

**TRIO RONALD E. McNAIR
POSTBACCALAUREATE
ACHIEVEMENT PROGRAM**

UNDERGRADUATE RESEARCH JOURNAL OF ABSTRACTS

at the University of Illinois at Urbana-Champaign

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ILLINOIS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

While every care has been exercised in compiling and publishing the information contained in these pages, please forgive any errors or omissions.

Acknowledgments

The TRIO McNair Program is grateful to so many people who support the program and contributed to making this edition of the *TRIO McNair Scholars Undergraduate Research Journal of Abstracts* at the University of Illinois at Urbana-Champaign a reality.

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The TRIO McNair Scholars Undergraduate Research Journal is the official publication of the Ronald E. McNair Scholars Program at the University of Illinois at Urbana-Champaign. The journal includes abstracts of the students' final paper and represents combined efforts of students and their research mentors. The views expressed in the papers and abstracts are not intended to represent the views, beliefs, interests, values, or practices of the University of Illinois at Urbana-Champaign.

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Original Cover Designed by Joanna Wozniak and modified by Nameka Bates.

*"Whether or not you reach your goals
in life depends entirely on how well
you prepare for them and how badly
you want them.
You're eagles!
Stretch your wings and y to the sky."
-Dr. Ronald Ervin McNair*



DR. RONALD ERVIN McNAIR, the second African American to fly in space, was born October 21, 1950, in Lake City, South Carolina to Carl and Pearl McNair. He attended North Carolina A&T State University in Greensboro, where, in 1971, he graduated magna cum laude with a B.S. degree in physics. In 1976, at the age of 26, he earned his Ph.D. degree in physics from the prestigious Massachusetts Institute of Technology. Ronald E. McNair was nationally recognized for his work in the field of laser physics. In 1978, he was one of 35 applicants selected from a pool of ten thousand for NASA's space shuttle program and assigned as a mission specialist aboard the 1984 - ight of the shuttle Challenger.

In addition to his academic achievements, he was the recipient of three honorary doctorates and numerous fellowships and commendations. He was also a sixth degree black belt in karate and an accomplished jazz saxophonist. He was married to Cheryl Moore and had two children, Reginald Ervin and Joy Cheray.

On the morning of January 28, 1986, McNair and his six crew members died in an explosion aboard the space shuttle Challenger. In his memory, members of Congress provided funding for the Ronald E. McNair Post- Baccalaureate Achievement Program to encourage low income, first generation college students to enroll in graduate studies. This program is dedicated to the high standard of achievement that Ronald E. McNair's life represented.

I _____ will strive to honor and respect the legacy set forth by Dr. Ronald E. McNair and former McNair scholars I will work earnestly toward the realization of my educational goals I will embrace the challenge of attaining baccalaureate and post baccalaureate education Through hard work, perseverance, and persistence. I will strive to overcome any obstacles, barriers and limitations That might hinder, derail, or prevent my educational attainment.

I will endeavor to achieve excellence
By conceiving of and believing in excellence in my personal, professional and academic endeavors.
I will observe high ethical, moral, academic standards.

I understand that I must be trustworthy, honorable and noble
Respect myself, my peers and the people who contribute to my personal and academic success

I will graciously extend myself and service to the uplifting of future TRIO students and promising scholars
I will be a part of the solution and not the problem;

I am a McNair Scholar and I believe in the words of Dr. McNair:
“Whether or not [I] reach [my] goals in life depends entirely on how well [I] prepare for them
And how badly [I] want them.”

With this pledge, I hereby accept the responsibilities and privileges of induction into the Ronald E. McNair Post baccalaureate Achievement Program.

Conceived and Authored by

*Wallace Southerland III, Ph.D., Former Associate Director,
McNair Program at the University of Maryland, College Park and
Cheryl Bailey Gittens, Former Director, McNair Scholars Program at
Virginia Polytechnic Institute and State University*

With contributions by members of the national McNair Scholars community.

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University of Maryland, College Park and Virginia Polytechnic Institute and State University McNair Scholars Programs.

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Ivy Hernandez Delgado	Psychology
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Jarvis Young	English

*Note: Efforts were made to ensure the accuracy of all information, including names, rank, and topics. Please forgive any oversights and notify the office. All abstracts included were those available at the time of publication. * indicates abstracts not included.*

2014-2015 Research Institute Faculty Mentors

Note: All Faculty Mentors are affiliated with the University of Illinois at Urbana-Champaign.

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TRIO Ronald E. McNair Post-Baccalaureate Achievement Program

Program Description

Established on the campus in 1990, the UIUC TRIO Ronald E. McNair Post-Baccalaureate Achievement Program (McNair Scholars Program) is funded by the U.S. Department of Education. The program provides research, mentoring, advising, and graduate school preparation opportunities for eligible rising juniors and seniors to promote their academic excellence and pursuit of a PhD. TRIO McNair Scholars attend relevant workshops and seminars throughout the academic year, engage in a 10-week Summer Research Institute, and commit to preparing themselves for doctoral studies following the completion of undergraduate studies.

Vision

We envision a program in which all McNair Scholars achieve academic and personal success so they can become the next generation of scientists, researchers, and professors. We seek to empower scholars to believe that the vision they have for the world can be realized through their research and service efforts in the academy.

Mission

The mission of the program is to prepare participants to be the next generation of scientists, researchers, and professors through rigorous graduate school preparation, academic development, and research training.

**Message from the Associate Dean of Students and
University TRIO Director**

Dear Colleagues, Supporters, Partners, Faculty, and Friends:

I am delighted to share with you the latest edition of the University of Illinois at Urbana-Champaign TRIO McNair Scholars Undergraduate Research Journal of Abstracts. The young scholars have worked with a faculty or research mentor to learn how to develop and implement quality and relevant research in their respective fields. The scholars' research is the result of applying creative ideas to research questions using systematic and rigorous methods of established research protocols in the STEM fields, the social sciences, and the humanities.

The TRIO McNair Scholars Program is a federally-funded program that provides research opportunities to first-generation, low-income, and underrepresented undergraduates to prepare them for graduate schools, faculty positions, and research careers. By combining undergraduate research with mentoring and academic support services, the program paves the way to graduate school for students who are underrepresented in higher education. Since 1990, the program has been an important asset and contribution to the research culture on the campus. More than 400 students have benefited from services and opportunities. More than 60 percent of our scholars are typically accepted into graduate schools each year and over 70 scholars have attained their Ph.D. or other doctoral degree since 1990.

We are very proud of the success of our scholars and alumni/ae scholars. We envision them as leaders in their respective fields. Congratulations to the McNair scholars and their mentors. I also extend my appreciation to the McNair staff for their dedication and for helping the next generation of scholars, scientists, faculty, and leaders achieve success.

With warm regards,



Wallace Southerland III, Ph.D.
Associate Dean of Students and Project Director

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Examining Study Abroad Participation in I-Promise Students: Preliminary Study on Why Minority Students Don't Study Abroad

Jennifer Aguayo, Community Health

Research Mentor: Nicole Lamers

Abstract

Overall, study abroad participation rates have steadily increased across higher education institutions, however, the majority of the participating population is persistently Caucasian females. This project seeks to understand how Illinois Promise (I-Promise) students' decision against studying abroad is influenced by their race or socioeconomic status. Illinois Promise is a scholarship awarded to students considered to be the most disadvantaged in society. Despite I-Promise's transferability of financial aid, not many I-Promise students are studying abroad. This qualitative study will survey I-Promise students and then purposefully sample minority (African-American, Native-American, Latino, and Asian-American) students for in-person interviews. Implications for this study include gaining insight on the social influences that might exist in a minority student's decision to study abroad. As the gap in minority participation in study abroad continues to widen, it is hoped that this study will increase understanding of why racial disparities exist in study abroad participation. Higher education policy may benefit from understanding this and ultimately contribute to the increase in minority participation in study abroad programs.

Effects of Bile Acids on Adipogenesis

Oludemilade Akinrotimi, Molecular and Cellular Biology

Research Mentor: Anakk Sayeepriyadarshini

Abstract

Bile acids (BA) are important agents for intestinal digestion of lipids and have also been identified as signaling molecules used to maintain metabolic homeostasis. Loss of nuclear receptors Farnesoid X Receptor (FXR) and Small Heterodimer Partner (SHP), which negatively regulate BA, exhibited reduced body weight compared to wild type mice, even when placed on a high fat diet. Subsequently, high serum levels of bile acids and reduced white adipose tissue are observed in the double knockout (DKO) mice. In order to determine the role bile acids play in this beneficial phenotype, we examined BA effect on fat cell accumulation using the NIH-3t3 L1 cells. In differentiated adipocytes we observe a decrease in lipid droplet size, a marker of fat accumulation, in correlation with increasing amounts of bile acid treatments. This suggests that bile acids may have a protective effect against fat accumulation, which looks promising to treat obesity.

Factors Contributing to African American Male Persistence in Higher Education

Brandon Boston, Communications

Research Mentor: James Anderson

Abstract

African American males have unsatisfactory high school and college graduation rates. This research examines patterns of college degree attainment for African American males in higher education. The goal of this research is to see what factors are most highly correlated to the six-year graduate rates of African American males from four-year public higher education institutions. Specifically, this research focuses on the following factors: college readiness, social capital, and financial aid. This research analyzes data from multiple primary and secondary sources. The main argument that the aforementioned factors depress the college graduation rates for African American males. Further, removing these barriers should contribute significantly to African American males completing college at much higher rates.

Connecting homes and schools: A Photo Elicitation Study

Jasmine Brown, Human Development and Family Studies

Research Mentor: Robin Jarrett

Abstract

Researchers have highlighted the importance of school readiness for low-income, African-American children who are disproportionately at risk for being unready for the transition to kindergarten. School readiness entails key reading, writing, and language skills that are associated with school success. However, preschools, elementary schools, and families frequently understand school readiness differently. Research further documents that children perform better in school when there is consistency in beliefs and practices between families and schools. Quality learning opportunities in the home and school promote school readiness and children fare better in kindergarten when collaborations are forged between the home and the school during the preschool process. A critical piece of this collaboration is understanding low-income, African-American parents' views of school readiness competencies and abilities and related parenting practices. To address this gap in the field, we used a resilience framework and photo elicitation interviews with low-income, African-American mothers of preschoolers. Mothers documented the various home-based activities they engaged in to promote their children's school readiness. Home-based activities focused on multiple literacy skills and included multiple family members. These findings suggest the ways that schools can partner with families that are culturally-sensitive and enhance the early educational success of children.

The Experience of Housing Instability and Black Sexuality Amongst African American Women

Aneisha Dunmore, Human Development and Family Studies

Research Mentor: Ruby Mendenhall

Abstract

This study shows how neighborhoods with high levels of violence affect the mental health of low-income, African-American mothers who live in Englewood and surrounding Chicago communities. Specifically, this study will examine how neighborhood violence affects depression and post-traumatic stress disorder. Interviews and mental health scales were conducted with 93 African-American mothers in and around Englewood. Mixed methods will be used, which will include coding and analyzing transcriptions. The preliminary results of this research show that neighborhood violence negatively affects the mother's mental health.

Determining the Identity and Possible Origins of a Collembola Pest of Lettuce and Tree Seedlings

Alejandra Flores, Molecular and Cellular Biology

Research Mentor: Rosanna Giordano

Abstract

Lettuce farmers in the Salinas Valley of California have reported debilitating losses to their crop as a result of damage to the roots of lettuce plants. Similar symptoms have also been reported by maple and poplar tree nurseries in Oregon. A study of the arthropods associated with the damaged lettuce and tree seedling roots indicated that feeding by a Collembola is the likely cause of the damage. Using morphological evidence the Collembola were identified as *Protaphorura fimata*. We used molecular tools, the mitochondrial gene cytochrome oxidase I (COI), to confirm the identity of this pest as well as to determine the genetic relationship between the California and Oregon *P. fimata* populations to each other and with a population from Europe. The goals of this research are as follows: 1) Confirm species identity of California and Oregon *P. fimata* populations. 2) Determine genetic relationship of California, Oregon and European *P. fimata* populations in order to assess whether *P. fimata* is an invasive species.

Electrodeposition of Cu on Arbitrary Substrates for CVD Graphene Synthesis

Mahmoud Fouly, Chemistry (Specialized)

Research Mentor: SungWoo Nam

Abstract

Graphene, a 2-dimensional carbon material, exhibits optical, mechanical, chemical and electrical properties, making it a viable option for a wide range of industrial applications. Despite graphene's potential, challenges in the cost and energy efficiency of the synthetic process as well as quality of synthesized graphene still stand. Amongst the most popular and industrially practical methods used to synthesize graphene, is the employment of Chemical Vapor Deposition (CVD) to grow graphene on a copper substrate/catalyst. Here we explore methods to reduce cost while maintaining high quality graphene synthesis by optimizing the recyclability of copper substrate.

In the 21st Century Have the Demographics and Social Changes Regarding the Hispanic Population in the United States Impacted Military Advertising?

Jasmin Garcia, Advertising

Research Mentor: Jason Chambers

Abstract

Over time, The United States' racial demographics have evolved and continue to do so, as the fastest growing minority population is Hispanic Latinos/as. The objectives of this proposal are to conduct a historical analysis of various primary and secondary sources in order to see how military advertisements have evolved. My paper focuses on analyzing military advertisements in the 21st century, and seeing if the demographic and social changes regarding the Hispanic population in the United States have impacted military advertising. This area is significant to explore because US racial demographics are changing, as the fastest growing minority population is Hispanic Latinos/as. My analysis has led me to believe that in recent years, the demographic and social changes regarding the Hispanic population in the United States have impacted military advertising. In the past joining the military was presented as an honorable sacrifice, whereas nowadays it has become more about the benefits that come with enlisting.

Analysis of Shear-rate Dependent Blood-Flow Models Through Idealized Bifurcating Geometries with Traction-Free and Resistance Outlet Boundary Conditions

Francisco Gonzalez, Aerospace Engineering

Research Mentor: Daniel Bodony

Abstract

Arterial blood-flow is simulated using the shear-rate dependent Carreau-Yasuda fluid model through idealized bifurcating arterial geometries. Given that the whole cardiovascular system would be too large and complex to model, a resistance boundary condition is used to incorporate the downstream domains in a truncated geometry. The pressure and flow-rate of a truncated geometry with resistance outlet boundary conditions are compared to the pressure and flow-rate at the same region of a non-truncated geometry with traction-free outlet boundary conditions.

Youth's Commitment to Responsibilities in Youth Programs

Natali Gracia, Human Development and Family Studies

Research Mentor: Kelly Bost

Abstract

Youth programs can provide a space for skill development and practice through task-oriented activities (Denner, Meyer, & Beon, 2005). This qualitative, grounded theory study was aimed at learning why youth remain committed to their responsibilities in youth programs and also, what role program leaders play in this process of youth commitment. The coded responsibility data was analyzed from the Pathways Project, which is a longitudinal study on youth, parents, and program leaders from voluntary project-based programs. Results show that in youth developing commitment, there were four themes: (1) youth viewed their responsibilities as a team effort; (2) youth had self-pride when responsibilities were completed; (3) youth believed that responsibilities were achievable; and (4) youth were able to stay committed to their responsibilities when planning was done in advance. For the leaders' roles, there were three themes found that highlighted the importance of: (1) facilitating within a group of youth, (2) supporting the youth through flexibility, and (3) being present to serve as examples for the youth. In all, these factors were shown to play an important role in the youth staying committed. This study should be continued and used to improve curriculum development in and outside of classroom settings.

A Small City School vs. A Big City School: Student Preparedness for Students of Color

Olivia Hatch, Sociology

Research Mentor: Monica McDermott

Abstract

The focus of this project is to examine the comparison between the neighborhood environment and the school experience, especially within two metropolitan cities: Champaign, IL and Chicago, IL. It is assumed that the bigger city would have a larger pool of resources for schools to utilize, which would give these schools a better opportunity to educate and to improve their students and that Chicago has fewer neighborhood-to-school interactions than that of Champaign, because it is a bigger city, which is also key in educating and improving students. This study hopes to investigate if there are differences in student resources, preparedness, etc. based on the size, racial makeup and socioeconomic makeup of the community/city that they are being educated in. If differences are apparent this research also hopes to offer suggestions in fixing the problem for the sake of student preparedness.

Plasticity in the PFC Following 5-7-9 Postnatal Alcohol Exposure Using Exercise as an Intervention

Ivy Hernandez Delgado, Psychology
Research Mentor: Justin Rhodes

Abstract

Fetal alcohol spectrum disorder (FASD) is an umbrella term used to describe the wide range of deficits caused by exposure to alcohol in utero. Lack of restraint from conducting a behavior or a psychological process, is often impaired in these individuals (inhibition). One region that is attributed to this lack of inhibition is the medial prefrontal cortex. GABAergic parvalbumin interneurons (PV+) play a role in the inhibition surrounding neurons in the medial prefrontal cortex. Therefore, we hypothesize that alcohol exposed individuals will have less PV+ cells compared to their control counterparts. This study used C57/6J male adolescent mice. These subjects were divided into two groups, alcohol exposure (20% ethanol solution at 5 g/kg) or saline. Behavioral testing occurred between PD72-79. Subjects were tested on the Passive Avoidance task and Rotarod. On 85 PD mice were anesthetized, perfused using saline, and the brains processed using Parvalbumin antibody. Preliminary results show a decrease in PV+ cells in alcohol exposed subjects compared to control groups. Further, alcohol exposed subjects exhibited an increased latency to learn the passive avoidance task. Both the number of PV+ cells and the level of inhibitory control were decreased with prenatal alcohol exposure infer the differences in inhibition between the groups; can be seen by quantity of the PV+ cells in the medial prefrontal cortex. These results show the long term impact prenatal alcohol exposure have on the functioning and anatomy of the medial prefrontal cortex.

“Being 100”: Social Justice Youth Development Among Black Youth

Alexander Horton, African American Studies and Sociology
Research Mentor: Helen Neville

Abstract

Scholars and community leaders have voiced concerns about the recent decrease in youth civic engagement. This is a concern because research indicates that participating in civil society during adolescence promotes effective decision making, strategic thinking, and other components of democracy. Extant scholarship on youth engagement primarily considers mainstream forms of civic engagement. There is a dearth of information on urban African American youth's understanding of and participation in civic and community work. This study will address the gap by using social justice youth development theory to center the voices of African American youth in describing their own experiences with activism.

Chicago Black Mother's Project on Violence, Depression, Resilience, and Sociogenomics

Osazomon Imarenezor, Chemistry
Research Mentor: Ruby Mendenhall

Abstract

This paper explores the South Chicago Black Mothers' Resiliency Project that examines issues of violence, resilience, depression, and sociogenomics within the Chicago Englewood neighborhood. This study reviews the stories of 93 low-income single women from the Black Mother's Chicago project and their reasons for parenting decisions. This study looks at how the single mothers view themselves as women and as parents while living in neighborhoods with high levels of violence crime. The findings fall into three main categories: commitment to well-being, resiliency and sacrifices. We see that there is a serious commitment of the mothers to ensure that their children have the safest and enriched experience growing up in their own neighborhoods. The mothers exhibit their resiliency through an adaptation of their environment by tapping into their resources and hunkering down within their homes and neighborhoods. Lastly, these mothers are also consistently sacrificing their daily lives in order to ensure their children are healthy, and successfully functioning.

East African Water and Sanitation Inequities: Activism for Maternal and Child Health

Arianna Jenkins, Psychology and Political Science
Research Mentor: Asata Zerai

Abstract

In developing countries, one of the current issues for populaces in both urban and rural areas deals with the percentage of people who have access to quality water and sanitation facilities. Research suggests that there is a major disparity in the distribution of improved water and sanitation facilities based on geography and the effects that it has on its' people. This research considers the existing socioeconomic, political, and environmental state of Sub-Saharan Africa (SSA) in relationship to the Millennium Development Goals (MDGs). Through an extensive literature review, meta-analysis and comparative analyses across countries using Demographic and Health Surveys and World Health Organization statistics, this paper will focus on water and sanitation technologies in Kenya, Uganda, and Tanzania. Here it is argued that childhood morbidity and maternal health disparities cannot be fully understood without the inclusion of research regarding their health and environmental resources. Through an Africana feminist lens, the benefits and drawbacks of the present water and sanitation technologies in East African countries are analyzed for further insight to health and environmental anomalies. Finally, the goal is to unveil suggestions for future policy implementation and possible variables affecting maternal and child health.

“A mi nadie me ayudaba: Scholl Readiness Beliefs and Involvement of Latina Mothers and Preschoolers

Jazmin Landa, Kinesiology

Research Mentor: Renee Baillargeon

Abstract

Research has recently shown that the number of Latino children in the U.S. education system continues to increase. Additionally, Latino children are at a greater risk for not being prepared upon their entrance to school. Such unpreparedness puts Latino children at higher risk for facing lifetime challenges (e.g., school dropout, financial hardships). Scholars have also identified the inconsistency in defining school readiness. Most of the research on school readiness focuses on white, middle-class families and therefore such findings cannot be generalized to Latino families given its lack of culturally contextualized models. As a result, the purpose of this study was to examine Latino parents' perspectives on what school readiness means, as well as what they are doing to ensure that their child is ready for school. The study used a series of qualitative in-depth interviews with low-income, Latina mothers of preschool age children transitioning to kindergarten. Mothers were recruited from a Head Start program in a large Midwestern Northwest suburb. Using an interpretative approach, we analyzed the interviews as well as used the qualitative data analysis program, N-Vivo, to interpret the data. Using these strategies, we hope to have a better understanding of Latino parents' perspectives on school readiness. Such findings will allow us to suggest effective ways Latino parents can contribute to their children's academic success.

Multiplex Protein Analysis of Glioblastoma Multiform Cancer Cells Through the Use of Microring Resonators

Ruth Londono, Integrated Biology

Research Mentor: Ryan Bailey

Abstract

Next generation cancer treatments rely on molecular diagnostics to identify the patients that would benefit from treatment. These diagnostics are part of the larger field of personalized medicine. One branch of molecular diagnostics is the detection of phosphoproteins that drive cancer growth and proliferation. Phosphoprotein information is limited because most current methods focus on a single target. Microring resonator arrays allows for the detection and analysis of multiple phosphoproteins. In this study, microring resonators, which are silicon photonic biosensors, are applied to samples of cell lysate from cancer cell culture. Microring resonators are capable of up to 32-plex analysis. We use this multiplexing capability to detect multiple phosphoprotein targets in a single assay. This assay can analyze 12 phosphoprotein levels simultaneously in less than two hours. The method is capable of monitoring changes due to cell state and environmental alterations. Future implications of this study include monitoring changes in cancer cells due to treatment, differentiating and classifying cancer cells as well as cancer stages, and studying the effects of oncogenes in protein signaling.

Exclusion within Inclusion: The Alienation and Retention Effects of Black Students on Campus

Aaminah Long, Psychology
Research Mentor: Kristina Riedel

Abstract

While many universities have taken the initiative to diversify campus enrollment, some still contend issues of maintaining the population. This is especially true for predominantly white institutions, where severe underrepresentation of Black students is common. Such institutions require access to psychological and socio-cultural dimensions to address low retention rates of Black students. This research analyzes the phenomena of alienation affiliated with Black students described at a predominantly white, elitist post-secondary institution. Through a series of interviews and review of existing data, this study aims to assess the psychological nature of alienation and academic satisfaction among Black students at post-secondary institutions.

Analysis of Hospital Charges: Comparing Three Services in Illinois

Javier Lopez, Community Health
Research Mentor: Stephen Notaro

Abstract

Hospital charges vary greatly among facilities even in those that are within a 10 mile radius. Establishing procedure costs within a hospital is a complicated process where many factors can be taken into account such as overhead costs, equipment, and location. Hospitals have their own charges for procedures that can vary greatly within each individual hospital. Hospitals charge a lot higher than their actual costs in order to compensate for unpaid bills and other expenses. My research question is to what extent do hospitals charge different rates for the same diagnoses? The services/diagnoses being compared are heart failure, pneumonia, and urinary tract infection. These diagnoses were selected due to their regularity and are generally treated in a majority of hospitals.

The Effect of Immunoaffinity Column Chromatography Elution Buffers on HDL Apolipoprotein Detection

Viridiana Luna, Molecular and Cellular Biology

Research Mentor: Flavia Andrade

Abstract

High-density lipoproteins (HDL) are complex particles composed of lipids and apolipoproteins. The major function of HDL is to transport cholesterol from peripheral tissues to the liver. HDL apolipoproteins include apoA1, a major structural apolipoprotein; apoCIII, a protein that inhibits binding of apoE and apoB-100 to hepatic receptors; and apoE, a ligand for the low-density lipoprotein (LDL) receptor, apoE receptor, and LDL receptor related protein. Immunoaffinity column chromatography methods are frequently used to isolate HDL subspecies. Therefore, it is important to understand how elution buffers may be affecting protein detection and potentially denaturing proteins. In order to optimize immunoaffinity column chromatography elution conditions, we tested the effects of two elution buffers, acetic acid and sodium thiocyanate (NaSCN), on apoA1, apoCIII, and apoE. We tested the elution buffers for: number of elutions required to elute protein, protein recovery, and reduction of protein detection after treatment with elution buffer. Plasma samples containing known concentrations of apolipoproteins listed were used. This allowed us to compare expected concentrations and measured concentrations after treatment. The sandwich enzyme-linked immunosorbent assay (ELISA) method was used to quantify protein concentrations. The results of these experiments will allow us to maximize protein recovery and account for loss of protein detection due to treatment with elution buffers.

Educational Expectations that Low-Income African-American Mothers Have for Their Preschool-Aged Children

Theola Maxon, Kinesiology

Research Mentor: Robin Jarrett

Abstract

Regardless of the limited resources that often exist in many urban neighborhoods, research has documented high educational expectations (i.e. completion of high school/post-secondary school, admission to selective colleges, etc.) among many low-income African-American families. To better understand how these families navigate their neighborhoods and identify resources that can promote their child's educational achievements, this study will take an interpretive approach to explore the lives of low-income African-American mothers with children entering their first year of primary school. This study is significant because it takes a resiliency, as opposed to a deficit approach to explore the educational process of low-income African-American children.

School Readiness: Insights from Low-income, African American Mothers

Lilli Melero, Psychology
Research Mentor: Robin Jarrett

Abstract

Research has shown that low-income, African American children are disproportionately at risk for not being ready for school. Children who are unprepared for kindergarten are at risk of lifetime disadvantages (e.g. school dropout, antisocial behavior, premature parenting). Research also suggests that perceptions of school readiness vary and that families and schools may have different viewpoints on what constitutes school readiness. The purpose of the research is twofold: First we examine to explore parents' perspectives of what school readiness means. Second, we examine what parents are doing to promote their children's readiness for school. The study draws upon a series of in-depth interviews with low-income, African American mothers of pre-school age children transitioning to kindergarten. Caregivers were sampled from families using a Head Start program in an inner-city neighborhood in Chicago. An interpretive approach guides the analysis of the interviews. N-Vivo, a qualitative data analysis program, will be used to aid in analysis and interpretation, as well as data displays and memos. These strategies will allow us to identify key themes and patterns among parents. The study of school readiness will make substantive and applied contributions. More specifically, the research will add new knowledge on school readiness from the perspective of parents, and elaborate on existing knowledge. Our findings will be particularly relevant for preschools and elementary schools. These findings will determine effective ways for schools and families to collaborate to enhance children's readiness for school.

The Connections between Social Anxiety and Curiosity

Brenda Mendez-Gutierrez, Psychology
Research Mentor: Howard Berenbaum

Abstract

Among the anxiety disorders, social anxiety is second only to generalized anxiety disorder for comorbidity with major depression (Kessler et al., 2005). It can be defined as an extreme and irrational fear of social circumstances or performance situations; anxiety can arise from the fear of being closely watched, judged, and criticized by others, he or she can be afraid of making errors, looking bad, and being embarrassed or humiliated in front of others (Holt, Heimberg, Hope, & Liebowitz, 1992). Some may also worry that the symptoms like shaking or sweating palms will be visible to others and lead other people to assume that they are extremely anxious (Roth & Antony, 2001). Furthermore social anxiety has been linked to body dysmorphic disorder (Kelly, Walters & Phillips, 2009), social phobia, stress, fear in social situations and behavior submissiveness (Weeks, Heimberg, & Heuer, 2011). This makes social anxiety a very stressful disorder to handle and can cause major problem in one's life. Visual perception is influenced by the environment but can also be altered by mood. In fact, jealousy is a key player in altering vision. This study will explore the connection between visual perception, including hallucinations, and jealousy. By showing if there is a connection between visual perception and jealousy, we can improve the diagnosis of hallucination .

Discovering Characteristics and Photosynthesis Rates of African Cassava Cultivars

Ahrianna Mitchell-Sodipe, Food Science and Human Nutrition

Research Mentor: Stephen Long

Abstract

An estimated 795 million people around the world are food insecure. The majority of these people are in Sub-Saharan Africa, Asia, and South America where cassava is a major food crop. Cassava, grown mainly by poor family farmers, can be grown in poor soils, is drought tolerant, and has a high yield potential. There is a direct correlation between increased photosynthetic rate and an increase in yield. Our goal is to determine the photosynthetic rate of African cassava cultivars for further improvement. If successful, we hope to increase cassava yield to decrease global food insecurity.

Promotora Model as a Method of Health Intervention in US Latino Immigrant Populations

Ramona Montez, Human Nutrition

Research Mentor: Angela Wiley

Abstract

Many of the health disparities experienced by Latino immigrants add up to Metabolic Syndrome. Metabolic Syndrome is defined as “a cluster of several cardio-metabolic risk factors” such as high blood pressure (hypertension), large waist circumference, high fasting glucose levels, low high-density lipoprotein cholesterol (HDL-C) levels, and elevated triglyceride levels. All of these risk factors combined identify individuals with elevated risk of cardiovascular disease (CVD) and Type 2 diabetes. In the 2006 Mexican National Health and Nutrition Survey, it was discovered that 30% of adults (20+ years) of both sexes were obese, and more than 40% of Mexicans had 3 or more Metabolic Syndrome components, indicating that the Mexican population in general is particularly vulnerable to contracting Metabolic Syndrome. In order to work with all of the aforementioned disparities, there has been a recent upswing in the number of Promotoras in the US to work with disadvantaged Latino communities. By definition, Promotoras are “trusted health care workers of underserved, at-risk Hispanic communities experiencing social and health inequities.” Promotoras are especially effective in this setting because they are “lay members of communities who work either for pay or as volunteers in association with the local healthcare system in both urban and rural environments and usually share ethnicity, language, socioeconomic status and life experiences with the communities they serve.” Because of this, they know the social dynamics and networks as well as the strengths, needs, and challenges that are specific to their communities.

Accelerated 4D Flow MRI Using a Shared Subspace Constraint

Miguel Moscoso, Electrical Engineering
Research Mentor: Zhi-Pei Liang

Abstract

Cardiovascular diseases are the leading cause of death in the world, more than the next three leading causes of death combined. Cardiovascular imaging techniques have allowed for the study and understanding of the function and structure of the heart as well as the detection, diagnosis, and monitoring of cardiovascular diseases in patients. One powerful technique for cardiac imaging is 4D phase contrast magnetic resonance imaging (PC-MRI) which allows measurement of blood flow velocity in the heart and vessels. However, 4D PC-MRI is difficult to perform due to low imaging speed and is therefore often carried out using accelerated imaging techniques which reconstruct images from reduced data. One approach for accelerating PC-MRI is explicit-subspace low-rank imaging; this project focuses on further accelerating explicit-subspace low-rank PC-MRI through the use of a shared temporal subspace between PC-MR images with velocity encoded in different directions. We will: a) investigate the subspace structure of the differently encoded images to verify that they indeed live in a shared subspace; b) evaluate the feasibility of estimating this shared subspace from reduced auxiliary data (which has direct implications on the frame rate of the resulting images); and c) demonstrate the utility of exploiting this subspace structure when performing image reconstruction from reduced data.

Uncle Sam's Pastime: La Liga Mexicana and the Hegemony of Major League Baseball, 1942-1948

Mariano Nava, History
Research Mentor: Adrian Burgos, Jr.

Abstract

Uncle Sam's Pastime: La Liga Mexicana and the Hegemony of Major League Baseball, 1942-1948 is about how millionaire mogul Jorge Pasquel and La Liga Mexicana (the Mexican Baseball League) challenged the hegemony of Major League Baseball in a time where one's race not only dictated their worth but also their livelihood. This story analyzes how Pasquel, La Liga and those who played south of the border were framed and presented differently in English and Spanish-language mainstream newspapers to U.S. (white) and Latino (Mexican) audiences during World War II. The representations of La Liga Mexicana— and by default Pasquel, the players and more broadly Mexicans— presented in the media gives insight to the race relations and sentiments between U.S. (white) and Latino (Mexican) peoples during the 1940's, a period that witnessed the United States enter World War II which resulted in an influx and exploitation of Latino (Mexican) labor across many U.S. industries, baseball included.

Investigating Student Learning and Online Homework Tools

Chinedu Nwoko, Molecular and Cellular Biology

Research Mentor: Sarah Grison

Abstract

Many different learning tools are used in the field of education, but not enough thought is given as to how effective these tools are and whether there are more efficient alternatives that would better facilitate student learning. In this research, there are two major strategies that will be implemented: the first method is the development of online tests to gauge student performance and learning from video, audio, and text (to see which method of teaching correlated with the higher scores), and the next will be to investigate the development of students' critical thinking skills using homework questions. These experiments are designed to see what different tools actually enhance the teachers' ability to convey information and/or students' ability to understand and apply key ideas. The research and testing is more geared towards psychology students, but the results should be able to be applied in all fields of study.

Can Our Children Really Learn This Way? Discovering the Impact of the Afrocentric Curriculum

Ashley Ojiemwen, Speech and Hearing Sciences

Research Mentor: Ruby Mendenhall

Abstract

The current state of education for African American children continues to fall behind the academic achievements of White American children. I offer an Afrocentric curriculum to improve the current state of education for African American children. The need for improvements to access for African American children's educational success is longstanding in research. While many researchers identify failure in African American academic achievements, Afrocentric scholars offer the development of the Afrocentric curriculum has a solution to increase self-esteem, academic success, and systematic/institutionally structure awareness. This research discusses the development of the Afrocentric curriculum. Scholars debate the use of the Afrocentric curriculum in a kindergarten through 12th grade public education, and I will show the current case studies that argue for and against its use. My research finds strengths and challenges with the use of the Afrocentric curriculum. The Afrocentric curriculum can be empowering if the environment, the school, administrators, teachers, and students, are fully committed to the social, educational, and personal changes and principles that are essential to the Afrocentric curriculum.

“Mommy, Can You Help Me?” An Ethnographic Look at Maternal Involvement from Pre-school to Kindergarten

Anita Oladunni, Human Development and Family Studies
Research Mentor: Robin Jarrett

Abstract

When parents are more involved in their child’s educational process, children tend to do better in school. However, research has shown limited parental involvement among low-income African-American families. Building upon previous school readiness research, this study uses an interpretive approach to explore the facilitators and barriers that affect parental involvement among African-American mothers living in a low-income Midwestern neighborhood. This research is significant because once we gain a better understanding of the factors that contribute to the involvement of low-income families, effective strategies can be developed to strengthen their involvement and increase the school readiness of low-income African-American children.

Analysis of Social Needs and Chronic Conditions of the Uninsured Utilizing a Free Clinic

Anuoluwapo Osideko, Community Health
Research Mentor: S. Notaro & K. Ibe-Lamberts

Abstract

The number of medically uninsured people in the United States rose from 46 million in 2008 to 50.7 million in 2009. This population cannot access medical care partially due to the decrease in employment-based health insurance and constant increase in health care cost. Free health clinics job is to ensure access to health care by providing care for underserved populations, and ultimately to lower the racial gap health disparities. The purpose of this research is to analyze the demographic characteristics and medical needs of the uninsured through self-diagnosis while using a free clinic. Data were collected from a sample of 2,000 low income, uninsured residents of Champaign County. Secondary data will be analyzed using descriptive and inferential statistics. Results indicate that there is a positive association between self-diagnosis and treatment. Measuring the effectiveness of self-diagnosis contributes to the larger body of research by determining if the perceived needs of those utilizing free clinics are being met. If preventative care is improved through self-diagnosis and treatment, this subsequently saves money by reducing emergency room visits.

Optimization of a Signal Enhancement Strategy for the Detection of MicroRNA Using Silicon Photonic Microring Resonator Arrays

Christopher Para, Chemistry and Communication

Research Mentor: Ryan Bailey

Abstract

MicroRNAs (miRNAs) are an important class of non-coding RNA molecules, regulating gene expression at the transcriptional and post-transcriptional level. As potent gene regulators, miRNAs have been linked to developmental processes and establishment and maintenance of tissue differentiation. As a result, miRNA expression in tissue and blood samples can be associated with disease types and stages and be used to fully distinguish tissue types. These findings, among others, have firmly established the diagnostic value of miRNAs. Recently, our group has shown the ability of silicon photonic microring resonators to quantitatively detect miRNA. This technology is scalable, highly multiplexable (128 sensors/chip), and inexpensive (<\$1/assay). Current nucleic acid analysis methods have distinct disadvantages when compared to microring resonators. qRT-PCR is incredibly sensitive but requires expensive reagents and has limited multiplexing capabilities. Conversely, microarrays are highly multiplexable, but labor intensive and expensive. Here we use the microring resonator platform to quantitate expression levels of 7 miRNAs relevant to distinguishing tissue type, while also leaving sensors to normalize data and compare the results to those obtained from qRT-PCR (the current gold standard).

Mitochondrial Redox Homeostasis in Hypoxia via a Microfluidic Platform

Taylor Person, Animal Science

Research Mentor: H. Rex Gaskins

Abstract

Significant research has been conducted on cancer, the molecular basis of metastasis, malignancy, and the signaling pathways that lead to these conditions. However, limited research has been conducted regarding the tumor microenvironment, specifically its constraints and limitations. Researchers have found that the study of tumor molecular genetics is limiting because the heterogeneity of DNA mutations associated with cancer make it difficult to develop innovative treatments that target every specific gene. Our approach targets aspects of the tumor microenvironment that are common in every cell. One such aspect is mitochondrial metabolism. Mitochondria are universal in every cell. It is well known that mitochondria have DNA that is passed down from mother to offspring. Mutations of this DNA can also lead to cancer transformation. This research will determine if certain characteristics of the tumor environment, such as the partial pressure of oxygen, affect mitochondria, as a part of a larger project explaining the relationship between mitochondrial REDOX homeostasis and tumor cell metabolism. The effects that the condition called hypoxia, or a reduction of oxygen supply, has on mitochondria will be specifically studied. A novel 3D culture model will be constructed and validated, that allows the observation of tumor cells in real time. This model will be specially designed to allow the investigator to control the levels of O₂. The mitochondrial glutathione redox cycle will be targeted via genetically programmed redox-sensitive GFP-based fluorescent proteins in order to assay the chemical environment involved in metabolism. The results of this study could shed light on additional mechanisms by which cancer cells can overcome hypoxia and progress into aggressive malignancy.

Women with Diabetes and Depression: A Systematic Review Discussing Comorbidity Within the U.S.

Caroline Quintanilla, Social Work
Research Mentor: Karen Tabb Dina

Abstract

Women and minorities tend to experience greater rates of diabetes and depression. Based on a review of the existing literature, this study sought to determine the comorbidity of these diseases among ethnic women, with particular attention to pregnant and elderly women. Studies found that comorbid diabetes and depression is significantly prevalent in these samples. This indicates that through detection of diabetes in ethnic women, easier detection of depression will occur, or vice versa. This would rapidly increase the detection of both diseases in primary care settings, which has positive implications regarding potential expansion of prevention programs for diabetes and depression.

Use of Social Networking Applications and Sexual Interactions among Latino MSM

Xavier Ramirez, Social Work
Research Mentor: Julie Dowling

Abstract

New advances in communication technology have drastically altered the manner in which people interact with each other. Finding romantic and sexual partners can now be done so on the Internet as well as on cell phone devices. This exploratory case study focuses on Latino Men who have Sex with Men (MSM) who use GPS (Global Positioning System)-based social networking applications on cell phones and other electronic devices. Specifically, this project utilizes a mixed methods approach—surveys and in-depth interviews—to examine how Latino MSM between the ages of 18-24 living in Chicago utilize such social networking applications to meet other MSM and negotiate condom use. Little is known about how the use of location-based social networking applications contributes to users' participation in spontaneous sexual encounters and importantly, how condom use unfolds during sexual encounters. The findings of this study will provide insight into how Latino MSM communicate with other MSM about STD and HIV status and negotiate condom use. This knowledge can be utilized to inform sexual health interventions and programs for Latino MSM.

White Matter Changes in the Brains of Adults with Tinnitus

Ariana Romero, Speech –Language Pathology

Research Mentor: Fatima Husain

Abstract

Tinnitus is a hearing disorder that causes the sensation of noises to be heard when there is no source generating it (“ringing in the ears”). Many people that experience tinnitus become depressed or anxious and are left with a sense of not wanting to participate in their daily activities. Tinnitus affects about 10-20% of the population (American Tinnitus Association, 2012). White matter tracts in the brain connect different brain regions and conduct information between these regions. In this study, we will examine white matter tracts through diffusion tensor imaging (DTI) that allows us to investigate the manner in which the white matter tracts are organized in patients with differing tinnitus severity with also taking into consideration the limbic and attention areas of the brain. This information can give important insights into neural mechanisms underlying tinnitus perception. Currently there is no cure for tinnitus. As a result of conducting this study, better understanding of tinnitus’ neural mechanisms will then lead to better therapy treatments.

Evaluation of Bone Tissue Decalcification Methods for Use in Tissue Engineering Research

Diamond Stevens, Interdisciplinary Health

Research Mentor: Matthew B. Wheeler

Abstract

Developing tissue engineering implants to treat severe bone injuries requires studies using large animal model systems, such as swine, before human clinical trials can be considered. Use of large animals for bone tissue studies is complicated by the need to use harsh chemical agents to decalcify the bone. To take full advantage of modern, commonly used histological techniques for data generation, the bone must be decalcified in order to soften it enough so that it can be sectioned. However, prolonged or improper exposure to harsh chemical decalcification agents can destroy the tissue and make it useless for data gathering. The goal of this work is to determine which, decalcifying agent treatment gives the best combination of sectioning, histochemical staining, and immunostaining competence in swine radius bone specimens. The three decalcification agents we investigated were trifluoroacetic acid (TFA), CalciClear Rapid, and Nitric Acid (HNO₃). These findings will help us to develop better experiments using swine as a model for bone tissues engineering.

Mentoring Mexican-American College Women: A Study of the Role of Race/Ethnicity in Shaping Mentoring Relationships and Experiences

**Jasmine Patron Vargas, Human Development & Family
Studies**

Research Mentor: Ana Soltero

Abstract

Research indicates that mentoring has a positive impact on one's career and educational trajectory and is noted as one of the most critical resources for academic success. Specifically, mentoring has been shown to be relevant for the career experiences and advancement of individuals from particular groups, such as women and members of marginalized racial and ethnic groups. Furthermore, some studies also suggest that mentoring relationships, in which mentors and mentees share similar attributes, such as racial or ethnic identification, may contribute to more positive mentoring experiences. But do such findings also apply to the mentoring relationships and experiences of college students? This qualitative study examines the mentoring relationships and experiences of Mexican-American young college women. Through in-depth interviews, this study explores if and how shared racial/ethnic identification in a mentoring relationship shapes the educational experiences of young Mexican American women currently enrolled in college.

Silicone Elastomer Blends

Gabriel Velarde, Material Science and Engineering

Research Mentor: Kevin Kim

Abstract

Silicones currently remain as a relatively new polymer material class that has surpassed numerous benchmarks in regards to functionality, applicability, and finally, costs. This paper aims to provide a comprehensive review of the current standing of the multifunctional silicone field. Namely, discussion regarding the discovery, chemical structure, applications, and future work will be carried out to provide the reader with a fundamental understanding of the topic at hand. Nonetheless, with such a background established, readers may begin to develop the necessary mindset in incorporating the silicone polymer material class within the fields of electronics, composites, and biomaterials.

The Literary Self: An Examination of a Contextual Black Identity

Jarvis Young, English

Research Mentor: Christopher Freeburg

Abstract

By analyzing the works of Ottobah Cugoano's *Thoughts and Sentiments* and *David Walker's Appeal*, I argue that a particular literary self appears contextually in the form of a political agitator which represents black identity. By using the literary self in their polemical essays, Cugoano and Walker are able to "humanize the African" (Gunn, 2). The political agitator is the literary "self" displayed in both texts. The significance of examining the political agitator is to see who Cugoano and Walker appear to be when writing their political documents. In essence, Cugoano and Walker use a polemical self in order to state their claims. Some of the major questions I will address are, why use a political agitator self to convey a message, and what was at stake for the African race during the late eighteenth and early nineteenth centuries, and if proven human, what would happen to slavery? Wheatley was able to prove that African slaves were capable of producing poems and heroic couplets which suggests that African slaves could be poets. Likewise, by producing polemical documents, Cugoano and Walker are able to prove how African slaves could be political agitators and write scholarly. Their method, like Wheatley, was through writing (essay) since literacy was the primary way to prove the human status of Africans. We will find that both Cugoano and Walker have presented the "literary self" polemically, but structurally different.



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