on the virus. While most models have been developed for reassortment events in viruses infecting humans, reassortment does occur within viruses infecting other animals, plants and bacteria. Due to different lifestyles of the host, different parameters must be considered. The goal of this research project is to design a model for reassortment within viruses infecting bacteria, also called bacteriophages, and in particular the bacteriophage $\Phi 8$ which is a model organism studied in the Putonti Lab.

◆ 63 ◆

Effect of Deletion of an Evolutionary Conserved Region on RALDH2 Promoter Activity

Alexander Martin, Biology (2011), Mulcahy Scholars Program
Mentors: Dr. F. Bryan Pickett, Biology and Paula Martin, Research Associate, Pickett lab

Retinoic acid, a metabolite of retinol or Vitamin A, serves as a signaling molecule during the development of the vertebrate embryo. Catalyzed from retinol by the enzyme Retinaldehyde Dehydrogenase 2 (RaldH2), retinoic acid is crucial in cell differentiation during embryogenesis. It is an intercellular signaling molecule that determines the identity of cells along the anterior and posterior axis in the embryo. During neural tube development, RA signaling stimulates neural cell differentiation. Retinoic acid signaling is important in determining caudal hindbrain and rostral cervical spinal identity and in controlling the patterning and differentiation of spinal motor neurons and interneurons. This project will begin to characterize the regulation of Raldh2 gene expression by studying the promoter region of the gene to determine if the distal portion of the promoter is critical for normal RA patterning in the vertebrate embryo. A 3.1 kilobase minimal RaldH2 promoter has been characterized in lab, and shown to contain an Evolutionarily Conserved Region common to other bony fish. This region may identify an important cis regulatory element. Using restriction enzyme deletion we have constructed a new promoter lacking the ECR and are producing transgenics to determine if loss of this region modifies the expression of a RaldH2:YFP reporter gene. Our newly created transgenics are showing significant changes in the expression of the reporter, suggesting the evolutionarily conserved region we removed from this gene is required for normal expression.

◆ 64 ◆

Nitrogen Cycling by Cave Bacteria

Sarah Massarani, Biology (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Domenic Castignetti, Biology

Bacteria living in extreme environments, such as caves, survive on no sunlight and little organic carbon. Twenty-five Kentucky pseudomonads were isolated from a cave where knowledge of nutrient cycling within it is not greatly understood. After determining that three of the isolates (KY64, KY198, and KY429) have the *nirK* gene, which codes for nitrite reductase, an enzyme that reduces nitrite to nitric oxide, physiological testing was needed to examine nitrogen gas production by the bacteria. Nitrogen gas production results from denitrification, a pathway involved in the nitrogen cycle. Gas chromatography was performed to characterize the isolates as denitrifiers. This semester's experiments continued with re-examining nitrogen gas production by the isolates to confirm our results.

◆ 65 ◆

Solving the Bi-Equation

Timothy McAlister, Psychology (2012), Provost Fellowship
Faculty Mentor: Dr. Anthony Burrow, Cornell University

Alfred Kinsey (1942) theorized that sexual orientation existed on a 6 point continuum from 0=completely heterosexual to 6=completely homosexual. However, empirical research has only focused on the two extremes of the continuum- completely heterosexual and completely homosexual. Little information has been collected about individuals that would exist at other points on this continuum by empirical research. 220 participants, between the age of 18-25, responded on an online advertisement on complete a survey on sexual behavior and connected to others, as well as connectedness to major institutions. Participants were given the option to identify as completely heterosexual, mostly heterosexual, bisexual, mostly homosexual, and completely homosexual. Participants who were willing to provide more information about their answers could provide an email to participant in an extended response follow up interview. Mostly homosexual participants indicated that they have a strong desire to have a sexual relationship with a member of the opposite sex without a romantic relationship; while mostly heterosexual participants indicated that they have a strong desire to have a sexual relationship with a member of the same sex without a romantic relationship. Bisexual participants indicated a desire to have a sexual relationship and romantic relationship with both sexes equally. Results also show that completely homosexual participants have similar feelings of overall well-being and connectedness at completely heterosexual participants. These results indicate that stigmas around homosexuality in society are beginning to disappear, and it is important to study sexuality across the continuum because there are significant differences that are left noticed by only focusing on completely heterosexual and completely homosexual individuals.

◆ 66 ◆

In Vivo Imaging of Retinal Dendritic Bipolar Cell Dynamics Within Zebrafish

Jonathan Medernach, Biology (2012), Biology Summer Research Fellowship
Faculty Mentor: Dr. Eric Schroeter, Biology

To better comprehend how bipolar cells function and develop we looked at the dendritic arbors of bipolar cells and their interactions with cone photoreceptors in vivo using confocal microscopy. Using TG (*nyx:G4V16, UAS:MYFP*)Q16 transgenic zebrafish we are able to visualize bipolar cells while simultaneously using an ultraviolet light cone photoreceptor promoter (*SWS1:MCFP*) to label cone photoreceptors. This concurrent labeling allows us to observe these specific cells as they differentiate, while they form interactions, and their responses to regeneration when one cell type is ablated. We hypothesize that bipolar cell dendrites make their connections with photoreceptors using a growth and remodeling method, where bipolar cells make and break contacts with photoreceptors until the correct contacts are established. Our observations present the first in vivo visualization of bipolar dendritic development and behavior in a vertebrate retina.

◆ 67 ◆

Linkages Between Teachers Depressive Symptoms and Children's Executive Functioning and Attention/Impulse Control

Sophie A. Mir, Psychology and Biology (2012), Provost Fellow

Sarah Pekoc, Psychology (2013)

Faculty Mentor: Christine Li-Grining, Psychology

Parents depression has been negatively associated with childrens self-regulation. Therefore, it is not surprising that teachers stressors are negatively linked to classroom quality, which predicts childrens' self-regulation. Little research has examined the relation between teachers stressors and childrens' self-regulation. This study investigates the relation between teachers depressive symptoms and preschoolers attention/impulse control and executive functioning, which are higher-order cognitive processes that are involved in the regulation of attention, behavior, and emotions. Data were drawn from the Seeds for School Success Project. Information was collected on preschoolers (n = 73-83) self-regulation through direct assessments and assessor reports. Teachers reported on their own characteristics. Results from regression models suggest that children with less executive functioning had teachers with more experience. It could be that children with less self-regulation are intentionally placed with teachers who are more experienced. Future studies should further investigate preschoolers self-regulation in the context of classrooms.

◆ 68 ◆

Personality and Relationships

Jaclyn Moloney, Psychology (2012), Provost Fellowship

Faculty Mentor: Dr. Tracy DeHart, Psychology

Research has shown that narcissism is linked to negative relationship outcomes. Narcissists look to their partner for self-enhancement and power while showing lower commitment and a game-playing love style (Campbell, Foster, & Finkel, 2002). Previous research has only looked at narcissists explicit evaluations of the partner. The current study examines the implicit evaluations of a romantic partner by those higher in narcissism. We predict that after rejection those higher in narcissism will implicitly evaluate their partners more negatively than people lower in narcissism and compared to those in the control condition. The current research will attempt to provide insight into how to improve relationship outcomes.

◆ 69 ◆

Maternal Influences on Youth Coping: The Moderating Role of Youth Gender

Jessie Montes de Oca, Psychology (2012), Research Mentoring Program

Mentors: Corinn Elmore, Psychology and Dr. Noni Gaylord-Harden, Psychology

The family provides the primary context in which children acquire ways of coping with stress (Compas, Worsham, & Ey, 1992). Kliewer and colleagues (1996) proposed three parental influences on youth coping: socialization of coping, parental support, and parental modeling of coping. Research with African-American youth has shown that the influence of maternal-support on youth coping varies by youth gender. The current study examined the influence of socialization of coping, modeling of coping, and maternal-support on youth coping, and youth gender as a moderator of these associations. Participants were 87 African American youth (58.8% female; mean age = 11.8) and their mothers. Results showed that youth coping strategies varied based on parenting style and youth gender. Results are discussed in terms of the implications of gender on parents socialization of childrens coping behavior.

◆ 70 ◆

Rate of Nitrite, Nitrous Oxide, and Nitrogen Gas Production in C. Pauculus

Jennifer Obrzydowski, Biology (2013), Mulcahy Scholars Program

Faculty Mentor: Dr. Domenic Castignetti, Biology

C. pauculus is a heterotrophic nitrifier and denitrifier. As a heterotrophic denitrifier, it may release harmful intermediates such as nitrous oxide (N₂O). This preliminary investigation was performed to monitor NO₂⁻, N₂, and N₂O production of *C. pauculus* in a pure oxygen environment. The goal of this study is to determine at which growth points, and under what environmental conditions, *C. pauculus* produces N₂ and N₂O. Four glass vials were filled with 5mL *C. pauculus* cells then sealed sterily. Controls were boiled for five minutes to ensure cell death. The vials were flooded with 100% O₂ and pyruvic oxime, the carbon source, was then added. Experimental replicates produced miniscule, yet visibly greater amounts of N₂. A second peak, presumably N₂O or CO₂, also appeared in the experimental replicates. NO₂⁻ production peaked then gradually decreased in the experimental replicates. Controls showed miniscule gas and NO₂⁻ production. The *C. pauculus* may thus be making N₂ as it heterotrophically nitrifies.

◆ 71 ◆

Foster Youth Aging Out of the Child Welfare System

Kasia Opalacz, Social Work and Criminal Justice (2012), Provost Fellowship

Faculty Mentor: Dr. Julia Pryce, Social Work

This research analyzed the second wave of qualitative data collected from 26 young adults as they age out of the foster care system. This project followed young adults across a life course as a means of learning more about the ways by which these young adults navigate this stage of life. There are many challenges that come along with this unique process, and these youth are very much at risk. Through the analysis of qualitative data using NVIVO qualitative software, analysis examined numerous factors, including the role of social networks and the ways by which such relationships among these youth influence adult outcomes.

◆ 72 ◆

Lexical Access of Memory Representations of Words in the Context of the Split-Fovea Model

Marylin Palackel, Biology (2012), Provost Fellowship

Faculty Mentor: Dr. Anne Sutter, Psychology

How important is the order of the internal letters of a word in recognizing the word? Stimuli consisted of common English words and non-words created by transposing two adjacent internal letters of a word. Participants decided as quickly and accurately as possible whether or not the stimulus was a word or not. Reaction times were longer and error rates higher when the letter transpositions occurred on the same side of the fixation point (within a cerebral hemisphere) than when the transposition occurred across the fixation point (across cerebral hemispheres.) These results have implications for theories of visual word recognition, many (but not all) of which assume strict positional encoding of letters during the recognition process.

◆ 73 ◆

Characterizing a BSA based Photodynamic Therapy Agent

Marco Palomo, Biochemistry (2013), Mulcahy Scholars Program

Faculty Mentor: Dr. Ken Olsen, Chemistry

Photodynamic therapy (PDT) relies on the ability of photosensitizers to use light and excite oxygen to a reactive oxygen species (ROS). This ROS can oxidatively damage the cancer cells and cause death. My project involves characterizing a PDT agent that uses chlorin e6 (Ce6) as a photosensitizer, folate (FA) as a targeting moiety, and either bovine serum albumin (BSA) or hemoglobin (Hb) as a protein base. Using heme extraction procedures we were able to quantify the amount of covalently bound Ce6 and FA on the PDT agent. Singlet oxygen sensor green experiments provided quantification data of

ROS yields. Our results point to the stability and ability of our agent to produce ROS. Further experiments are being done to characterize Hb based agents and to show a proof of principle in cell cultures. By characterizing and testing this novel PDT agent, we hope to propose a less invasive cancer therapy technique.

◆ 74 ◆

Hydrodynamic Simulations of Density Inversion in Granular Layers

Joshua Panfil, Theoretical Physics and Applied Mathematics (2013)

Veronica Policht, Biophysics and Mathematics (2012)

Faculty Mentor: Dr. Jon Bougie, Physics

Granular hydrodynamics studies the flow, movement, and general behavior of grains, i.e. collections of roughly spherical macroscopic particles. By using a continuum simulation based upon three-dimensional, time-dependent forms of hydrodynamic conservation equations, we are able to study the nature of density inversion. Density inversion is observed when there exist two distinct granular layers characterized by their density; these layers consist of a very low density portion of grains near the plate of oscillation and below a high density portion of grains [1]. In our work, we have closely followed the methodology of time-independent simulations performed by Lan, et al. and their subsequent discussion of density inversion, suggesting that density inversion is dependent upon a relationship between shaking-frequency and amplitude - or the shaking strength S [2]. In order to characterize density inversion we have employed our continuum based computer program to run simulations for several fixed values of S wherein the shaking frequency and amplitude vary. These simulations have shown that the time-dependence of the density inversion is related to its shaking frequency; while density inversion occurs only periodically for lower shaking frequencies, higher frequencies exhibit nearly steady-state density inversion. Additionally, we have observed what appears to be a relationship between the shaking frequency and the height of the layer of greatest density for a given S value.

◆ 75 ◆

The Role of Behavioral Motivation in Determining Political Ideology

Nirav Patel, Psychology (2013), Provost Fellowship

Mentors: Dr. Robert Morrison, Psychology and Dane Wendell, Graduate Research Assistant

Political scientists have traditionally focused on the environmental factors that shape the formation of political attitudes. The current project is a first look at how behavioral motivation tendencies may influence the political attitudes that a person can hold. Our team sent a survey to 1100 Loyola staff which was designed to measure behavioral motivation, political ideology and attitudes. We use Gray's Behavioral Inhibition and Behavioral Approach Systems (BIS/BAS) to link political attitudes with approach and avoidance tendencies. Through the analysis of our survey data we predict conservatives will exhibit high BIS, suggesting they have a predisposition to avoidance tendencies and inhibition, while liberals will display high BAS, suggesting they are predisposed to fun seeking behavior. We will also analyze the discrepancies between self-placement of political ideology and survey answers of individual political attitudes. This study is part of a larger project that seeks to demonstrate these correlations in the brain.

◆ 76 ◆

Analysis of the Histone Modifications on Human Chromosome 21p

Raj Patel, Biology (2012), Provost Fellowship

Faculty Mentor: Dr. Jeffrey Doering, Biology

Our lab is characterizing the structure of the short arm of human chromosome 21 (HC21p) to better understand the structure and function of heterochromatic genome regions. The specific region we are looking at on HC21p is the chAB4 duplicon, a 200 kb repetitive element found on the acrocentric chro-

mosome p arm. We are determining whether this region has histone modifications characteristic of euchromatin or heterochromatin. This analysis is being done by ChIP-qPCR using PCR primers that we designed to be specific for five regions within chAB4. The histone modifications on chAB4 are being characterized in HC21p in both normal and transformed cell lines. Initial results indicate that chAB4 has both euchromatic and heterochromatic regions in transformed cells. This information could be used in the identification of cancerous cells and to help explain the role that expression of repetitive sequences plays in creating the transformed phenotype.

◆ 77 ◆

Depression as a Moderating Role of Ethnic Identity Among African American Youth Exposed to Violence In Low Income Urban Environments

Andrew Perrotte, Psychology (2014)

Joshua Terry, Psychology (2014)

Faculty Mentor: Dr. Maryse Richards, Psychology

Exposure to community violence victimization is a common experience for African American youth living in innercity neighborhoods, linked to outcomes like depression (Buka et al., 2001; Fowler et al., 2009). This research examines the longitudinal effects of ethnic identity as a moderator on the relationship between exposure to violence and depression among a sample of innercity African American adolescents. A sample of 249 African American students from six public schools in low-income Chicago neighborhoods participated in a longitudinal study examining youth's exposure to violence, from 7th to 8th grade. Ethnic identity was measured using a subscale from the Multigroup Ethnic Identity Measure (Phinney, 1992). Depression was measured with the Children's Depression Inventory (Kovacs, 1986). Exposure to violence was measured with an adaptation of My Exposure to Violence Interview (Buka et al., 1997). A regression analysis revealed significant main effects of ethnic identity and victimization for males, but not females.

◆ 78 ◆

The Chilean Economy: Challenges and Opportunities in Chilean Growth and Development

Julia Philips-Roth, Economics and Mathematics (2013)

Faculty Mentorx: Dr. Marc Hayford, Economics and Dr. Mine Cinar, Economics

The purpose of this investigation is to analyze the strengths and weaknesses in Chile's social, political and economic institutions and identify opportunities for growth and development. A summary of Chile's history and current development statistics collected from the International Monetary Fund, World Bank and United Nations Development Programme highlight the developmental weaknesses that hitherto have stalled the country's progress. Forecasting tools, such as the Solow neoclassical regression, identify what type of investment is best suited for the Chilean economy. Finally, an overview of Chile's three-gap model provides a frame for the economic stability of Chile's political and financial institutions. Based on these indicators, two aspects of the economy surface as potential investment opportunities: the energy sector and education. This study suggests that strategic public policy decisions could propel Chilean development and that investors should not overlook Chile among emerging markets, despite its small size in comparison with the BRIC countries.

◆ 79 ◆

Litter Accumulation in Urban Freshwater Ecosystems

Adam Pink, Biology (2013), Center for Urban Environmental Research and Policy Fellow

Faculty Mentor: Dr. Timothy Hoellein, Biology

Marine litter accumulation is a conservation concern. Freshwater ecosystems, especially urban environments, may accumulate litter, but this has not been quantified. We measured litter accrual in benthic

and riparian zones in the Chicago River and Lake Michigan beaches. We visited sites 3 times from 2011-2012 to remove all litter from 70-100 m reaches. Items were weighed and surface area measured. We used ANOVA to compare the total abundance and major categories among ecosystems. Finally, we used data from Atlantic Ocean beaches to compare freshwater and marine litter. River locations had the highest mass, area, and abundance relative to the riparian zone and beaches. Plastic and paper were identical among sites and glass was more abundant in the river. While marine sites had slightly higher total litter than freshwaters, litter composition was similar between. In general, litter in freshwaters comes from recreational use. Effective disposal and education could reduce its abundance.

◆ 80 ◆

What is the Relationship between Vitamin D and Calcium Serum Levels and Cardiovascular Risk Factors in Women with Type 2 Diabetes?

Kara Podjasek, Nursing (2014), Provost Fellowship

Faculty Mentors: Dr. Sue Penckofer, Nursing and Dr. Mary Byrn, Nursing

Women with type 2 diabetes have the greatest risk for cardiovascular disease. Low levels of vitamin D have been associated with diabetes, obesity, hypertension, smoking, inflammation, and heart disease, and lower calcium levels have been associated with cardiovascular disease. Additionally, high serum parathyroid hormone has been associated with increased cardiac risk. The relationship between cardiovascular risk factors and serum and dietary levels of vitamin D and calcium in type 2 diabetic women has not been reported. This descriptive exploratory study examined the relationship between vitamin D and calcium (serum and self report) and cardiovascular risk factors in type 2 diabetic women. Women (>18 years old) with type 2 diabetes (? 6 months) not taking any vitamin D supplements who were being screened for the Sunshine Study completed self-report questionnaire booklets that included health and dietary information. Additionally fasting serum labs were collected for vitamin D, calcium, PTH, cholesterol, hemoglobin A1c (HbA1c), and c-reactive protein (CRP). The data suggested that these women had severely low dietary intake of calcium and vitamin D, according to nutrition guidelines. Furthermore, data suggested that low serum vitamin D was significantly associated with increased weight ($p=.003$), high systolic BP ($p=.055$), greater total cholesterol ($p=.037$), and higher PTH ($p=.001$). Low serum calcium was significantly associated with increased weight ($p=.005$). Evidence suggests that women with type 2 diabetes should be educated regarding a diet high in calcium and vitamin D, or they should be educated about dietary supplements with calcium and vitamin D with their healthcare provider.

◆ 81 ◆

The Influence of Hard Clams, Mercenaria Mercenaria, on Sediment Nitrogen Cycling Across a Nutrient Gradient in Jamaica Bay, New York City

Steven Polaskey, Biology (2011)

Faculty Mentor: Dr. Timothy Hoellein, Biology

The eutrophic estuary of Jamaica Bay, New York City maintains significant populations of hard clams (*Mercenaria mercenaria*) due to harvesting restrictions. Infaunal clams may influence nitrogen (N) dynamics by redistributing N to the benthos via waste, or changing sediment redox conditions through burrowing. We predicted clams would increase exchangeable ammonium and coupled nitrification-denitrification. Results showed positive correlations between organic matter and exchangeable ammonium, between exchangeable ammonium and nitrification, and between nitrification and denitrification potential. However, positive correlations occurred across all dates and sites, with no effect of clams. Environmental factors which drive high pelagic production and sediment processing of organic matter and N are more important controls on N dynamics than the influence of clam feeding and burrowing across this eutrophic estuary. In general, bivalves influence on sediment N dynamics may be reduced in eutrophic environments with high primary production and N loads.

◆ 82 ◆

Functionalization and Growth Of Rubrene Single Crystals

Srividya Prasad, Chemistry (2012), Carbon Scholar

Faculty Mentors: Dr. Jacob Ciszek, Chemistry and Dr. Douglas Natelson, Rice University

Organic semiconductors are an emerging class of materials that promises to revolutionize electronics and computing, especially devices such as light-emitting diodes (OLEDs) and field-effect transistors (OFETs). Of particular interest are polyaromatic compounds such as tetracene and rubrene; recent studies demonstrate that applying a self-assembled monolayer (SAM) onto a crystalline rubrene surface dramatically increases current conductivity. However, the surface chemistry of rubrene is not well understood. Functionalizing the surfaces of homogenous tetracene and rubrene single crystals with the well-studied, versatile Diels-Alder reaction provides a means to better grasp how SAMs improve conductivity. We built a horizontal, multi-zone quartz furnace to fabricate tetracene and rubrene single crystals via physical vapor growth. By adjusting their respective temperature gradients (including source temperature, deposition temperature, and growth time), the size and purity of these crystals is optimized. We studied crystal face adsorption and monolayer coverage of a fluorescent dye on these crystals through confocal fluorescence microscopy.

◆ 83 ◆

The Role of Due Process: A Comparative Analysis of the Legal Rights Provided by Ghana's Constitution

Alyssa Pronley, Political Science and Journalism (2012), Rudis Fellowship

Faculty Mentor: Michael Walsh J.D., Political Science

Constitutions lay out the fundamental rights of citizens, determine the standard administration of the law, and establish the legal rights of the accused and the trial systems that determine guilt, innocence, and punishment. The due process rights guaranteed by the Constitution of Ghana both differ from and resemble the rights provided by the United States Constitution. The most recent version of the Ghanaian Constitution was signed in 1992; however, the government has considered rewriting it in recent years. The changes in the constitution could affect due process legal rights guaranteed to citizens. This research sheds light on the always developing constitutional rights of Ghana. It also supports a better understanding of the origins and workings of American citizens' rights. The fact that due process rights are constantly evolving even once the document is finalized plays a role in the way the Ghanaian and United States Constitutions relate to each other.

◆ 84 ◆

Coffee Composting Study

Leslie Proudfoot, Political Science and Environmental Studies (2012), Provost Fellowship

Faculty Mentor: Lane Vail, M.S., Research Associate, CUERP

Composting fruit and vegetable (food) waste is a way to improve sustainability on a university campus, by closing the loop between food consumption and garden growth. The purpose of this study is to investigate the effect of using coffee grounds as a compost amendment on the overall quality of compost. In this study, food waste and coffee grounds were collected for five weeks from Loyola's Ignatius House kitchen and composted in bins maintained under three treatments: 1) all food waste, 2) half food waste and half coffee grounds, and 3) all coffee grounds. Throughout the experiment compost was maintained by frequently turning and kept moist. In October, samples were sent to Midwest Laboratories, Inc. for analysis, and initial results suggest that coffee alters the overall quality of compost.

◆ 85 ◆

Viral Evolution of Genomic Composition

Krista Reiling, Biology (2013), Carbon Scholar

Faculty Mentors: Dr. Catherine Putonti, Biology and Computer Science, Dr. Dali Liu, Chemistry

Because viruses with smaller genomes lack tRNAs, they rely on their hosts for protein synthesis and often utilize codons preferred by their host species to increase translational efficiency. Previous work conducted in the Putonti laboratory shows that attenuated viruses are under strong selection to incorporate more host-preferred codons. The proposed project will build upon prior work, conducting long-term evolution experiments with the attenuated viral strain under new selection conditions likely giving rise to different adaptive trajectories. Employing molecular and bioinformatic techniques, phenotypic and genotypic changes in evolved strains will be investigated. The project can provide a better understanding of the adaptations in selection conditions and can be applied to other viral pathogens.

◆ 86 ◆

A Bioinformatic Approach to Identifying CRISPR-Associated Immune Defense

Zachary Romer, Bioinformatics (2012), Mulcahy Scholars Program and Provost Fellow

Faculty Mentor: Dr. Catherine Putonti, Biology and Computer Science

Clustered regularly interspaced short palindromic repeats or CRISPRs have recently been identified in half of all bacterial and nearly all archaeal genomic sequences. CRISPRs provide the bacteria/archaea with immunity against viruses and plasmids, recognizing foreign DNAs which match spacer sequences located within the CRISPR loci. These 26- to 72 base pair spacer sequences within the microbial genomes are identical to the corresponding phage or plasmid genomic sequence. Identifying the source of spacer sequences within the genomes of bacteria and archaea can provide insight into the individual microbe's resistance and prior exposure to particular bacteriophages and/or plasmids. Herein we present a new software tool which utilizes known virus genomes and our knowledge of the structure of CRISPR loci. Rather than target identification of the repetitive elements, our approach looks specifically for spacer sequences. This tool was developed with the specific purpose of identifying CRISPRs in unassembled metagenomic next-generation sequencing reads. Using this tool we examined both publicly available genomic sequences as well as metagenomic sequence collections.

◆ 87 ◆

Microfinance Business Models in Sub-Saharan Africa: Six Solutions to Global Poverty

Jacob Runkel, Accounting and English (2014), Provost Fellowship

Faculty Mentor: Dr. Dan Vaillancourt, Philosophy

Microenterprises offer a powerful solution to ending world poverty and to instilling both initiative and long-term sustainability in the lives of millions of people. Defined by a socioeconomic past riddled with corruption, disease, and colonialism, sub-Saharan Africa posts anemic economic productivity (with a per capita gross domestic product of only \$2,744) and a poverty rate of 72.9 percent (2005), which equates to an impoverished population of roughly 590 million people. Despite these dark socioeconomic statistics, multiple non-governmental organizations (NGOs) like World Bicycle Relief and Women's Microfinance Initiative have cast a light of hope on this depressed African region by creating and putting in place microcredit and small loans that have exhibited great success.

◆ 88 ◆

A Profile of English Language Brokers in Chicago Area Elementary Schools

Margaret Rusch, Psychology (2012), Research Mentoring Program

Mentor: Vanessa Raschke, PhD student, Psychology

The cognitive benefits of bilingualism have been particularly recognized in bilingual language brokers (i.e., those who translate for non-English-speaking family members). Part of the current study examined the profiles of English/Spanish-speaking bilingual third and fourth graders, half of which were language brokers, with a monolingual comparison group. Language proficiency skills, usage, child demographics, socioeconomic status and translating frequencies were examined to see factors that may be contributing to children becoming family language brokers. Using data from parent surveys and surveys from the children themselves, differing profiles of the children were created. Variables such as parent's education level, home literacy environment, and birth order were analyzed in order to create these profiles. A majority of the children included in the study were born in the United States, and most are second or third generation, indicating that neither birth country nor generation status have an impact on broker status.

◆ 89 ◆

Gender Differences in Ethanol Preference After Adolescent Stress

Margaret Rusch, Psychology (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Louis Lucas, Biology

Adolescence is a sensitive time in development. We hypothesized that ethanol consumption and stress reactions would be different between male and females during this critical period. Male and female rats were stressed and given exposure to 6% ethanol solution. Either immediately after the exposure or following a 24 day delay period, a preference test was administered to determine which groups consumed more ethanol. Brains and blood were harvested to look for the neurotransmitter GABA and a blood stress hormone (CORT). Ethanol consumption was highest in females that experienced a delay before testing, possibly indicating withdrawal or anxiety. This confirmed a gender difference in consumption. Analysis of CORT showed that females in general had higher CORT levels than males, and males whose preference test immediately followed the exposure period had lower blood CORT levels than all other groups. GABA has been shown to reduce anxiety, so upon neurochemical analysis we expect to see the highest levels of GABA in the group with the lowest levels of stress, which were the males without a delay.

◆ 90 ◆

Phenothiazine Based Photosensitizers: A Possible Cure for Cancer

Shermin Sayani, Chemistry (2013), Provost Fellowship

Faculty Mentor: Dr. David Crumrine, Chemistry

Photodynamic therapy is a cancer treatment that involves the administration of a photosensitizer that localizes in tumor cells. When the photosensitizer is exposed to a specific wavelength of light in the presence of ground state oxygen, it produces activated oxygen that kills nearby cells. Currently, most photosensitizers tested collect with some selectivity in tumors cells, but they also amass to some degree in normal tissues. A possible way to increase selectivity involves the use of heavily substituted photosensitizing agents. The synthesis of such an agent is the objective of this experiment. This synthesized photosensitizer will attach to a linker group that will together attack folic acid, which is overexpressed in cancer cells and the targeting group. A reaction scheme to synthesize the substituted photosensitizer has been developed and is currently in progress.

◆ 91 ◆

Using Computational and Experimental Tools to Discover New Genetic Elements in the Clover Genome

Alexander Sbrocchi, Biology (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Howard Laten, Biology

Retrotransposons constitute the majority of the protein coding regions of most eukaryotic genomes. Most genomes carry tens to thousands of retrotransposon copies derived from dozens of distinct fami-

lies, but most, if not all of these copies are non-functional and contain disabling mutations, including large numbers of indels. Regions rich in these elements have, until recently, been ignored in all but the most complete genome sequencing projects. Many repetitive DNA families, such as those in the genus *Trifolium*, can be pieced together from hundreds of short overlapping DNA sequence fragments that exist on separate clones that have been deposited in Genbank databases containing BAC-end sequences. The results are hypothetical sequences that encode fully functional elements with in tact open reading frames and other conserved features. These sequences provide the basis for when, during the history of native and/or synthetic allopolyploid *Trifolium*, retrotransposon insertion occurred.

◆ 92 ◆

Optimized Thermal Conditions for N3-CTV and Phenazine Formation

Carlene Schleisman, Biochemistry (2012), Provost Fellowship
Faculty Mentor: Dr. Daniel Becker, Chemistry

Cyclotrimeratrylene (CTV) is a bowl-shaped molecular scaffold that is commonly employed in supramolecular chemistry for host-guest chemistry and biomimetic molecular recognition. As part of our research program directed toward the synthesis and application of apex-modified CTV derivatives we recently reported the synthesis of the new triaza orthocyclophane N3-CTV. Two mechanistically different approaches were examined in order to obtain the desired bowl-shaped molecule. The classic palladium-catalyzed Buchwald-Hartwig N-arylation successfully afforded N3-CTV, and we have optimized conditions for the successful closure to the 9-membered ring. Attempted closure under benzyne conditions gave an unexpected phenazine with an alkyl-shift, and we have performed mechanistic studies to elucidate the mechanism of this rearrangement which will be presented as well.

◆ 93 ◆

Stress Response as Survival Mechanism for the Human Malaria Parasite during Mosquito Transmission

Ashley Schon, Molecular Biology (2013), Carbon Scholar
Faculty Mentors: Dr. Stefan Kanzok, Biology and Dr. Catherine Putonti, Biology and Computer Science

The WHO estimates that 225 million people are infected with Malaria each year. The cause of this vector borne disease is the protozoan parasite Plasmodium. The parasite is transmitted between humans by Anopheles mosquitoes. However, the biology of this human pathogen during its passage through the insect is not well understood. Our research focuses on ways to prevent transmission by the mosquito and thus infection of humans. Inside the mosquito, Plasmodium elicits a stress response to a void digestion in the midgut. Our lab has been investigating this response using a mouse parasite. I will be studying the human pathogen Plasmodium falciparum. Using a combination of experimental and computational techniques I will study the parasite genes involved in oxidative defense. This investigation serves to learn more about the adaptive responses of Plasmodium to the mosquito environment.

◆ 94 ◆

The Micro-Distribution of Algal Species Within Stream Biofilms and the Implications Between Algal/Bacterial Interactions.

Adam Senese, Environmental Studies (2013), Mulcahy Scholars Program
Faculty Mentor: Dr. Christopher G. Peterson, Environmental Science

The interactions between certain algae and bacteria may create ideal conditions for chemical processes, such as denitrification, which converts a form of nitrogen that is a pollutant (NO₃) into one that is not (N₂). We hypothesize that small-scale heterogeneity in distribution of algal populations within developed biofilms will be linked to heterogeneity in genotypes of denitrifying bacteria and that these associations may influence rates of denitrification. After growing biofilms on unglazed ceramic tiles in partitioned

among three artificial recirculating streams, we selected two tiles from each. Biofilms on each of these tiles were sampled from nine points (2.8 cm²) on each tile to determine the varying distribution of certain types of green algae species. Those samples were then compared to the full tile sample to assess the degree of heterogeneity in spatial distribution of different species populations.

◆ 95 ◆

Determination of Oxygen Pathways in R-State Hemoglobin Bound to Bisphosphoglycerate

Shaan Setia, Biology (2012), Mulcahy Scholars Program

Faculty Mentor: Dr. Ken Olsen, Chemistry

2,3- Bisphosphoglycerate (BPG) is an allosteric effector of human hemoglobin. Presence of BPG will decrease hemoglobin's affinity to oxygen. Our research investigates the interaction between BPG and hemoglobin and refutes claims that BPG does not bind to R-state hemoglobin. We have already investigated the interaction energies between different states of hemoglobin and BPG. As expected, the interaction energies between BPG and hemoglobin were much higher in the T-state conformer. Additionally, our research will determine the effect of BPG on oxygen binding pathways. During simulations, oxygen was able to find its way into the binding pockets of R-state hemoglobin within 10 nanoseconds. T-state simulations showed fewer oxygen binding events. Thus, the simulations showed that the changes in protein dynamics may be responsible for the effects of BPG on oxygen binding.

◆ 96 ◆

United States Military and Monetary Aid to El Salvador: The Civil War Years and Modern Policy

Jillian Severinski, International Studies (2012)

Faculty Mentor: Dr. Gunes Tezcur, Political Science

Beginning in 1934, the United States government has taken an active role in supporting repressive policies and political violence in El Salvador. This relationship strengthened throughout the 1980s and 1990s as the United States provided technical and financial assistance to the Salvadoran government, military and police forces during the civil war, resulting in a multitude of human rights violations. History itself is repeating today, as monetary and military aid relations between the United States and El Salvador are reemerging to address gang violence in El Salvador with the expected result of violence and public insecurity. Using scholarly articles, government documents, and research from non-government organizations, this paper hopes to make connections between past and present human rights abuses committed by the Salvadoran government with aid assistance from the United States.

◆ 97 ◆

Rescuing Mesorhizobium Loti Mutants To Find Desferrioxamine B Producing Genes

Jhanvi Shah, Biology (2014), Mulcahy Scholars Program

Faculty Mentors: Dr. Domenic Castignetti, Biology and Monica Micek, Biology

Mesorhizobium loti is a gram-negative soil bacteria that undergoes nitrogen-fixing symbiosis with leguminous plants. This wild type M. loti readily uses desferrioxamine B (DFB), a type of siderophore, as its sole source of carbon. Siderophores are small, high-affinity iron compounds. In low iron environments, microbes release these siderophores to search for iron that can be taken up by these microbes through active transport mechanisms. We inserted a transposon, Tn5:OT182, into wild type M. loti. The insertion of Tn5 disrupted the growth of DFB production in the wild type M. loti (which created mutants 42 and 34). Therefore mutants 42 and 34 are unable to use DFB as their sole source of carbon. My overall goal is to determine the genes that were knocked out in the mutants. That is, I want to know where Tn5 has inserted itself into the mutants which has caused the disruption of DFB metabolism.

◆ 98 ◆

Organization of Satellite I on HC21p

Mauli Shah, Biology (2012), Mulcahy Scholars Program and Biology Summer Research Fellowship
Faculty Mentor: Dr. Jeffrey Doering, Biology

Chromosome 21 is an acrocentric chromosome whose short (p) arm is comprised of clusters of tandemly repetitive sequences known as satellite sequences. One family of classical satellite DNA is satellite I, located at the distal end of the p arm of chromosome 21. My goal is to characterize the distal satellite I region and create a chromosome 21 specific satellite marker through repeated PCR. This sequence can then be used as a diagnostic tool in detecting the presence of an extra copy of chromosome 21, characteristic of Down syndrome. Finally, distal satellite I will be studied at the level of the chromatin histone modifications through ChIP and qPCR to identify changes that may control the expression of satellite I in normal and malignant cells.

◆ 99 ◆

The Relationship between External Stressors and Internal Satisfaction with Life in Urban, Low-Income African American Youth

Tameer Siddiqui, Psychology (2013)

Faculty Mentors: Dr. Maryse Richards, Psychology and Edna Romero

This paper analyzes the relationship between neighborhood stressors in underserved communities and internal satisfaction with life in approximately 100 urban, low-income African American 7th and 8th grade students. Financial stress may result in mental health problems (depression, bipolar disorder, and anxiety), physical health problems (excessive weight gain/loss, hypertension, and heart attack), negative impact on occupational productivity, and interpersonal relationships. There is growing empirical evidence that low-income urban youth are at heightened risk for stressful life experiences, in general, and chronic uncontrollable stressors in particular (Allison et al., 1999). Poverty brings with it a range of economic stressors including evictions, dilapidated housing, noise, crowding, environmental toxins, inadequate health care, ineffective schools, domestic violence, and divorce. Beyond the effects of poverty, in general, urban poverty, in particular, is associated with heightened exposure to community violence (Henrich, Schwab-Stone, Fant, Jones, & Ruchkin, 2004). The crushing poverty and the violence the neighborhoods breed may or may not be the root cause of an individual's dissatisfaction with life. The current study will examine the correlation between perceived neighborhood disorder, using the Neighborhood Environmental Survey Children's Perception (Mason, C.A., et al., 1994) (a measure of self-reported perceptions of the physical environment), and individual well-being (self-reported thoughts and behaviors) using the Satisfaction with Life scale (Diener, E, et al., 1985). Data were collected from public and catholic schools in Chicago. By assessing the relationship between neighborhood stressors and an individual's satisfaction with life, we can better understand the power of neighborhood poverty to affect an important marker of well-being.

◆ 100 ◆

Characterizing Indel Evolution in Bird Genomes

Kamil Slowikowski, Bioinformatics (Dec 2011)

Ted Vlahos, Bioinformatics and Economics (2012), Mulcahy Scholars Program and Provost Fellowship
Faculty Mentor: Dr. Sushma Reddy, Biology

Birds are the most diverse group of terrestrial vertebrates and better knowledge of their genomes will help to understand how vertebrates have evolved. DNA insertion and deletion mutations, indels, are significant contributors to the evolution of coding and non-coding DNA sequences. The main objective of this project was to acquire a greater understanding of the mechanisms pertaining to the evolution of indel mutations in birds. Using comparative genomic analysis, a data set containing approximately 50

kilobases of aligned nuclear DNA sequences from 19 independent loci for 200 species, representing the full extent of the diversity of modern birds. We examined the prevalence of indels of various size, the correlation of indels with base composition, and examined possible deletion biases across the genomic regions. We have additionally developed a user interface algorithm that produces these indel statistics and graphical images for any sequence file.

◆ 101 ◆

Fostering Cross Cultural Relationships Between Newly Arriving Iraqi Refugees and American Volunteers

Sarah Smith, International Studies (2012), Provost Fellowship
Faculty Mentor: Joyce Epolito, Fine Arts

Despite the growing numbers of Iraqi refugees arriving since the passage of the 2007 Refugee Crisis in Iraq Act, agencies in Chicago have very few resources dedicated specifically to the needs of this group. Due in part to their high levels of education and familiarity with living in modern, urban settings, refugees from Iraq present a completely different set of needs than the other refugee communities that have settled in Chicago. Refugee service providers expressed frustration that the methods that worked to engage other refugee groups were not working with Iraqis. This study recognizes that hospitality, generosity and the ritual of sharing food are essential threads that connect the Iraqi refugee community. Through interviews with Iraqi refugees, this project documents recipes and stories that demonstrate the practical, as well as the honored place of food in Iraqi culture. This collection will be published as a bilingual book that will be used to help to facilitate cross-cultural exchange between Iraqi refugees and American volunteers. This food-oriented tool will help ease the transition for Iraqis by encouraging American volunteers to be curious about their new Iraqi friends' foods and cultures and participate in age-old traditions of hospitality and generosity.

◆ 102 ◆

Applying Organization Theory to NGO Networks: The Case of the Global Coalition to Protect Education from Attack

Erin Summerlee, International Studies (2012), Provost Fellowship
Faculty Mentor: Dr. Alexandru Grigorescu, Political Science

The literature on international non-governmental organizations (NGOs) has emphasized the significance of the advocacy networks such organizations form, and their important informational role. The study asks which NGOs are more likely to be at the center of the information-sharing networks and which ones are likely to be at their periphery. Based on expectations derived from the organization theory literature I develop a set of hypotheses regarding the relevance of financial resources, expertise, prestige, and bureaucratic culture on the degree to which NGOs will collaborate. The study tests these hypotheses on the collaborative network formed between approximately eighty NGOs and United Nations (UN) agencies engaged in the Global Coalition to Protect Education from Attack. The research is based on in-person and phone interviews with officials from NGOs and UN agencies involved in the network. The interviews and data reflecting NGO structure and availability of resources are used to test the hypotheses.

◆ 103 ◆

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

Brian Sweis, Biology and Psychology (2012), Carbon Scholar
Ekamjeet Dhillon, Biology, Psychology (2014)
Kevin Veverka, Biology (2014)
Mentors: Dr. Louis Lucas, Biology and Dr. Robert Morrison, Psychology

Repeated exposure to stress generally impairs memory in rodents. However, the extent to which memory is impaired is often variable. Stress is a subjective experience and differences between individuals and their coping-mechanisms determine the impact and severity of a stressor. Individual differences in particular behaviors, including anxiety, may reveal underlying neurobiological mechanisms that could be driving such differences in stress resiliency and may serve as early indicators of susceptibility to stress. In this experiment, rats were appetitively trained in a spatial memory task before undergoing 10 consecutive days of immobilization stress. Memory retention was tested post-stress, after which brain tissues and blood samples were collected for neurochemical analyses. Characterizing behaviors such as anxiety were monitored longitudinally throughout the experiment. Neurochemical markers including Neuropeptide Y a key player in stress and anxiety pathways “ may be targets for pharmacological interventions that can serve to ameliorate the negative effects of stress on memory.

◆ 104 ◆

Time Course of Inhibitory Control During Analogical Reasoning: An Event-Related Potential Approach

Brian Sweis, Biology and Psychology (2012)

Krishna L. Bharani, Biology and Psychology (2011)

Mentor: Dr. Robert Morrison, Psychology

Inhibitory control is an important aspect of analogical reasoning critically dependent on the prefrontal cortex. To explore the time course of inhibitory control during analogy, we developed a paradigm for use with scalp electroencephalography (EEG). On each trial, participants were cued to solve an analogy based on one of three perceptual relations present in each stimuli. On some trials, one of the uncued relations was not congruent. Previous EEG studies have shown that working-memory span predicts the degree of inhibitory control, so we measured working-memory span in our participants. Our results indicate that increasing distracting information modulated the early N2 event-related potential (ERP), previously associated with inhibitory control. ERP results also suggest that individuals with high working-memory engage inhibitory control during analogy more than low-span participants. These findings suggest that process models of analogy need to account for the role of inhibitory control in analogy processing.

◆ 105 ◆

Mutation Accumulation Within Viral Species

John Thompson, Biology (2013), Provost Fellowship

Faculty Mentor: Dr. Catherine Putonti, Biology and Computer Science

Viruses often have high frequencies of mutation during replication in an effort to more efficiently infect their host. These mutations can be the result of mutational or translational biases exerted by the host species. Separating these two influences, however, is a very complicated process. Using the DNA-based virus bacteriophage phiX174, we will investigate the mutational biases of two different virus populations, both adapted to high host availability. First, I will create well-adapted viral strains by growing phiX174 in na⁻ve host. Afterwards, mutation accumulation will be quantified by induced bottlenecks. The bottleneck effect, often experienced by viruses in nature, reduces genetic variation and increases genetic drift. This bottleneck effect will be compared to a control population not under any stress. I hypothesize that the strain undergoing bottlenecks will be less adapted than the control strain because of the decrease in diversity caused by genetic drift.

◆ 106 ◆

Characterizing the Potential of Great Lakes Wetland Invaders to Produce Biogas

Erin Throop, Biology (2012), Center for Urban Environmental Research & Policy Fellow

Mentors: Dr. Beth Lawrence, Biology and Dr. Nancy Tuchman, Biology

Invasive species spreading throughout the Great Lakes region alter wetland function and reduce native species diversity, necessitating wetland restoration. Traditional methods of controlling invasive species are both environmentally and economically costly, and are typically only short-term solutions. In order to work towards a more sustainable approach to wetland restoration, we propose the possibility of combining the mechanical harvest of invasive species biomass with anaerobic digestion to produce biogas, a renewable energy source. We have developed an experimental approach to test the capacity of common invasive species, to produce methane during anaerobic digestion to provide a baseline for the development of ecological and economic models evaluating the efficacy of this restoration approach. Our first trial compared the methane production potential of *Typha x glauca* and *Phragmites australis*; preliminary analysis suggests that *P. australis* yields significantly more biogas per unit biomass than *T. x glauca*, indicating its potential utility as a biofuel. We will also test the methane production potential of *Myriophyllum spicatum*, and relate biogas production rates to nutrient characteristics of the plant tissue (C, N, P). Our experimental methods can be used to analyze other invasive species as potential biofuels and will improve the sustainable management of our natural areas.

◆ 107 ◆

Expression of Putative Antioxidative Proteins in the Mosquito Stages of the Malaria Parasite Plasmodium Berghei

Benjamin Turturice, Biochemistry and Biology (2012)

Faculty Mentor: Dr. Stefan M Kanzok, Biology

Plasmodium spp. are the causative agent of Malaria. This protozoan parasite is transmitted between people by *Anopheles* mosquitoes. Taken up by the insect as part of a blood meal the parasite encounters an environment dramatically different from the human host. It is not well understood how the malaria parasite adapts to and develops under the hazardous conditions of the digesting blood meal. Using confocal microscopy we present the mosquito-stage specific expression and subcellular localization of four putative stress response proteins in the mouse malaria parasites *Plasmodium berghei*. All proteins under investigation belong to the thioredoxin superfamily: thioredoxin-1 (Trx-1), thioredoxin-dependent peroxiredoxin-1 (TPx-1), thioredoxin-dependent peroxiredoxin-2 (TPx-2) and 1-Cysteine peroxiredoxin (1-Cys Prx). In wild type ookinetes, Trx-1 and TPx-1 show ubiquitous expression in the predicted cytosolic localization. We found the 1-Cys prx is limited to the posterior end of the developing ookinete and TPx-2 was restricted to the mitochondrion. In TPx-1- ookinetes the localization of TPx-2 and Trx-1 remained unaffected, where as 1-Cys Prx was expressed through out the cytosol in higher concentrations than the wild type. Our findings give new insight into the protein expression and localization of three putative antioxidant proteins in the mosquito stages of the malaria parasite.

◆ 108 ◆

Construction of Model Alternative Waste Water Treatment System for Monitoring the Efficacy of Emerging Contaminant Removal

Benjamin Turturice, Biochemistry and Biology (2012), Center for Urban Environmental Research & Policy Fellow

Mentor: Lane Vail, M.S., Research Associate, CUERP

Traditional waste water treatment systems are designed for the removal of harmful pathogens from waste water, and typically do not target emerging contaminants (ECs) such as personal care products, industrial by products, and pharmaceutical metabolites. These ECs are generally found in the nanogram per liter concentrations in most effluents and can be stabilized by processes such as chlorination. Chronic exposure to low concentrations of ECs poses a potential human and environmental health hazard. Alternative waste water treatment systems, such as constructed wetlands and Living Machines[®], offer a potential tool for removal and/or degradation of ECs. A model alternative waste water treatment

system was constructed using the principles applied in other alternative waste water treatment systems such as multiple oxidative environments, greater biodiversity, mineralization, and flocculation. The system was constructed and monitored for the ability to reduce BOD5, Total Suspended Solids (TSS), Nitrate, Ammonium, and Orthophosphate in primary effluent samples obtained from Metropolitan Water Reclamation District of Greater Chicago over the span of four months. The system showed a reduction in all measures: BOD5, Total Suspended Solids (TSS), Nitrate, Ammonium, and Orthophosphate. The system can now be used in future studies for its ability to remove ECs such as Bisphenol-A and Azithromycin.

◆ 109 ◆

Seaweed Lie Algebras

John Versnel, Mathematics (2013), Provost Fellowship

Faculty Mentor: Dr. Giaquinto, Mathematics and Dr. Lauve, Mathematics

In our research, we study Seaweed Lie Algebras. Seaweed Lie algebras are families of square matrices that share a common seaweed-like shape. Our goal is to prove that the spectrum of all Seaweed Lie Algebras is made of consecutive integers. To do this we look at their functionals, which gives us an efficient way to find the spectrum. A functional is an operation, which assigns to each entry of a matrix an integer. We have introduced a new family of functionals that we can show are Frobenius. This first step is already a publishable result and shows promise of being a strong enough tool to accomplish our original goal.

◆ 110 ◆

Gender Differences in Affluent Parents' Future Academic and Career Goals for their Children

Kristin Walker, Psychology and Sociology (2013), Research Mentoring Program

Mentor: Lea Travers, PhD student, Psychology

Youth from high SES backgrounds report elevated adjustment problems (Csikszentmihalyi & Schneider, 2001; Luthar & Lantendresse, 2005a). One potential influence is parental pressure to achieve (Ablard & Parker, 1997). The current study seeks to understand parents' future academic/career goals for their children and how goals differ by child gender. Participants included parents of 10th grade students (n = 94; 84 mothers) recruited from three affluent high schools in the Northeast and Midwest. A coding scheme was created to describe parent goals in terms of performance-orientation (i.e., emphasizing achievement, prestige, academic/professional success) and fulfillment-orientation (i.e., emphasizing happiness, personal growth/development, life satisfaction). Findings will provide information regarding the amount and type of academic/career pressure placed on affluent adolescents, and how pressure may differ by gender. Given that parental pressure to achieve is often linked to adjustment problems in affluent adolescents, it is important to examine these factors.

◆ 111 ◆

Examining Variance in Morphological Characteristics of Scimitar and Tree Babblers (Timaliidae)

Julie Witkowski, Biology (2012)

Faculty Mentor: Dr. Sushma Reddy, Biology

Recent genetic studies on tropical Asian babblers (Timaliidae) have shown that among two closely-related genera (*Pomatorhinus* and *Stachyris*) short, thick-billed and a long, thin-billed morphology evolved multiple times. This study aims to understand how diversification and speciation took place within these groups. We examined the variation across several species of Timaliidae babblers using differences in morphological characteristics. In total we measured 28 species of babblers, consisting of 36 subspecies, and 1,835 individual specimens. We recorded various distance measurements using elec-

tronic calipers, and used two-dimensional digital images to determine beak curvature. Through analysis of the morphological data we aim to examine measurable differences within these groups of babblers to determine whether there are any patterns which correspond to the groups found in genetic studies.

◆ 112 ◆

NLRP3 Inflammasome

Teresa Yoon, Psychology (2013), Research Mentoring Program

Mentor: Zhenyu Zhong, PhD Student, Microbiology and Immunology

Liposomes, especially the charged ones, are promising immune adjuvant that are frequently used in vaccines against infectious diseases. Charged liposomes can greatly enhance the specific adaptive immunities against co-administered antigens. However, how the immune system initially recognizes liposomes remains largely unknown. Here, we report that the NLRP3 inflammasome in macrophages functions as an immune receptor that senses the presence of liposomes, which subsequently induce the secretion of a proinflammatory cytokine IL-1beta from macrophages. Interestingly, only charged liposomes, but not neutral ones, are capable of activating the NLRP3 inflammasome. IL-1beta secretion induced by charged liposomes requires the intact machinery of the NLRP3 inflammasome because macrophages deficient in NLRP3 inflammasome failed to respond to liposomes' stimulation. In conclusion, we identified a previously unknown immune receptor for charged liposomes which is critical for establishing a solid basis for using liposomes as immune adjuvants.



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