



ILLINOIS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

2010

Summer Research Opportunities Program



The Graduate College

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Welcome to the 2010 Summer Research Symposium. Committed to fostering a diverse and inclusive graduate community, the Graduate College at Illinois is proud to sponsor this annual symposium that showcases our equity and diversity programs along with the exceptional research talents of the next generation of scholars and leaders. Diversity among our graduate community is vital to ensure more voices in shaping transformative knowledge and creative expression at Illinois and beyond.

As in previous years, the Summer Research Symposium includes participants of two programs housed in the Graduate College: the Summer Research Opportunities Program (SROP) and the Summer Pre-doctoral Institute (SPI). SROP provides undergraduate students, who are interested in exploring graduate study and research in their majors, an opportunity to work with a faculty member on campus. Students spend the summer preparing for the G.R.E., developing skills that prepare them for competitive admission to graduate programs, and working with Illinois faculty mentors to conduct graduate-level research over a nine to ten-week period.

SPI provides incoming graduate students from populations underrepresented in graduate education at Illinois an opportunity to begin their graduate studies early. SPI places particular emphasis on preparing students to understand and to meet the expectations and rigors of graduate study. The summer experience pairs students with faculty in their respective programs, provides a preparatory statistics and methods course as well as seminars and workshops that sharpen their analytical skills and best acclimate them to the cultural of graduate school in general.

These programs are successful in large part because of the commitment and inspiration of faculty who serve as mentors. Their passion and generosity make achievement possible and we are deeply appreciative of their time and effort. While we could not accommodate the requests of all faculty who expressed interest in mentoring this year, we hope to work with them next year.

I would very much like to thank Jennifer Hamer, Associate Dean; Ave Alvarado, Director of Educational Equity Programs; Phoebe Lenear, Visiting Program Coordinator; and Susanne Garrison, support staff, for their leadership and dedication to make this event and the SROP and SPI programs possible. A special thank you is extended to our graduate student assistants and team leaders: Melissa Neely, Jamil Johnson, Daniel Wong and Myra Washington. We would like to also acknowledge Wanju Huang for her outstanding work as instructor for the Research Methods and Statistics Seminar Series, as well as her commitment to the goals of the SPI program.

Through collaboration with the Office of Minority Student Affairs, participants in the Ronald E. McNair Scholars programs are joining us for the first time this year. We are grateful for the opportunity to partner with the Office of Minority Student Affairs, and sincerely thank Priscilla Fortier, Celina Wu Trujillo, and the OMSA staff.

On behalf of the Graduate College, I'd like to thank you for joining us for the Summer Research Symposium. Your support for our programs and students is truly appreciated.

Sincerely,

Deba Dutta  
Dean of the Graduate College

## Symposium Schedule

9:30 a.m. - 10:30 a.m. **EBI/Crop Science (Room 403)**

Tahir Ibrahim: *Which Poplar Clone Produces the Most Biomass?* (McNair)

Juliette Morris: *Analysis of Miscanthus BAC and Fosmid End Sequences* (McNair)

Chanell Davis: *Making Big Corn Bigger: Genetic Variation at the TAS3 Loci* (McNair)

### **Kinesiology and Community Health (Room 404)**

Jilber Jerman: *Body Mass Index and Validity of Self-Reported Body Size among Mexican Young Adults* (McNair)

Kierra Barnett: *Efficacy of HIV Prevention Interventions Targeting Black Women* (McNair)

Higgins Durand: *Aging, Isometric Force Control: The Role of Feedback Modality and Effector* (McNair)

### **Communications (Room 405)**

Brittney Potier: *Unlocking Secrets in Dating Relationships* (McNair)

Erin Watley: *What Are the Effects that Small Group, Intercultural Discussion or Dialogue Programs Have on the Actions and Feelings of Undergraduate Students Regarding Issues of Culture and Diversity?* (SPI)

Jasmine Roberts: *Online News Media Representations of Race and Gender: The Case of Michelle Obama* (SPI)

### **Counseling Psychology (Room 406)**

Michelle Martinez: *The Paternal Influence on Daughters' Attitudes towards Sexual Harassment* (McNair)

Lilyana Ortega: *Victimization and Psychosocial Adjustment in Underrepresented Adolescents* (SPI)

Tyrone Rivers: *Bullying: A Comparative Study of Inner City and Suburban Youth* (SPI)

### **Anthropology/Ethnic Studies (Room 407)**

Rigoberto Robles: *Urban Scriptures: Mexican-American Graffiti Resistance in Chicago* (SROP)

Victoria Briones: *Gendered Violence on the U.S.-Mexico Border: Femicide in Ciudad Juárez* (McNair)

Sydney Stoudmire: *Faces/Voices/Histories: Legacies of Champaign's Historic African American Community* (McNair)

## **Educational Policy Studies (Room 210)**

Chanee Anderson: *African American Achievement in Predominantly White Institutions: The New Labor Movement* (SPI)

Christopher Barnes: *Concrete Roses: An Evaluation of Low Matriculation Rates among Black and Latino Students at the 7 City Colleges of Chicago* (SPI)

Kimberly Watson: *Show Me the Money: Teachers' Responses to Merit Pay in the Chicago Public Schools* (SPI)

## **Engineering (Room 215)**

Brantly Sturgeon: *Comparison of Analytical Probe Feed Models for Rectangular Microstrip Patch Antennas* (SROP)

Jose Rivera: *Analysis of Charge Permeation in Ion Channels Using Boundary Force* (SROP)

Rasheed Ibrahim: *Deforming a Buckled Elastic Strip of Rod* (McNair)

10:30 a.m. - 10:40 a.m. **Break**

10:45 a.m. - 11:45 a.m. **EBI/Crop Science (Room 403)**

Emzi Clemons: *The Identification of Lignocellulose Degradative Enzyme* (McNair)

Ngozi Okanu: *Real-time RT-PCR Detection and Quantification of Viruses of Switchgrass* (McNair)

Angela Holliday: *Identification of Pathogens Specific to Biofuel Grasses* (McNair)

## **Kinesiology and Community Health (Room 404)**

Diana Arellano: *India's Baby Paradox: Examining the Disparity of Infant Mortality Rates throughout India* (McNair)

Daniela Mitchem: *Comparative Analysis of Quality Measures of Not-For Profit and For Profit Nursing Homes in Cook County* (McNair)

Natalie Bradford: *Food Environments, Physical Activity Resources, and Obesity in the United States* (McNair)

## **Speech/Hearing Science (Room 405)**

Amanda Ward: *A Direct Comparison of Short-Term Audiomotor and Visuomotor Memory* (SROP)

Amy Nelloms: *Psychological Factors Affecting Adjustment to Tinnitus* (SPI)

**Clinical Psychology (Room 406)**

Maria Pineros: *Effects of Amphetamine Exposure during Adolescence on Impulsive Behavior in Adulthood in Male Rats* (McNair)

Chantell Strong: *The Relationship between Emotional Awareness and Psychological Distress* (McNair)

Leslie Mendoza: *Discomfort with Emotion and Psychological Distress* (McNair)

**Anthropology/Ethnic Studies (Room 407)**

Erin Hayes: *Documenting Early Dynastic Cylinder Seals of Ancient Mesopotamia* (McNair)

Irene Jaramillo: *Orendorf, The Native American Archeological Site that Emerged from Ashes* (McNair)

Sara Bordowitz: *Through the Writings of Edith Wharton and Charlotte Perkins Gilman: Understanding Gender and Social Geography* (SROP)

**Educational Policy Studies (Room 210)**

Janine Franklin: *The Impact of Incentivized Programs on Attendance for Special Education Students in High School* (SPI)

Royel Johnson: *An Examination of the No Child Left Behind Act and Its Deprivation of Artistic Expression* (SPI)

Taylor-Imani Linear: *Writing For Liberation: How Black Girls Navigate Life through Reflective-based Writing* (SPI)

**Math/Chemistry (Room 215)**

Kwadwo Opoku-Nsiah: *Total Chemical Synthesis of Lantibiotics with Overlapping Polycyclic Lanthionines using Orthogonal Protecting Groups* (SROP)

Robert Walker: *Investigating q-analogs of Binomial Coefficient Identities* (SROP)

11:45 a.m. - 1:00 p.m. **Lunch Break**

1:15 p.m. - 2:15 p.m. **Biology (Room 403)**

Maribel Arteaga: *Function of Post-transcriptional Regulators Vasa and Pumilio in Regeneration and Germline Formation of the Flatworm Schmidtea mediterranea* (McNair)

Lauren Rosales: *Alterations in mRNA Expression of Hepatic Carotenoid Cleavage Enzymes in Mice* (McNair)

Hazel Ozuna: *What regulates the hilD promoter to allow Salmonella enterica serovar Typhimurium to Invade Intestinal epithelium* (SPI)

## **Human and Community Development (Room 404)**

Kenly Brown: *"I Only Want the Best for You": Gender Differences in Low-Income African American Mothers' Parenting Techniques* (SROP)

Benie Bakala: *Eating Right: African-American Mother's Strategies to Promote Healthy Eating Habits for Their Pre-school Age Children* (McNair)

Tolulope Olorode: *Spatial Landscape and Physical Activity among Inner City Pre-School Age Children* (McNair)

## **Business (Room 405)**

Taiwo Abebowale: *Don't Ask Questions, Just Eat! - An Examination of How Quick Service Restaurants Communicate Nutritional Information to Consumers* (McNair)

Alfredo Gonzalez: *Crowdsourcing: The Future of Marketing Innovation in the Corporate World* (McNair)

## **History (Room 406)**

Aquiles Damiron: *Defining Dominicanness: The Ideas of Progreso and Cultura through the Eyes of Dominican Intellectuals and Culture* (SROP)

Courtney Pierre: *The Impact of Activism: How the Black Panther Party Affected Kathleen and Eldridge Cleaver's Marriage* (SPI)

Ricardo Colon: *Literacy, Orality and Polity in Early Medieval East-Central Europe* (SPI)

## **Social Science (Room 407)**

Omar Perez Figueroa: *Impacts of Humans in the Activated Sludge Treatment Plant* (SROP)

Tonisha Daniel: *The Forgotten Women: Health Disparities Concerning Minority Women* (McNair)

Antoine Jackson: *"If They Can't Use Your Comb": How African American Men's Interracial Partnerships Impact the Lives of African American Women: The Perspective of African American Women* (SPI)

## **Educational Policy Studies (Room 210)**

Terrance Range: *I Am My Brother's Keeper: A Preliminary Examination of the "Best Practices" Surrounding the All-Male Academy* (SPI)

Alicia Robinson: *I Hate School! Academic Self-Motivation in African American Children* (SPI)

Cecilia Suarez: *Degrees vs. Disrespect: Navigating the Balance between Cultural Respect and Educational Goals of Mexican-American Young Women Pursuing Higher Education Degrees* (SPI)

## **Animal Science (Room 215)**

Mayra Lopez: *Association between Coat Color and Behavior in Cats* (McNair)

Sierra Burrell: *Metabolic Adaptations of Bovine Adipose Tissue in the Periparturient Period* (SROP)

Tanisha Taylor: *Potential Relationship between Maternal Body Condition at Conception and Ratio of Male to Female Calves in Dairy Cattle* (McNair)

2:15 a.m. - 2:30 p.m.

## **Break**

2:30 p.m. - 3:30 p.m.

## **Counseling Psychology (Room 403)**

Elizabeth Gonzalez: *Childhood Experiences, Personality and Health: Does Personality Mediate the Relationship between Trauma and Health* (McNair)

Sharday Love: *The Implications of Attachment Style for Relationship Quality: The Role of Compatibility* (McNair)

Stephanie Aghahowa: *White Counseling Psychologists and Their Construction of a White Racial Identity* (McNair)

## **Kinesiology and Community Health (Room 404)**

Linda Salgado: *The Effect of Acculturation on Satisfaction with Life, General Stress, and Acculturative Stress in Latina Immigrant Women Residing in Illinois* (McNair)

Melissa Morales: *Impact of Acculturation on Dietary Habits and Stress Levels of Latina Immigrants in Central Illinois* (McNair)

Karah Bush: *The Effects of a 9-Month Physical Activity Afterschool Program on Verbal Fluency in Preadolescent Children* (McNair)

## **Curriculum and Instruction (Room 405)**

Elizabeth Clark: *The Truth About Education: Overcoming the Lack of Diversity in K-12 Curriculum* (McNair)

Derrick Rhodes: *Attitudes and Perceptions of High School Administrators in Urban Communities about Career and Technical Education Programs* (McNair)

Juan Gerardo: *A Critical Analysis of the National Mathematics Advisory Panel Final Report: An Analysis Elucidating the Assumptions of the Final Report and Implications for Educators and Marginalized Students* (SPI)

Brittney Walker: *The Usage of Personal Diaries as a Language Research Tool* (SPI)

**History (Room 406)**

Isabel Lara: *Race and Gender in Colonial Mexico through Caste Painting* (McNair)

Van Hong Nguyen: *Zazen-the Core Teaching of Dogen: How and Why Did Dogen Promote and Protect This Core Value Throughout Different Stages of His Zen Teaching Career?* (SPI)

Kyle Mays: *Black, Red, and Resistance: A Comparative Analysis between African American and Native American Activism during the Black and Red Power Eras, 1966-1974* (SPI)

**Social Science (Room 407)**

Alisa Shockley: *Spatial Accessibility of Health Care and Cancer in African Americans* (SPI)

Bryana Mantilla: *Social Medicine in Action – the Opportunities and Challenges of Community-Based Healthcare Models in Latin America* (SPI)

Lhea Randle: *Social Identities Effect on Policy Preferences* (SPI)

**Educational Policy Studies (Room 210)**

Marla Mojica: *Household Wealth in the Latina/o Community* (SROP)

Ronald Threadgill: *Diversity in Higher Education: The Story of SEOP and ATEP* (McNair)

Darnell Leatherwood: *Children From Low-Income Families: A Success Story* (McNair)

Regina Sierra Carter: *A Study of Elementary School Students' Perceptions of African American Children's Literature* (SPI)

**Neuroscience (Room 215)**

Nilmarie Ayala-Fontanez: *Effects of Amphetamine on Inhibitory Control in Rats Exposed during Adolescence or Adulthood* (SROP)

Gloria Mayowa Faboyede: *Constructing Assessments for Neonatal Cognitive Ability* (SPI)

Franklyn Rocha Cabrero: *The Effects of Pesticide-induced Parkinson's Disease across Multiple Learning and Memory Systems in Rats* (SPI)





**Nilmarie Ayala-Fontánez**

Faculty Mentor: **Dr. Josh Gulley**

Research Department: **Psychology**

*Effects of Amphetamine on Inhibitory Control in Rats Exposed during Adolescence or Adulthood*

In recent years, the use of prescription drugs containing amphetamine had increased significantly among adolescents. Even though, it is well known that amphetamine induces significant changes in the adult brain, considerably less is known about the effects on adolescent brain. This research tries to understand how amphetamine exposure can affect the cognitive behavior of adults rats exposed to amphetamine during adolescence as compared to adulthood. Our hypothesis is that adolescent rats are more susceptible than adults to drug-induced plasticity and therefore more vulnerable to effects on cognitive behavior such as changes in inhibitory control. We will do experiments of the impulsivity action using the Differential reinforcement of low rates of responding (DRL) in adolescent and adults male Sprague-Dawley rats. This research will contribute to understand about the effects of amphetamine exposure when it is started in adolescence. By elucidating the mechanisms for the vulnerability to the plasticity induced by drugs in adolescents, we will provide information that could support the creation of new strategies and techniques for the prevention and reversal of the neuroadaptation induced by the drug.



**Sara Bordowitz**

Faculty Mentors: **Dr. Dale Bauer and Dr. Michael Odom**

Research Department: **English**

*Through the Writings of Edith Wharton and Charlotte Perkins Gilman: Understanding Gender and Social Geography*

I examine how the personal psychology of women is affected by the social geography of the home as seen in the works of Charlotte Perkins Gilman and Edith Wharton. The first half of my paper explores the nonfiction works of Gilman and Wharton, *The Home* and *The Decoration of Houses* respectively, which deal with the creation of domestic space and their societal implications. The second half of my paper focuses on how the sentiments of the nonfiction work operate within the fiction works; Gilman and Wharton have set up particular ideas about the home in their nonfiction works, but how they choose to have the women within their novels function in this domestic space reflects whether or not they believe women can rise above and flourish within these social spaces, or whether they will be destroyed in the oppressive environment.



**Kenly Brown**

Faculty Mentor: **Dr. Robin Jarrett**

Research Department: **Human and Community Development**

*“I Only Want the Best for You”: Gender Differences in Low-Income African-American Mothers’ Parenting Techniques*

This research examines low income, African American mothers’ parenting techniques used to parent their sons and daughters. I will specifically explore the goals and expectations, disciplinary strategies, and ways in which mothers implement their said goals and expectations. A family resiliency framework guided the study. This structure uses an ecological context and illustrates how families utilize resources during hardship. The data I am using derive from qualitative, in-depth interviews. Findings from the study suggest that mothers child rearing goals and expectations and disciplinary strategies are egalitarian; however, the motives and ways mothers implement these goals and expectations differ for males and females.



**Sierra Burrell**

Faculty Mentor: **Dr. Juan Llor**

Research Department: **Animal Sciences**

*Metabolic Adaptations of Bovine Adipose Tissue in the Periparturient Period*

Nutriphysiogenomics is an area of research that involves the study of nutritional and physiological causes of genomic adaptations through the use of ruminant models. Ruminants that are considered food animals play a major role in this research and have become the primary research models. We are studying metabolic adaptations of bovine adipose tissue in the periparturient period in an attempt to improve dairy cow performance during this period. Metabolic adaptations during gestation and lactation are important because metabolism is the direct conversion of feed into useful nutrients for the body. A positive nutrient balance is essential for the calf's survival as well as superior milk synthesis and secretion. Gaining a better understanding of the genomic adaptations of these food animals is critical to the success of the dairy and beef cattle industries and the safety of its consumers. Better suited management practices catered to the needs of the dairy cow can be created through understanding the interaction of multiple body systems during the periparturient period. Adipose tissue samples will be taken from pregnant cows -21, -7, +7, +28, and +56 days from calving. Quantitative PCR will be used to determine which genes are expressed during the periparturient period. I hypothesize that the genes expressed will give us a better understanding of why there are metabolic adaptation during the periparturient period.



**Aquiles Damirón-Alcántara**

Faculty Mentor: **Dr. Adrian Burgos**

Research Department: **History, Latino/a Studies**

*Defining Dominicaness: The Ideas of Progreso and Cultura through the Eyes of Dominican Intellectuals and Culture*

Dominican socially constructed concepts of progreso and cultura have played an essential role in defining contemporary Dominican identity culturally, ethnically, socially and politically. In an attempt to understand the historical roots of these concepts, this project focuses on two central moments in the Dominican-Haitian history—the Haitian domination of Hispaniola from 1822-1844, and the Dominican-lead massacre in 1937 against non-ethnic Dominicans. These two historical events established a clear political and social division between both Dominicans and Haitians, which consequently altered the ideas of progreso and cultura in the eastern corner of the island, where la esencia africana became associated with cultural and social retrogression. By examining Dominican intellectual productions concerned with Dominican national identity, I argue that Haiti’s role in the realization of progreso and cultura, as interpreted by Dominican intellectuals and academics, has led to the rejection of Haitianness within Dominican culture. Additionally, this historical analysis links intellectual production with cultural production, which one might see as the manifestation of progreso and cultura, as evidenced by political campaigns and movements, personal development, and media in the Dominican Republic.



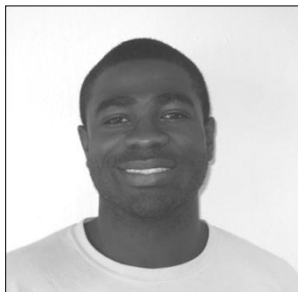
**Marla Mojica**

Faculty Mentor: **Dr. James Anderson**

Research Department: **Educational Policy Studies**

*Household Wealth in the Latina/o Community*

The main focus of this research is to compare household wealth between Latinas/os and non-Latinas/os because the wealth gap persists among ethnic groups. Household wealth is an important measure of economic stability, and economic stability is a measure of overall well-being. Scholarly publications will be used to examine inequalities in household wealth between Latinas/os and non-Latinas/os. Household wealth is affected by certain demographics such as gender, age, education, income, and region of residence as well as years of residency. Inequalities in household wealth are heightened during periods of economic downturns. For example, in 2001 a recession occurred, and the wealth of White households continued to grow, but the economic downturn had a negative effect on the wealth of Latinas/os and Blacks households. In a recession, Latina/o and Black families with no assets experience economic hardship. During economic hardships, Latina/o and Black households are at higher risks of economic instability than White households. I expect to find significant disparities in net worth between Latinas/os and non-Latinas/os and that such disparities impact other forms of inequalities such as homeownership, start-up capital for entrepreneurs, and education.

**Kwadwo Opoku-Nsiah**Faculty Mentor: **Dr. Wilfred van der Donk**Research Department: **Chemistry***Total Chemical Synthesis of Lantibiotics with Overlapping Polycyclic Lanthionines Using Orthogonal Protecting Groups*

The urgent need for advancements in antibiotics comes as a result of the increasing incidences of antibiotic resistance. Lantibiotics, a class of antibiotic peptide natural products containing lanthionine rings, show potential as therapeutics to overcome bacterial resistance to traditional drugs. In order to study these peptides in vitro, total chemical synthesis is utilized as a method to produce quantifiable yields of lantibiotics and derivatives. However, to date, very few cases of synthesis of complex lantibiotics containing overlapping polycyclic lanthionine rings, such as nisin, have been reported. This work aims to utilize solution-phase synthesis (SPPS) to produce lanthionines containing amino acids protected with various types of orthogonal protecting groups (e.g. dimedone and p-nitrobenzyl derivatives). SPPS was employed in an attempt to yield cyclic, lanthionine containing, peptides. The success of each protecting group pair was evaluated by the presence of impurities and the calculated percent yield of the desired peptide. Identification of sustainable protecting groups for this system will lead to progressive attempts at synthesizing complex lantibiotics.



**Omar Pérez Figueroa**

Faculty Mentor: **Dr. Daniel Schneider**

Research Department: **Urban and Regional Planning**

*Impacts of Humans in the Activated Sludge Treatment Plant*

The increasing scarcity of fresh water due to population growth, urbanization, and possibly climate change, has led to increased use of wastewater for agriculture, aquaculture, household, groundwater recharge and other areas. In this research project, I will study the effects of two different kinds of sewage on the bacterial communities of a sewage treatment plant. The first sewage type, high in simple carbohydrates, is typical of waste produced by food processing industries. The second type, with more complex organic carbon and nitrogen, is more typical of municipal domestic sewage. The analysis will focus on how the different types of bacterial colonies interact with bacteria of the activated sludge. An additional focal point will be on how the different types of sewage produced by society impact the sewage treatment plant and how resultant failures in sewage treatment plants affect society. The interaction between different bacterial colonies resulted in differences in culture media created different microbial communities. Both cultures were dominated by flock, but began to disappear by day 12. Fungus where found in the glucose. Both cultures show poor settling and bulking characteristics.





**Jose Rivera**

Faculty Mentor: **Dr. Umberto Ravaioli**

Research Department: **Electrical Engineering**

*Analysis of Charge Permeation in Ion Channels Using Boundary Force Simulation*

The study of ion channels has led scientists to unearth the biochemical pathways that dictate both cell functionality and the progression of disease. Ion channels are responsible for regulating the flow of ions across the membrane of a cell as they respond to different stimuli from both the intracellular and extracellular environment. In this study, BioMOCA is used as an alternative to Molecular Dynamics for the simulation of ion transport characteristics. BioMOCA (Biology Monte Carlo) is a 3D ion channel simulator based on the Boltzmann Transport Monte Carlo (BTMC) methodology. The mechanosensitive channel of small conductance (MscS) and the gramicidin (gA) channels will be studied by using the boundary force simulator tool in BioMOCA. The purpose of this study is to investigate how the potential energy distribution of a point charge changes with respect to a varying dielectric constant of water, thereby providing key insight into the potential energy profile of a point charge as it traverses the narrow channel pore. The results of this study may have implications for developing algorithms in BioMOCA that would allow the user to enter a range of dielectric constants rather than one nominal value.



**Rigoberto Robles**

Faculty Mentor: **Dr. Gilberto Rosas**

Research Department: **Anthropology**

*Urban Scriptures: Mexican-American Graffiti Resistance in Chicago*

'Legal' graffiti-murals are elaborate and thematic mural productions that are created with aerosol paint and with the property owner's permission. This study focuses on the physical and social processes of a graffiti-mural among Mexican-descent aerosol writers in Chicago. Literature on Mexican-American graffiti concentrates on its use by gangs and neglects the use of aerosol graffiti culture. This research will gather data through ethnography, participant-observation, photography and interviews during the creation of a Mexican-American graffiti-mural. My hypothesis is that graffiti-murals involve extensive organizing, negotiations over space and are events that build identity and community. As marginalized people, Mexican-American graffiti writers in Chicago challenge their social conditions by appropriating space and becoming 'visible' through their elaborate graffiti-mural masterpieces.



## **Brantly Sturgeon**

Faculty Mentor: **Dr. Jennifer Bernhard**

Research Department: **Electrical and Computer Engineering**

### *Comparison of Analytical Probe Feed Models for Rectangular Microstrip Patch Antennas*

Previous research has produced a number of circuit models for the probe in a probe-fed rectangular microstrip patch antenna. We compare each analytical probe feed model's behavior by altering various physical conditions. Test conditions include the substrate thickness and dielectric constant, probe feed placement, patch dimensions, and probe dimensions. In this work, we compare reactive impedance characteristics obtained from transmission-line based analytical analysis (MATLAB®), numerical analysis (HFSS® v.12), and experimental measurement. The analytical models for each test case use a transmission line circuit combined with a probe feed circuit in series with a source. In contrast, the baseline circuit consists of a transmission-line circuit and a direct connection to the source (no probe feed model). Numerical analysis is used to simulate more variations on each condition due to the prohibitive cost of fabricating a sufficient number of antennas for conclusive study of the conditions. Finally, measured results from previous publications and from antennas fabricated for this research are used for comparison with the analytical and numerical models.



**Robert Marshawn Walker**

Faculty Mentor: **Dr. Andrew Schultz**

Research Department: **Mathematics**

*Investigating q-analogs of Binomial Coefficient Identities*

In the realm of combinatorics, the binomial coefficient is a foundational object, and mathematicians have deduced a multitude of identities in which the binomial coefficient participates. Combinatorics and number theory commingle in Fleck's Congruence, which tells us that an alternating sum involving certain binomial coefficients is sufficiently-divisible by a nonnegative prime power  $p^k$ . In the realm of q-analogs, the q-Binomial Coefficient is a polynomial generalization of the binomial coefficient. What we ask is: if we make a brief exodus to the realm of q-analogs, can we deduce a result comparable to Fleck's Congruence, in which the q-Binomial Coefficient participates? We construct a function in Mathematica to produce q-Binomial Coefficients, and use the outputs to test, one case at a time, a sum involving the q-Binomial Coefficients, in order to see which polynomials are reliable factors of the sum. Based on the data, we construct some promising conjectures for the q-analog of Fleck's Congruence, and, having verified one conjecture, we expect to verify the remainder of them. Finally, given our degree of success, we believe that similar methods of testing can be used to deduce q-analogs for other modular congruencies.



**Amanda Ward**

Faculty Mentor: **Dr. Torrey Loucks**

Research Department: **Speech and Hearing Science**

*A Direct Comparison of Short-Term Audiomotor and Visuomotor Memory*

The current study directly compared audiomotor and visuomotor memory in one experiment. It is necessary to compare visual and auditory motor memory directly to test if a more complex motor memory system exists in audition. Participants were instructed to produce continuous force with the index finger in both an auditory and visual condition. Within both the auditory and visual condition, there was a feedback and feedback removal condition. The feedback removal tested the duration of the memory buffer. In the feedback condition, participants produced continuous force throughout the 25 second trial. In the feedback removal condition, feedback was removed at 10 seconds. We predicted that the auditory motor memory buffer is longer and has a slower rate of decay than the visuomotor memory buffer.



Science, Technology, Engineering, and Mathematics Research Team Leader:  
**Daniel Wong**

Daniel Wong is a PhD candidate in the Department of English at the University of Illinois at Urbana-Champaign. His dissertation examines Victorian literature and religion in relation to secularization, political economy, political theory, and contemporary understandings of the postsecular, pluralism, and cosmopolitanism. He holds degrees in English and BioChemistry from the University of Kansas, and has been a TA for BioChemistry 460 (Scientific Communication) at UIUC, in addition to having worked as a science writing instructor for SROP the past five summers. His favorite author is George Eliot, his favorite glycoprotein is human chorionic gonadotropin, and he was pulling for Portugal in the World Cup.



Humanities, Behavioral and Social Sciences Research Team Leader:  
**Myra Washington**

Myra Washington has a B.A. and M.Ed. from Vanderbilt University. She is currently a Ph.D. candidate in the Institute of Communications Research. Her work focuses on race, mixed-race, and celebrity, especially as it is represented in television, films and digital media. Her dissertation looks specifically at the rhetoric on Black/Asian mixed-race celebrities and the ways they challenge current discourses on race. This is her third year with the SROP program.

**Notes:**