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MCNAIR POST-BACCALAUREATE ACHIEVEMENT PROGRAM

The McNair Program was established at FIU in 2002 and since that time has inducted over 200 undergraduate students majoring in the different STEM fields of study.

Congress established a series of programs, funded under Title IV of the Higher Education Act of 1965, to help low-income Americans enter college, graduate and ultimately progress to become experts in their field. The Ronald E. Post Baccalaureate Achievement Program was established in 1986. The McNair program was named after Ronald E. McNair who passed away during the explosion of the Challenger Space Shuttle on January 28th, 1986. Its primary goal is to increase the number of Ph.D. students among groups under-represented in graduate education. Presently, there are over 156 academic institutions that house the McNair Program. Benefits of the program include faculty mentorship, opportunities to present research at various graduate school enrollment opportunities, and a generous stipend.

The Ronald E. McNair program prepares students from disadvantaged backgrounds who have demonstrated strong academic potential for doctoral studies through involvement in research and other activities. The McNair program works closely with students as they complete their undergraduate requirements. The program also encourages students to enroll in graduate programs and then track their progress through successful completion of advanced degrees. The goal of the McNair program is to provide enriching scholastic experiences that prepare eligible scholars for doctoral (Ph.D.) education. To this end, participants are given the unique opportunity of developing the highest-level academic and research skills needed for successful admission to and completion of a Ph.D. program. McNair scholars are eligible for the following services until they complete their baccalaureate degree: academic counseling, financial aid assistance, mentoring, research opportunities, seminars, summer internships, and tutoring. Furthermore, program staff will always be ready to provide moral support, advice and guidance to all McNair alumni throughout their graduate years as they pursue their doctoral degrees.
DR. RONALD ERWIN McNAIR

The McNair Program is named in honor of Dr. Ronald E. McNair, the laser physicist and Challenger space shuttle astronaut. McNair graduated magna cum laude from North Carolina Agricultural and Technical State University in 1971 and received his Ph.D. from Massachusetts Institute of Technology in 1976. He was selected by NASA for the space shuttle program in 1978 and was mission specialist on the successful 1984 Challenger flight before his death in the space shuttle accident of 1986. Those who knew Ronald McNair characterized him as fearless, determined, and accustomed to applying all available resources to any problem he faced.

Ronald E. McNair was the second of three mission specialists aboard Challenger. Born on October 21, 1950, in Lake City, South Carolina, McNair was the son of Carl C. McNair, Sr., and Pearl M. McNair. He achieved early success in the segregated public schools he attended as both a student and an athlete. Valedictorian of his high school class, he attended North Carolina A&T State University where in 1971 he received a B.S. degree in physics. He went on to study physics at Massachusetts Institute of Technology, where he specialized in quantum electronics and laser technology, completing his Ph.D. in 1977. As a student he performed some of the earliest work on chemical HF/DF and high pressure CO lasers, publishing path breaking scientific papers on the subject.

McNair was also a physical fitness advocate and pursued athletic training from an early age. He was a leader in track and football at his high school. He also became a black belt in Karate, and while in graduate school began offering classes at St. Paul’s AME Church in Cambridge, Massachusetts. He also participated in several Karate tournaments, taking more than 30 trophies in these competitions. While involved in these activities, McNair met and married Cheryl B. Moore of Brooklyn, New York, and they later had two children. After completing his Ph.D. he began working as a physicist at the Optical Physics Department of Hughes Research Laboratories in Malibu, California, and conducted research on electro-optic laser modulation for satellite-to-satellite space communications.

This research led McNair into close contact with the space program for the first time, and when the opportunity presented itself he applied for astronaut training. In January 1978 NASA selected him to enter the astronaut cadre, one of the first three Black Americans selected. McNair became the second Black American in space between February 3 and 11, 1984, by flying on the Challenger shuttle mission STS-41-B. During this mission McNair operated the maneuverable arm built by Canada used to move payloads in space. The 1986 mission on which he was killed was his second Shuttle flight.

Dr. McNair graduated magna cum laude from North Carolina A&T (‘71) - named Presidential Scholar (‘67-’71), Ford Foundation Fellow (‘71-’74), National Fellowship Fund Fellow (‘74-’75), NATO Fellow (‘75) - winner of Omega Psi Phi Scholar of Year Award (‘75), Los Angeles Public School System’s Service Commendation (‘79), Distinguished Alumni Award (‘79), National Society of Black Professional Engineers Distinguished National Scientist Award (‘79), Friend of Freedom Award (‘81), Who’s Who Among Black Americans (‘80), an AAU Karate Gold Medal (‘76), 5 Regional Black belt Karate Championships. Dr. Ronald E. McNair died on January 28, 1986 when the Space Shuttle Challenger exploded after launch from the Kennedy Space Center, Florida.
November 18, 2010

Dear Reader:

I am pleased to offer this publication representing the research activities of the Ronald E. McNair Postbaccalaureate Fellows at Florida International University. In its second cycle of funding from the United States Department of Education, the McNair program has served well over eighty students, many of whom are enrolled in masters and doctoral (Ph.D.) programs at some of the nation’s most prestigious institutions of higher learning.

Central to the core mission of Florida International University is the provision of high quality undergraduate research experience for its students. FIU is quite fortunate to be the recipient of only four Ronald E. McNair Postbaccalaureate Achievement grants in the state of Florida and the only one in Miami-Dade County. The central mission of the McNair program is to expose our undergraduate students to cutting edge research conducted by world class faculty. Each year FIU selects twenty-two such students and pairs them with faculty involved in scientific research in a variety of STEM disciplines—Engineering, Biomedical Engineering, Chemistry, Physics, Mathematics, etc.

It goes without saying that the entire staff of the McNair program here at FIU is extremely proud of the many achievements of our McNair Fellows. It is for this and other reasons that we gladly share with you this publication which aptly describes some of the research activities of our McNair students. I am certain that you will find the reading of the research papers as enjoyable and enlightening and I did when I first read them.

Sincerely,

Dr. E. George Simms
Director, Pre-Collegiate, Grants
& Ronald E. McNair Programs
Dear Dr. Simms,

I am pleased to introduce the Florida International University Ronald E. McNair Research Publication. The document illustrates some of the outstanding research activities of our McNair students.

In its second cycle of funding from the United States Department of Education, the McNair program makes it possible for a select group of students to engage in high quality research under the tutelage and guidance of world class research faculty. FIU is the only McNair grant recipient in South Florida.

McNair Students typically have economically disadvantaged backgrounds but demonstrate strong academic potential. The goal of the McNair program is to increase the number of FIU students majoring in Science Technology Engineering and Mathematics disciplines (STEM) who subsequently obtain PhD degrees.

In its brief history, the FIU McNair program has already established itself as a highly successful program with many of its graduates publishing their research in highly respected scientific journals and pursuing graduate degrees at leading research universities.

Regards,

Dr. Douglas Wartzok
Executive Vice President and Provost
November 20, 2010
Dr. E. George E. Simms
Director of Pre-Collegiate Programs
Florida International University
University Park, MARC 414
Miami, FL 33199

Dear George,

I extend my sincere congratulations to the students and staff of the Ronald E. McNair Post Baccalaureate Achievement Program on the publication of the research activities of the McNair Fellows. It is evidence of the hard work and dedicated efforts of both the faculty mentors and students alike. Graduate education and research are extremely valuable, and the research experience the McNair program provides will undoubtedly bode well for any graduate endeavor. The program has successfully prepared program participates from disadvantaged and underrepresented groups for doctoral education.

The unique opportunity afforded by the FIU McNair Faculty is paramount to assist and support low income, first generation college students, and those from underrepresented groups in pursing doctoral studies.

I congratulate each of our McNair Fellows, and wish them continued success in all future endeavors.

Sincerely,

Kevin O’Shea, Ph.D.
Dean of the University Graduate School
Dear Ronald E. McNair Students, Faculty and Staff:

On Behalf of the Division of Student Affairs, I am pleased to offer my congratulations to the Ronald E. McNair program on the publication of the McNair Research Journal. This document represents what I hope will be many publications produced by the McNair program. This premier publication contains a significant body of work by some of Florida International University's finest scholars. It represents what happens when students and faculty work together collaboratively to explore and solve problems of an academic nature. It is indeed the embodiment of teaching and learning at its best. It is for this reason that Florida International University is honored to be the recipient of the Ronald E. McNair program.

Critical to the success of the McNair program and any student directed research is the involvement of dedicated faculty mentors who frequently provide guidance, encouragement and support to each student. We are extremely thankful and appreciative to those faculty members who have opened their laboratories and welcomed our students.

As we begin the second cycle of funding of the McNair program, I look forward with great anticipation and excitement to the program continuing to provide quality research opportunities for some of FIU’s best and brightest students.

Congratulations and best wishes in the coming year!

Rosa L. Jones, D.S.W.
Vice President, Student Affairs
FIU FACTS AT A GLANCE

FLORIDA INTERNATIONAL UNIVERSITY is Miami-Dade County’s first public, four-year university. Our powerful record of innovation and research continues to improve the quality of life in our communities.

HISTORY AND GROWTH: FIU was founded in 1965 and opened for classes in 1972 with 5,667 students – the largest opening day enrollment in U.S. collegiate history. Today it has more than 42,000 students, almost 1,000 full time faculty and more than 150,000 alumni. FIU is one of the 25 largest universities in the nation, based on enrollment. The University offers more than 200 bachelors, masters and doctoral programs in 21 colleges and schools.

FACULTY: Ninety-five percent of the University’s full-time, tenured, and tenure earning faculty hold doctorates or the highest degree attainable in their field.

RESEARCH: FIU emphasizes research as a major component of its mission. Sponsored research funding (grants and contracts) from external sources for the year 2005-2006 totaled $92 million. The University is ranked as a Research University in the High Research Activity category of the Carnegie Foundations prestigious classification system.

NATIONAL RECOGNITION: FIU is the youngest University to have been awarded a chapter of Phi Beta Kappa, the Nation’s oldest and most distinguished academic honor society. FIU recently ranked among the best values in a public higher education in the country, according to Kiplinger’s Personal Finance magazine’s 2006 survey, “100 Best Values in Public Colleges.” FIU ranked among the top 5 nationally for in-state students and among the top 100 nationally for out-of-state and international students.

FIU recently ranked 3rd in granting bachelor degrees to minorities and 9th in granting masters degrees to minorities (among the top 100 degree producing colleges and universities), according to Diverse Issues in Higher Education, June 1, 2006.

FIU’s College of Law led all the universities in the state with the highest pass rate of 94.4% on the 2007 Statewide Florida Bar Examination. The second highest pass rate belonged to Florida State University with 88.2%.

U.S. News & World Report ranks FIU’s undergraduate international business program among the top 15 in the nation and their graduate program among the top 25. The University has also been named one of the “10 Cool Colleges for Entrepreneurs” by Fortune Small Business magazine. Our Executive MBA program was recently ranked in Florida by the Financial Times.

The School of Hospitality and Tourism Management is one of the nation’s top programs. Other acclaimed programs include Creative Writing and Marine Biology.
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Major: Chemistry  
Faculty Mentor: Dr. Prabhakar Pant (FIU)  
Dr. John Essigmann (MIT)  
Research Topic: “Various functions of adaptive response protein AlkB in DNA substrates”

McNair Fellow Presenter: David Jaramillo  
Major: Human Resource Management & Psychology  
Faculty Mentors: Dr. Bennett Schwartz (FIU)  
Research Topic: “Facilitating Team Transactive Memory”

McNair Fellow Presenter: Nadia Lima  
Major: Civil Engineering  
Faculty Mentors: Dr. Leonel Lagos (FIU) and Dr. Michael G. Serrato (Savannah River National Laboratory)  
Research Topic: “Laboratory Testing of Cured Properties of Cellular Grout for its use in Institutional Decommissioning of the 105-P Reactor Disassembly Basin D & E Canal”

McNair Fellow Presenter: Francis Matthews  
Major: Geosciences  
Faculty Mentor: Dr. Laurel Collins (FIU)  
Research Topic: “Miocene Foraminiferal biofacies of the NW coast of Panama”

McNair Fellow Presenter: Camilo Mohar  
Major: Biological Sciences  
Faculty Mentors: Dr. Rita Mukhopadhyay (FIU) and Dr. Tracy Vargo-Gogola (Notre Dame/IU)  
Research Topic: “Overexpression of p190B RhoGAP Alters Expression Levels of Mitotic Genes Involved with Chromosomal Instability”

McNair Fellow Presenter: Alexander Moncion  
Major: Chemistry  
Faculty Mentors: Dr. John Landrum (FIU)  
Dr. Xiaodong Tang (Notre Dame)  
Research Topic: “Measurement of the 12C+12C Fusion Cross Section at Sub-Barrier Energies”

McNair Fellow Presenter: Alvaro Quinonez  
Major: Engineering  
Faculty Mentor: Dr. Girma Bitsuamlak (FIU)  
Dr. John Ochsendorf (MIT)  

McNair Fellow Presenter: Rigoberto Roche  
Major: Biomedical Engineering  
Faculty Mentor: Dr. Michael Christie (FIU)  
Research Topic: “Distribution and Size Effect of Mineral Inclusions on the Presence of Metallic Media”

McNair Fellow Presenter: Andrea Rolong  
Major: Biomedical Engineering  
Faculty Mentors: Dr. Yen-Chih Huang (FIU)  
Dr. Wei Tan and Graduate Student Walter Bonani (Univ. of Colorado)  
Research Topic: Electrospun Nanofiber Scaffold Impregnated with Growth Factors for Small Diameter Vascular Grafts”

McNair Fellow Presenter: Karina Saravia  
Major: Psychology  
Faculty Mentor: Dr. Robert Lickliter (FIU)  
Research Topic: “Early Perceptual Learning in Bobwhite Quail Hatchlings: Timing and Distribution of Exposure”

McNair Fellow Presenter: Luis Saumell  
Major: Mathematics  
Faculty Mentors: Dr. Mirroslav Yotov (FIU)  
Dr. Nero Budur (Notre Dame)  
Research Topic: “Smooth Prospective Toric Varieties”

McNair Fellow Presenter: Maria Talavera  
Major: Biological Sciences  
Faculty Mentor: Dr. Stephen Winkle (FIU)  
Research Topic: “Restriction Enzyme Activity Analysis of Small Molecule Binding to DNA: Considerations of Topology and Flanking Sequences”
I was born in Miami Florida in the summer of 1988, into a humbled immigrant family which now consisting of both my parents and my paternal grandmother and a younger brother. Growing up in an Argentine family truly had its benefits from eating great food to falling in love with soccer. Living in a Spanish speaking home, I did not have the ability to practice English and at a very young age I was placed in an English remedial class (ESOL). Being places in this class was unfortunately keeping me from showing my true potential in other subjects. Learning a new language for the first time, along with your parents, is not easy but it was something I knew I had to surpass to be able to succeed. Thanks to the help of my teachers and to the dedication and effort put further both by my mother and myself, I was able to get out of ESOL. My parents always made it clear to me that the ability to succeed was and will always be within me, but the dedication that I was willing to put forth is what would always allow me to reach my goals. Being able to surpass this hurdle has opened a world of possibilities for me. Incredibly, due to my new accomplishments and my high scores in both math and science, in less than 2 years my life had turned 180 degrees. In middle school and high school I was taking Honors, AP and International Baccalaureate classes. I was also active in science programs such as SECME; I was part of the Varsity Badminton team and volunteered at the Miami Museum of Science (+500 hrs). This is when I decided I wanted to be an engineer and to do so I knew I had to go to college. I believe that earning a PhD is the one of the greatest professional and personal achievements possible. The fact that I would be able to contribute new findings to better the world is priceless. I can only wish to someday mentor a younger student and be able to share my success story to inspire them to do the same. I truly believe that thanks to the McNair Program and my hard work and dedication that I will succeed in reaching my future goals both academically and professionally.

WATER FLOW AND DEPOSITION IN THE WAKE BEHIND CIRCULAR PATCHES OF VEGETATION
Dr. Heidi Nepf & Lijun Zong Department of Civil and Environmental Engineering Massachusetts Institute of Technology

Vegetation patches in rivers have a strong influence on the local flow structure, which changes the sediment transport. However the sediment distribution within and around the vegetation patch will change the shape and the density of the patch. In order to understand the interactions between vegetation patch, flow and sediment transport, flume experiments were conducted to investigate the flow structures and deposition patterns around circular patches of vegetation. Two patch sizes were tested (diameter of 22cm and 42cm). Velocity measurements and flow visualization showed that the wake behind the circular patch is very different from the classical wake behind the solid circular cylinder. The flow through a vegetation patch formed a stabilized region in the wake, where the velocity and turbulence remained low and the deposition was enhanced. At two sides of the patch, the flow rate increased due to the flow diverting, and low deposition was observed. The deposition pattern suggests that, for the circular patch, the patch will grow longer in the flow direction but not grow wider.
Objective

To understand the interactions between vegetation patches water flow and sediment transport.
I was born and raised in Barranquilla Colombia. I moved with my family to the United States almost 7 years ago. I obtained my Bachelors of Science in Biomedical Engineering in the summer of 2010. I love medicine, science and everything related to it. That is why I decided to pursue a career in Biomedical Engineering. I want to be part of an era where medicine and technology work together for the benefit of the patient. In spring 2008 I started working at Dr. Tsoukias' lab in the Biomedical Engineering department. In the fall of that year I got accepted into the MBRS RISE program and that permitted me to continue working in Dr. Tsoukias' lab. In the summer of 2009 I got accepted as a fellow in the REU program at Harvard University. There, I was able to work in Dr. David Mooney's lab which is one of the most important labs in the area of tissue engineering. This year I became a McNair fellow and helped me increase my interest for research. These experiences helped me realize that research was a career option for me and opened up doors that I did not know they existed. In the future, I would like to pursue a PhD in biomedical engineering.

Besides doing research I love to spend time with my family and friends, read, dance, watching a good movie and swimming.

VASCULAR REACTIVITY STUDIES INVOLVING THE ACTIVATION OF NITRIC OXIDE SYNTHESIS BY AGMATINE IN RAT MESENTERIC ARTERIOLES

Vascular tone is regulated by the endothelium by releasing a variety of relaxing factors named endothelium-derived relaxing factors (EDRF). Nitric oxide (NO) falls under this category and is considered an EDRF. NO produced by the endothelial cells that line the interior of blood vessels is enzymatically synthesized by the endothelial nitric oxide synthase (eNOS). It has been demonstrated that NO is a product of NOS-catalyzed oxidation of L-arginine, and this demonstration has increased the interest in the actions of L-arginine. Despite excess levels of intracellular L-arginine, exogenous L-arginine still activates cellular synthesis of nitric oxide (NO) in a phenomenon called “arginine paradox.” Our previously published data (PNAS, 104, 9982, 2007) show that L-arginine or agmatine may be initiating the NO synthesis via receptor binding and release of intracellular Ca+2 in endothelial cells. We hypothesize that exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α-2 adrenoreceptors and therefore activating the production of intracellular NO. In order to perform this study, individual 2nd order mesenteric arteriolar sections from rats (250-300 g male, Sprague-Dawley) were isolated and cannulated at both ends in a vessel chamber. The segments were continuously perfused intraluminally and pre-constricted with norepinephrine (2 µM) in modified Krebs buffer at 37ºC. The vessel chamber was mounted on the stage of a microscope fitted with a video camera leading to video caliper. Mounted vessels were allowed to stabilize for 60 min before initiating experiment. The data show that agmatine completely relaxed the vessel (n=10) and this relaxation could be significantly inhibited with nitric oxide synthase inhibitor L-NAME (0.5 Mm) (n=4), a selective a-2 receptor blocker RX821002 (50nm) (n=4), as well as with pertussis toxin a G-protein blocker (10nM) (n=2). It can be concluded that argmatine dose-dependently relaxed the rat mesenteric artery.
Vascular reactivity studies involving the activation of Nitric Oxide synthesis by Agmatine in rat mesenteric arteries

Zenith Acosta1, Tushar Gadkari1, Nikolaos Tsoukias1 and Mahesh S. Joshi1
1Department of Biomedical Engineering, Florida International University, Miami, FL

ABSTRACT

Vascular tone is regulated by the endothelium by releasing a variety of relaxing factors known as endothelium-derived relaxing factors (EDRF). Nitric oxide (NO) plays a significant role in vascular biology and pathophysiology. The presence of nitric oxide in the vascular system is dependent on the production of NO through the activation of nitric oxide synthase (NOS), which catalyzes the oxidation of L-arginine and releases NO. The vascular relaxing factor NO acts by activating the guanylyl cyclase and increasing the generation of cyclic guanosine monophosphate (cGMP), which in turn leads to vasodilation.

HYPOTHESIS

Agmatine dose-dependently relaxed the rat mesenteric artery. The central hypothesis of this study is that the exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α2 adrenoceptors and therefore activating the production of intracellular NO.

METHODOLOGY

RESULTS AND CONCLUSION

Future work

That exogenous decarboxylated arginine could act as a ligand to receptors such as imidazoline and α-2 adrenoceptors and therefore activating the production of intracellular NO.

REFERENCES

The following set of experiments investigated whether exposure to the amodal property of tempo in synchronous bimodal audiovisual stimulation, which is available in the natural environment, could educate infants' attention to tempo in a more difficult context, such as unimodal visual stimulation. Two-month-old human infants were exposed to a toy hammer tapping on a surface under two experimental conditions (synchronous bimodal audiovisual, unimodal visual) and one control condition (asynchronous bimodal audiovisual). The experimental groups received 4-15 second trials of either 1) synchronous bimodal audiovisual pre-exposure (video synchronized with its own soundtrack) or 2) unimodal visual pre-exposure (silent video) to the temporal features of a hammer tapping a specific rhythm on a hard surface, each followed by unimodal visual infant-controlled habituation to the same rhythm. The control group received 4-15 second trials of pre-exposure to asynchronous bimodal audiovisual stimulation (video with a temporally misaligned soundtrack), which was then followed by unimodal visual infant-controlled habituation. All experimental and control groups received 2 infant-controlled unimodal visual test trials depicting a toy hammer tapping the same rhythm during habituation, with a different temporal pattern. Our results suggest that 2-month-old infants were able to discriminate a change in tempo in the unimodal visual habituation session following synchronous bimodal audiovisual but not unimodal visual or asynchronous bimodal audiovisual pre-exposure to the amodal property of tempo.
**Objective**

Determine whether exposure to the amodal property of tempo in synchronous bimodal audiovisual stimulation could educate infants’ attention to tempo.

**Introduction**

Infants are known to have limited attentional resources therefore the most salient properties of an event are processed first (become "foreground") while other aspects of the event (become "background") and are processed later. According to Bahrick and Lickliter (2000, 2002, 2004) and the Intersensory Redundancy Hypothesis (IRH), detection of amodal properties (e.g., tempo, prosody) is facilitated by the presentation of information in synchrony across two senses. Previous studies using animal models have shown that pre-exposure to bimodal synchronous stimulation subsequently led to attention of amodal properties in unimodal stimulation (Lickliter, Bahrick & Markham, 2006). This finding suggests that redundant audiovisual stimulation can guide the detection of amodal properties and subsequently "educate" attention to those same properties in unimodal stimulation. The current set of experiments aimed to answer whether 2-month-old human infants could discriminate a change in the amodal property of tempo (toy hammer tapping on a surface) presented in a unimodal visual context depending on whether they were previously familiarized to the tempo in either a synchronous bimodal audiovisual, unimodal visual, or asynchronous bimodal audiovisual context. It was predicted that infants would be able to detect a change in tempo in a unimodal context only when familiarized or "educated" to the tempo in a synchronous bimodal audiovisual context.

**Methods**

Stimulus events. The stimulus events consisted of a video depicting a bright red colored toy hammer tapping one of two irregular 4-beat rhythms at one of two given tempos (Slow: 159 beats per minute vs. Fast: 240 beats per minute) on a wooden surface. Rhythm and tempo were fully counterbalanced across conditions. Infants in the synchronous bimodal audiovisual condition could see and hear the toy hammer tapping in synchrony, infants in the unimodal visual condition could only see the toy hammer and infants in the asynchronous bimodal audiovisual condition could see and hear the toy hammer tapping out of temporal synchrony.

Procedure. Twenty-nine 2-month-old infants were familiarized to four 15-second trials of a toy hammer tapping at one of two different rhythms (Rhythm A vs. Rhythm B) in one of two different tempos (Fast vs. Slow) in one of three conditions: synchronous bimodal audiovisual, unimodal visual, or asynchronous bimodal audiovisual.

Following the familiarization phase, all of the infants participated in a unimodal visual infant controlled habituation phase where they viewed the toy hammer tapping silently at the same rhythm they received during habituation. Following habituation, infants received two test trials depicting the red toy hammer tapping in novel tempo (e.g., if the infant was pre-exposed and habituated to the toy hammer tapping the fast tempo, rhythm A then they were tested with the slow tempo, rhythm A).

**Results**

Infants’ mean visual recovery (difference between the mean number of seconds the infant spent looking at the two test trials and mean number of seconds the infants spent looking at the two no-change post-habituation trials) to the novel tempo during the unimodal visual habituation session as a function of pre-exposure condition (synchronous bimodal audiovisual, unimodal visual, asynchronous bimodal audiovisual). Additionally, infants in the synchronous bimodal audiovisual pre-exposure condition demonstrated greater visual recovery to the change in tempo than infants in the unimodal visual and asynchronous bimodal audiovisual pre-exposure condition. Furthermore, planned comparisons revealed that the performance of infants who received unimodal visual pre-exposure did not differ from that of infants in the synchronous bimodal audiovisual pre-exposure condition ($p = .22$).

**Conclusions**

These results support the hypothesis that detection of amodal properties such as tempo in synchronous bimodal audiovisual stimulation can scaffold or "educate" selective attention to the same stimulus properties in subsequent unimodal stimulation. In addition, these results converge with animal based findings (Lickliter et al., 2006), where quail embryos were able to learn the temporal properties of a maternal quail call following synchronous bimodal audiovisual pre-exposure but not following unimodal auditory or asynchronous bimodal audiovisual pre-exposure. Taken together, our findings suggest that during early development, sensitivity to amodal properties (such as tempo) emerges in the context of synchronous bimodal stimulation and is later extended to unimodal stimulation.

**Acknowledgements**

I would like to thank the McNair Scholars Program, Dr. Jason S. Hamilton, Dr. George E. Simms, and mentor Dr. Lorraine E. Bahrick for granting me the opportunity to be a part of this academically enhancing program and providing constant guidance and advice. I am grateful to all the parents and infants who donated their time, without them, my research would not have been possible. I am indebted with the graduate students, research assistants and staff at the Infant Development Lab at FIU for their ongoing support and encouragement in times of greatest need. In addition to this, I owe my deepest gratitude to Irina Castellanos and Louise Nibley for their infinite patience, guidance, and support.

**References**


Michele Bechor was born and raised in South Florida. A Psychology major with a double minor in Biology and Chemistry, she plans to graduate in Spring 2011. As a first-generation American of Middle Eastern decent, she hopes to earn a Ph.D. in Clinical Health Psychology with a concentration in Mind-Body Medicine. She hopes to become an expert on psychophysiological disorders, administering clinical stress management interventions that help alleviate medical symptoms. After earning a PhD, she hopes to conduct more clinical interventions with placebo research and psychoneuroimmunology and intends to become a tenured professor in a medical school, outlining to future doctors the symptoms and treatment for mindfulness-based ailments. Regarding her efforts to pursue a Ph.D., she has spent much of her time at FIU devoted to empirical research. She has been a Research Assistant in FIU’s Developmental Psychobiology Lab since January 2009 and is currently conducting her senior honors thesis project, focusing on the effects of varying amounts of enriching environments on spatial exploration levels in Bobwhite quail hatchlings. She also intends to present her research at the International Society for Developmental Psychobiology Research Conference in November 2010. Michele spent her summer conducting Spatial Cognition research at the University of Notre Dame. A proud member of the Honors College, Golden Key International Honors Society and Psi Chi, Michele engages in various on-campus service and leadership activities, currently serving as a Student Ambassador for FIU’s Student Alumni Association. In her spare time, she enjoys shopping, traveling and Miami Heat basketball.

DEFINING SALIENCE FOR LANDMARK SELECTION IN A NOVEL ENVIRONMENT

Learning a novel environment involves representing the objects in that environment and their locations. Typically, the objects that stand out or are the most salient are more likely to be included in later descriptions and drawings of the environment. Landmarks can be salient based on their spatial features, for example, if they are located at an intersection on a path or at a turn. Landmarks can also be salient based on their perceptual features, for example, if they are uniquely colored. The current experiment investigated the influence of spatial and perceptual features on the selection of landmarks. Subjects watched a movie of a simulated path through a 3D virtual environment with 14 intersections and 9 turns. Four landmarks were located at the corners of each intersection, with one of the landmarks uniquely colored. After viewing the video 10 times to ensure learning, subjects described the path through the environment and drew a map, in counterbalanced order. Each landmark that was included in the descriptions or maps was coded for its location at the intersection, based on its position within the map and its position relative to the path, whether its intersection included a turn and whether it was uniquely colored. Generally, participants preferred to include landmarks located farther into the environment, at locations at the far corners of an intersection and at intersections that included a turn. They included uniquely colored landmarks less often than expected by chance, and when they were mentioned, they were not associated with the object’s spatial features. These data suggest that spatial features predominantly define the selection of landmarks.
OBJECTIVE

To determine whether at an intersection with a perceptually salient object, will subjects choose landmarks based on spatial salience or based on perceptual salience.
I was born in Lima, Peru on April 6, 2009. At about the age of two my family and I immigrated to the United States of America and have been here ever since. During middle school and high school I had practiced Taekwondo (attaining the level of black belt) and for the first two years of high school I had also wrestled for my high school. I had to stop both after a knee injury that prevented me from seriously practicing the sports ever since. At age 16 I entered into the College Academy program at Broward College. This was a collegiate high school, meaning that I went to school at the college and accumulated college credit primarily while finishing up my remaining high school credits. I was in the program for my junior and senior years of high school or equivalently, my freshman and sophomore years of college. In 2007 I graduated from Broward College with my Associates Degree and shortly after graduated from the College Academy with my high school diploma. It was at the College Academy that I first began nurturing my interest in physics. In the Fall of 2007 I began my studies at Florida International University and chose Physics as my major. A few short years later, I had also picked up a major in mathematics. Finally in 2010 I became a McNair fellow and now plan on pursuing graduate studies in mathematics after I graduate.

A GROUP THEORETIC PERSPECTIVE ON PEBBLE MOTION PROBLEMS
Christian Bueno and Miroslav Yotov

We take a strong algebraic perspective on the general permutation pebble problems. In particular we assign to each game its natural group based on how the pebbles are allowed to permute by the pebble moves. We call this group the home group. We go on to show that this group is an invariant of the game. We go on to prove that the numbers of conjugates of the home group are less than the number of components in the configuration graph.
Objective

The first result worth pointing out is that if there exist a sequence of moves that can take one configuration into another, then these respective home groups are identical.

Lemma 3. [If two configurations k and k’ are connected by a sequence of moves, then H(G,p,k) is isomorphic to H(G,p,k’).]

(Sketch of Proof) If the set of allowable permutations for k is known, then we may use these to construct the permutation of k’. What we do is consider a sequence of moves from home to k and then from k to k’. By transforming k’ into k we can add or delete any additional pebbles, according to (1) and then use the reversed sequence of moves to bring the pebbles back to home induced by (1). This means that H(G,k’) contains our adjacency permutation in addition to elements of H(G,k). And after removing all the extraneous elements we get H(G,k) is isomorphic to H(G,p,k) and therefore H(G,k) = H(G,p,k’.)

Another useful property is that if two configurations k and k’ are connected by a sequence of moves then they may be transformed into each other through a sequence of legal moves (plans), then we may form a permutation-k’ that turn one configuration into another, then their respective home groups are conjugate.

Lemma 4. [If two configurations k and k’ are permutations of each other then their home groups are conjugate in the symmetric group of p elements.]

(Sketch of Proof) If there was a way to more carefully examine the definition of the home group, the result would hold naturally. With these two properties combined, we may form a powerful statement about the home group. The home group is an invariant of the puzzle, and all of its properties are identical.

Theorem 5. [If two configurations k and k’ are configurations of the puzzle on Graph G, then H(G,k) is isomorphic to H(G,k’). More specifically H(G,k) and H(G,k’).]

(Sketch of Proof) It is best to do this theorem by cases:

Case 1. If k and k’ are connected by a sequence of moves, then by Lemma 1 it follows that the two-home groups are isomorphic.

Case 2. If there are not connected by a sequence of moves, then some permutation γ of k is connected to k’. To prove this we note the following two theorems and algorithmically move a i to γ(i), without a problem. The home group H(G(p)(p’)(k)) (H(G(p)(p’)(k’)) and H(G(p)(p’)(k)) are conjugates of H(G(p)(p’)(k’)), and thus H(G(p)(p’)(k)) = H(G(p)(p’)(k’)).

Theorem 6. The number of components of H(G,k) is then related to the number of components of the graph of configurations.

A Group Theoretic Perspective on Pebble Motion Problems

Christian Bueno, Miroslav Yotov

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Introduction

The topic of this study deals with the connection between group theory and class of problems known as Permutation Pebble Motion Problems (PPM), and how this connection may be exploited.

Home Group

Select a starting configuration k and the vertices on which its permitted. These problems will all have vertices that have. After using a sequence of moves, some or all of the puzzle will have left their home and began exploring the rest of the graph, either which in the eventually came back home or do not return, to made them.

Theorem 1. [If k and k’ are connected by a sequence of moves, then H(G,p,k) is a different configuration, i.e. a different permutation. The set of all permutations that can happen this way from the home group. For a graph G with a puzzle and initial configuration, we can create the home group H(G,k). It is important to note that there are permutations on the plane relative to the initial configuration. The examples below show what is meant.

References


Acknowledgements

Thanks go out to my host school, Florida International University, and the FIU Ronald E. McNair Program and its staff. Also an additional thanks to Ronald E. McNair Board. Thanks also go out to the McNair Program for introducing the students, that motivated the research. Thanks also go out to James jigz, Karash Mok, and Henry Zumela for their comments, suggestions and discussions they gave throughout the length of the research.

OBJECTIVE

The connection between group theory and class of problems known as Permutation Pebble Motion Problems (PPM), and how this connection may be exploited.
Natalie Damaso is currently a senior at Florida International University pursuing a Biology bachelor degree in Biology with a minor in Chemistry. She is involved with many student activities, such as being the President of the National Student Exchange Club. During the academic year of 2008-2009, she participated in the National Student Exchange Program in which she attended Plymouth State University in Plymouth, New Hampshire. During her exchange she participated in genetic research working with pseudo-nitzchia. During the summer of 2010, with the help of the McNair program, she was able to partake in biochemistry research in John Berry’s lab at Biscayne Bay campus working with Inhibition of Phosphatase2A by Microcystin LR within skin and liver cancer cells. Currently she is working to achieve her academic goal, which is to obtain a Ph-D in genetics or a related field. Natalie really enjoys watching movies, socializing, reading, and playing sports. Her favorite food is lasagna. Her academic goal is to obtain a Ph.D. degree in genetics or a related field. During this process she hope to learn as much as possible in the areas of performing research and how to achieve success in a laboratory environment. Her career goals are to work in an area of cutting edge research and to make what she have learned useful in society so that others can live healthier more successful lives. My career goals are heavily dependent on my academic goal to obtain a Ph.D. degree. The McNair program offers me the unique opportunity to be a part of many research topics and open new doors for me during my academic career.

INHIBITION OF PROTEIN PHOSPHATES BY MICROCYSTIN- LR IN LIVER AND SKIN CANCER CELLS

Microcystins are toxic cyclic heptapeptide produced by cyanobacteria that have been reported to be a serious public health issue because of their contamination in drinking water. Microcystin-LR, one of the most common members of the microcystin family, are toxins that have been known to be tumor promoters as well as cause liver damage, gastroenteritis, and irritation by inhibiting serine/threonine protein phosphatase 1 and 2A. In the study Bouaicha et al (2002) fluorometric protocol for detecting microcystin-LR was used with modifications to study the cellular effects of microcystin in skin and liver cancer cells. Rifampicin and Ursolic Acid was also used to look at the affect of their organic anion transfer proteins which is known to be the carrier proteins for microcystin into a liver cell and blood brain barrier. We expect to see a dose dependent response between concentrations of microcystin-LR and inhibition as shown by Bouaicha simple model using a commercial enzyme (PP2A). We also expect to see the inhibitors (rifampicin and ursolic acid) to effect the uptake of microcystin into the liver cells because of the OATP(organic anion transfer proteins), which have been known to be the cell mediated transfer proteins that effect the liver cells, but also hope to see their effect on the skin cancer cells as they have never been studied before. Sodium orthovanadate was used with microcystin concentrations to help inhibit the other phosphatases, such as tyrosine and alkaline phosphatase, to be able to study the PP2A inhibition of microcystin. Results did show a dose dependent response of the concentrations of microcystin and phosphatase inhibition. The inhibitors did have an effect on the liver cancer cells, but showed the opposite effect with the skin cancer cells.
Inhibition of protein phosphatase by MC-LR in liver and skin cancer cells

Natalie Damasc, Alika Darrego, Dr. John Berry
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Abstract

Microcystin-LR is a toxin produced by cyanobacteria. It has been demonstrated to block the uptake of microcystin-L into liver and brain cells. It is not known whether it is able to block the uptake of microcystin-LR into liver and brain cells. This study was designed to determine whether microcystin-LR is able to block the uptake of microcystin-LR into liver and brain cells.

Methodology

In order to determine whether microcystin-LR is able to block the uptake of microcystin-LR into liver and brain cells, we used a modified fluorometric assay protocol developed by Bouaicha et al. (2002) for detecting microcystin-LR.

1. Added different concentrations of Na3VO4 (.1mM and 10mM) to SKMEL-5 lysates.
2. Transferred lysate to black 96-well plate.
3. Analyzed plate using KC-4 software and Synergy HT-I plate reader at excitation/emission wavelengths of 360-460nm.

Results

The results showed that the addition of Na3VO4 increased the inhibition of protein phosphatase by MC-LR in liver and skin cancer cells. The inhibition of protein phosphatase by MC-LR was dose-dependent with the skin cancer cells showing a greater inhibition than the liver cancer cells.

Conclusion

These results suggest that microcystin-LR is able to block the uptake of microcystin-LR into liver and brain cells. Further studies are needed to determine the mechanism by which microcystin-LR blocks the uptake of microcystin-LR into liver and brain cells.

Acknowledgements

I would like to thank Dr. Berry’s lab for their help and support especially Dr. Zane Berry for his guidance and support during this project.

References


Objective

Measure inhibition of protein phosphatase by Microcystin-LR in liver and skin cancer cells.
My name is Kimberly Dizon and I am a plan to obtain a Bachelors degree in Nursing with a minor in Psychology. I also plan to pursue a Ph.D. in nursing focusing on mental-health. Intellect, modesty, sense of humor, generosity, being self-motivated and being respectful are qualities in people that I admire and qualities that I try to live up to everyday. I love understanding why people do what they do. I believe understanding one’s client as best as possible will help the nurse give a proper diagnosis and in turn implement the best intervention. This is why I found it imperative to pursue both majors to get the best out of both worlds and apply it to my practice.

I ventured even further through the research experience in my undergraduate career thus far. Past research experience ranges from cognitive infant development, positive adolescent development, breast cancer and the effect on couple dynamics, breast cancer and minority group couples, and dual diagnosis. As one can see, my research interests completely integrate both of my fields of study and therefore I am open to any topics that are in line with this idea of interdisciplinary research. I am affiliated with APA, NSCS and Psi Chi (wherein I held the leadership position as chapter president for 2 years). Last but not least, I am a proud IB, MHIRT and McNair fellow.

On a personal level, I like photography/cinematography, reading, cooking and being with my loved ones. I also like to teach and compose vocal/musical arrangements using the piano, organ or guitar. I love all types of music and I appreciate the differences in everything. I’d like to believe I’m an approachable person and I genuinely love helping people. My philosophy: When you lose, don’t lose the lesson.

DUAL DIAGNOSIS IN THE ADOLESCENT POPULATION: MENTAL HEALTH NURSING CONSIDERATIONS

In Erik Erikson’s eight stages of psychosocial development the critical task of the adolescent (ages 12-18) is to reach a “sense of identity.” To elaborate, this stage explores and clarifies to the individual a sense of “who one is” and “what one means to others.” If this goal is not achieved, psycho-social problems may result (Erikson, 1968). The journey to reach this goal may incorporate social experimenting with narcotics, alcohol, risky behavior and other maladaptive practices to temporarily ease the stress felt in an adolescent’s life. While there are individuals who practiced these activities and are able to exit this stage without negative psychological outcomes, there are individuals who do not and the range of psychological disorders that one may acquire is wide. The abuse of substances combined with initial or subsequent mental health problems causes significant functional and social problems during adolescence.

This growing problem facing adolescence is called Dual Diagnosis (DD) in the field of mental health. As illustrated in Figure 1, it is also known as “Co-occurring” or “Co-morbid” Disorder. DD describes the condition where individuals interdependently suffer from both a Mental Illness (MI) and a Substance Use Disorder (SUD) [Department of Health, 2006]. As a nurse, one should be prepared to provide full service care to individuals who suffer from this diagnosis. Currently, the topic of DD treatment has been widely examined in general mental health literature in comparison to the available nursing literature. The purpose of this literature review article is to describe DD and its treatment issues in adolescents by: 1) identifying current barriers to successful Dual Diagnosis nursing interventions and 2) describing current evidence-based practice interventions tailored to adolescents for nurses to utilize in practice.

Dual Diagnosis (DD) is the term used for individuals who interdependently suffer from both a Mental Illness (MI) and a substance Use Disorder (SUD). Though research supports the overwhelming increase in prevalence among all age groups, the incidence is increasing particularly among the adolescent population for ages 12-18. The outcomes of DD adolescents have higher levels of depression symptoms, poorer global functioning and higher levels of substance use compared to those who have no diagnosis (Vida et al., 2009). Also, adolescents who entered SUD treatment revealed 72% of the cannabis users reporting two or more psychiatric symptoms (Diamond et al., 2006). Currently, there is a gap between general literature versus nursing literature on DD and adolescence. The purpose of this literature review is to raise nurses’ awareness of DD treatment issues in adolescents by 1) identifying current barriers to successful DD nursing interventions and 2) describe current evidence-based practice interventions tailored to adolescents.
To raise nurses’ awareness of Dual Diagnosis treatment issues in adolescents by:

1) Identifying current barriers to successful Dual Diagnosis nursing interventions
2) Describe current evidence-based practice interventions tailored to adolescents

OBJECTIVE
My name is Jason Espinosa and I am a 22 year senior majoring in mathematics. I was born in Miami, Florida and I consider myself very fortunate because I have always had a brain for math. I plan to earn my Ph.D. in Mathematics and become a professor. I have a talent and love for teaching and I will always continue to learn via research and working with colleagues and students. The McNair Fellowship proved invaluable in both developing skills I will need for graduate work and doing research. I had two years of research work in the astrophysics lab at the University of Miami and one summer I was awarded a Beyond the Book scholarship to continue my work. I believe that mathematics is the bedrock of our society. It permeates every aspect of our lives, and the research done in the subject can have effects that ripple through society for generations. From technology to every field of science to everyday life, mathematics at the most basic study of patterns, structures, and connections in our world is undeniably fundamental to understanding and improving it. My current research topic is Hyperbolic Geometry. I’ve always been interested in math, ever since I was 5 years old. My research topic is related to physics, which I also like a lot. My hobbies are listening to music, programming, and karate.

A PARTIAL CHARACTERIZATION OF THE EULER LINE IN THE HYPERBOLIC PLANE
This thesis is dedicated to the memory of Dr. Ronald E. McNair

Abstract. The hyperbolic geometry is obtained by replacing the famous parallel postulate of Euclidean Geometry with the Hyperbolic Parallel Postulate, and important to the history of geometry. Due to its nature, it is natural to ask whether a particular Euclidean result has an analogue in hyperbolic geometry, and this question posed for the Euler line, which connects many triangle centers. For which classes of triangles the Euler line exists is explored, and it is concluded that it exists for some all isosceles triangles and no right triangles. For which other triangles it exists is unknown.
Objective

It is natural to ask whether a particular Euclidean result has an analogue in hyperbolic geometry and this question posed for the Euler line which connects many triangle centers.

Introduction

Hyperbolic Geometry is the end of a 2000 year quest to fix Euclid’s Elements. The Elements establishes geometry from axioms – statements taken for granted - and results that follow from those axioms. Its genius is that the consequences of its axioms is the geometry we are familiar with. The most controversial axiom was the parallel postulate, which states that for a point a and a line B, there is only one line A through a that's parallel to B. The hyperbolic parallel postulate states that there are infinitely many such lines. We can represent this by changing what a line looks like. In the Escher painting below, note that the white curves are parts of circles or straight lines through the center and intersect the circle at 90 degrees, and that the figures get smaller as the reach the edge. This is how the Poincare model of hyperbolic geometry is defined.

M.C. Escher. Circle Limit #3.

Results

The Euler line has been characterized for hyperbolic isosceles triangles and hyperbolic right triangles. For hyperbolic isosceles triangles, the Euler line exists. It is possible, through basic geometry, to prove that any isosceles triangle is congruent to one like in the figure to the right. The hyperbolic Euler line (the green line in the figure), which is defined slightly differently from the standard one, always exists for isosceles triangles. It does not exist for most right triangles.

Conclusion

The current results suggest that the isosceles triangle is the only triangle with an Euler line in the hyperbolic plane. After proving or disproving this, there are other questions to explore. Is the Euler line related to the defect (a hyperbolic property) of the triangle? Is there a relationship between the distances of the triangle centers? Given the importance of the Euler line to triangle geometry, it could prove as useful in the hyperbolic case.

Acknowledgements

I would like to thank Dr. Gueo Grantcharov for his invaluable guidance and feedback. I would especially like to thank the Ronald E. McNair Post-Baccalaureate Achievement Program for financial support. This work is dedicated to the memory of Dr. Ronald E. McNair for being a continuing source of inspiration.

The Euler Line in Hyperbolic Geometry

Jason Espinosa

The Euler Line is an important line in Euclidean triangle geometry. It goes through 3 triangle centers. The centroid is the point of intersection of the lines connecting each vertex to the midpoint of the opposite side. The orthocenter is formed from the lines starting at a vertex and forming a right angle with the opposite side. Finally, the circumcenter is the center of the circle touching all three vertices of the triangle.

The current results suggest that the isosceles triangle is the only triangle with an Euler line in the hyperbolic plane. After proving or disproving this, there are other questions to explore. Is the Euler line related to the defect (a hyperbolic property) of the triangle? Is there a relationship between the distances of the triangle centers? Given the importance of the Euler line to triangle geometry, it could prove as useful in the hyperbolic case.

Acknowledgements

I would like to thank Dr. Gueo Grantcharov for his invaluable guidance and feedback. I would especially like to thank the Ronald E. McNair Post-Baccalaureate Achievement Program for financial support. This work is dedicated to the memory of Dr. Ronald E. McNair for being a continuing source of inspiration.
I was born in Houston, Texas and was raised in Miami, Florida. After graduating from Lourdes Academy High School, I was admitted into Florida International University and began my studies in the areas of Psychology, Sociology & Anthropology, and Criminal Justice. As a college student I took up new hobbies such as cooking and playing the guitar, and thus sparked my interest for learning new things. During my sophomore year I began a research assistantship in the Cognitive Laboratory and Workshop (C.L.A.W) under Dr. Daniel Wright where I saw first hand what psychological research was about. Conducting various studies on eyewitness memory and memory conformity nourished my interest in the research process and led me to acquire more experiences in different types of research focusing on aspects of psychology and the law. While working with Dr. Wright, Dr. Nadja Schreiber Compo, and Dr. Steve Charman I became very interested in topics such as eyewitness feedback effects, investigative interviewing, as well as deception detection. Through the course of my research experience I was given the opportunity to conduct my own research project that focuses on deception detection and cognitive load. I presented my ideas to the Dr. Ronald E. McNair program, which in turn gave me the opportunity to further my research over the summer and become a McNair fellow. Currently, I am in the process of finishing my research project and will be graduating in December of 2010. Following graduation, I hope to be accepted into a doctoral program and continue my research in the areas of psychology and the law.

C O H O R T

McNair Postbaccalaureate Achievement Program
Undergraduate Achievement Journal    2010

Erika Nicole Fountain

CAN YOU CATCH A LIAR? IDENTIFYING PHYSICAL SIGNS OF COGNITIVE LOAD

Studies have shown that cues generally thought of as being indicative of deception are actually just physiological traits of nervousness, and do not reliably differentiate between truths and lies (Vrij, Fisher, Mann, & Leal, 2006). Instead, studies have shown that liars portray physical signs as a result of cognitive load, such as a decrease in eye blinking (Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008; Leal, Vrij, Fisher, Van Hooff, 2008). The present study examined whether the cognitive load approach could be used to train people to detect deception in others. Participants were trained in one of two ways to detect certain cues (nervousness and cognitive load). A control condition was included for comparison. Preliminary results show that participants trained to look for blinking patterns as a cue to deception were able to accurately detect deception 58% of the time. There was no significant difference when compared to the fidgeting group (56% accurate) and the control (53% accurate); however, more data is needed before inferences can be made. These preliminary results also show that those trained to use blinking patterns as a cue to deception may be better at detecting truths than any other group (blinking = 65%; fidgeting = 53%; control = 55%). Further data collection is currently underway.
Detecting Deception by Observing Physical Signs of Cognitive Load

Erika Nicole Fountain & Dr. Nadja Schreiber Compo, Florida International University

Abstract

The present study examined whether the cognitive load approach could be used to train people to detect deception in others. Researchers have found that people who lie blink less than people who tell the truth and that lying is cognitively taxing. A reliable indicator of deceit could help investigators in making these judgments using the training they had received prior. Following the videos participants were asked to fill out a short demographic questionnaire. Finally, participants were debriefed and thanked for their time.

Introduction

There is an obvious need to be able to detect deception. A reliable indicator of deceit could help investigators in every phase of a criminal case. Generally, researchers agree that people are not good at detecting deception. There is also a great deal of research in the area related to distinguishing between liars and truth tellers (e.g., Vrij, 2000). In most studies, deception detection precision falls just above chance (50%), (e.g., Vrij, 2000). This may be due to common misconceptions about how to detect deception. Researchers have found that the behaviors that are most closely related to deception are signs of cognitive load. Cognitive load refers to the amount of load put on working memory at any given time. Lying is cognitively taxing. A reliable indicator of deceit could help investigators in making these judgments using the training they had received prior. Following the videos participants were asked to fill out a short demographic questionnaire. Finally, participants were debriefed and thanked for their time.

Stimulus Material

The stimulus materials were acquired from Rossi, Meissner, Narchet, and Kassin (2005). Ten videos (five portraying liars and five portraying truth tellers) of approximately a minute and a half in length were used to test participants. The videos depict a research assistant posing as an interrogator accusing a participant of cheating during a research participation credit for their time. Following the videos participants were asked to fill out a short demographic questionnaire. Finally, participants were debriefed and thanked for their time.

Results

Across training groups, the main dependent variable was overall accuracy rates. That is, how often participants correctly identified liars and truth tellers. Preliminary results revealed that the blinking group (65% accuracy across tapes) and the control group (52%) had the highest accuracy rates across tapes. Accuracy rates for “truth” (52% accuracy across tapes) showed that the blinking group had an accuracy rate of 65%, the fidgeting group had an accuracy rate of 52%, and the control group had an accuracy rate of 52%. All training groups performed at 50% accuracy for “lies” (52% accuracy across tapes). An analysis of variance revealed no significant differences in accuracy rates between training groups, which was expected due to the small sample size. All groups displayed high confidence in their decisions with a mean of 3.1 out of 4. Further testing is underway.

Discussion

Preliminary data suggests that training does not increase overall accuracy rates. However, there does seem to be a trend favoring in terms of “truth” accuracy. As hypothesized, those trained to look for blinking patterns outperformed (65%) the fidgeting group (52%) and the control group (52%) in detecting truths. Although still early in the data collection process, current results give the impression that we can increase accuracy rates for detecting truths with the proper training. This is important because although we may not be able to detect deception all of the time, it could be made easier to identify when a suspect is telling the truth. Identifying truth-takers can decrease excessive interrogation practices. In addition, this training may be helpful in reducing false confessions (Rossi, Meissner, Narchet, and Kassin, 2005). This training could also lead to a decrease in false confessions if an interrogator is able to identify that a subject is telling the truth instead of misinterpreting nervous cues for deception cues. If the supplemental data supports these assumptions, training protocols currently in use by police might one day include these reliable cues to better prepare officers for interrogating suspects. More data is currently being gathered to investigate the effect that training individuals to identify signs of cognitive load has on deception detection accuracy.

Acknowledgments

I would like to thank the following individuals for their support and help throughout the course of this research:

- Dr. Nadja Schreiber Compo
- Mariana E. Carcello, M.S.
- Dr. George E. Siemens, Dr. Susan Scott Winningham, and the Florida E. McNair Post Baccalaureate Program.

The present study examined whether the cognitive load approach could be used to train people to detect deception in others.
As a Latin American immigrant I am extremely grateful to the McNair Fellowship for providing a platform for my academic future. I was born in Maracaibo, Venezuela in 1987 though I have done all my formal education in the United States. My parents share a mixed Hispanic heritage which includes descendants Colombia, Venezuela, Costa Rica, Cuba, and Spain. My interest in politics in general, and Latin American Politics in particular, motivated me to study Political Science and Philosophy in FIU where I will be graduating fall of 2010 with a 3.9 GPA.

Since very early on I had the strong desire to help were not as fortunate as I was to study in such a prosperous country. I believe strongly the value of giving back to the community and investing one’s youth and energy in places not so well off. I have been privileged to do community service work in Colombia, Venezuela, Honduras, Nicaragua, China, Kyrgyzstan, Kazakhstan, Puerto Rico, and the Dominican Republic. These experiences had forged in me the obligation to do my best to lead a life that that exemplifies the value of giving from one’s time and energies to help those in need.

PARTY POLARIZATION AND IDEOLOGY
Diverging Trends in Britain and the United States

America’s major political parties have traditionally been regarded as organizationally weak, highly decentralized, and ideologically incoherent by comparison with the highly disciplined, ideological class-based, parties of the UK. Indeed for a period after World War II American parties’ scholarship tended to look approvingly at the UK as an alternative model of a well-functioning party system for modern advanced industrial democracies (Schattschneider 1942; Ranney 1962; Beer 1965). It was the late Leon Epstein (1980) in his 1979 APSA presidential address “What Happened to the British Party Model” who convincingly argued that the UK party system was no longer – if it ever had been – an appropriate model for American political parties. Since he wrote it appears that in several aspects American and British parties have become more similar. American political parties are now more ideologically polarized, more disciplined and united in Congress, and more centralized in their operations than they were in the postwar decades, when the APSA’s famous report ‘Toward a More Responsible Two Party System (1950), bemoaned the US parties’ lack of those very characteristics. In the UK, by contrast, social change has eroded the dominance of the class-based political parties of mid-century, promoted ideological convergence between the Labor and Conservative parties, and assisted the increasing fragmentation of the British party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different – particularly in their organizational aspect – and the apparent convergence is due more to changes in the respective societies as British society has become somewhat less polarized while American society has become more so since the 1960s. Both party systems have changed due to the erosion of mid-20th century class-based economic cleavages in both societies. In the United States this has been supplanted by an increasingly strong cleavage based on traditional moral values and religious observance that has polarized the major parties to an unprecedented extent. In the UK the same process has seen the rise of new cleavages based more on regional divisions, values and lifestyles, and integration into the European Union, rather than religious questions.
Abstract

American's major political parties have traditionally been regarded as organizationally weak, highly decentralized, and ideologically illiberal in comparison with the highly disciplined, ideological class-based parties of the UK. Indeed, for a period after World War II American parties scholarship tended to look approvingly at the UK as an alternative model of effective party politics – one that was a mass party system. However, in his 1979 APSA presidential address “What Happened to the British Party Model” who convincingly argued that the UK party system was no longer similar. American political parties are now more ideologically polarized, more disciplined and united in Congress, and more centralized in their operations than they were in the post-war decades, when the APA's Venice report 'Towards a Minority Responsible Two Party System (1942) bequeathed the UK party leaders of those very characteristics. In the UK, by contrast, social change has eroded the dominance of the class-based political parties of post-war period, promoted ideological convergence between the Labour and Conservative parties, and assisted the increasing fragmentation of the British party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different — both US and UK parties have become more ideologically polarized, more centralized and hierarchical. This convergence toward the American "party in service model' is not unique to America, it is also evident in the UK and other democracies (Schattscheider 1942; Ranney 1962; Beer 1965). It was the late Leon Epstein (1980) in his 1979 APSA presidential address who convincingly argued that the UK party system was no longer similar. American political parties are now more ideologically polarized, more disciplined and united in Congress, and more centralized in their operations than they were in the post-war decades, when the APA's Venice report 'Towards a Minority Responsible Two Party System (1942) bequeathed the UK party leaders of those very characteristics. In the UK, by contrast, social change has eroded the dominance of the class-based political parties of post-war period, promoted ideological convergence between the Labour and Conservative parties, and assisted the increasing fragmentation of the British party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different — both US and UK parties have become more ideologically polarized, more centralized and hierarchical. This convergence toward the American "party in service model' is not unique to America, it is also evident in the UK and other democracies (Schattscheider 1942; Ranney 1962; Beer 1965).

In order to determine the degree of convergence and divergence in respective party models between the US and UK, we rely mainly on Duverger's model of mass parties. The indicators of the mass party model includes a high number of dues paying members, a hierarchical top-down organization within the parties, a disciplined vote by party members within parliament, and an clear ideological orientation. To this list we add American characteristics. In the US the mass party never developed and American parties remain organizationally weak and ideologically incoherent. This has eroded in favor of newer party formations more reflective of a less class-based British society. Given this situation it seems less likely than ever that the British parties and mass party system could ever again serve as a model for the US. Conversely it appears that the influence has recently been more in the other direction, as the British parties – both old and new – have taken on more attributes of the contemporary American party in service terms of organization, standing, and campaign structure and have increased emphasis on ideological point of view. The development in the US of several political parties is an indication of the increasing fragmentation of the mass party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different — both US and UK parties have become more ideologically polarized, more centralized and hierarchical. This convergence toward the American "party in service model' is not unique to America, it is also evident in the UK and other democracies (Schattscheider 1942; Ranney 1962; Beer 1965).

Determine the degree of convergence and divergence in respective party models between the US and UK.

PARTY POLARIZATION AND IDEOLOGY

DIVERGING TRENDS IN BRITAIN AND THE UNITED STATES

US and UK since the 1970’s

- National convention achieved only every four years for presidential election.
- By 1840’s the party model had evolved into party bosses that regionally based local leaders that rallied voters mostly at state level.
- Regionally based local leaders that rallied voters mostly at state level.

Methodology

In order to determine the degree of convergence and divergence in respective party models between the US and UK, we rely mainly on Duverger’s model of mass parties. The indicators of the mass party model includes a high number of dues paying members, a hierarchical top-down organization within the parties, a disciplined vote by party members within parliament, and an clear ideological orientation. To this list we add American characteristics. In the US the mass party never developed and American parties remain organizationally weak and ideologically incoherent. This has eroded in favor of newer party formations more reflective of a less class-based British society. Given this situation it seems less likely than ever that the British parties and mass party system could ever again serve as a model for the US. Conversely it appears that the influence has recently been more in the other direction, as the British parties – both old and new – have taken on more attributes of the contemporary American party in service terms of organization, standing, and campaign structure and have increased emphasis on ideological point of view. The development in the US of several political parties is an indication of the increasing fragmentation of the mass party system in the post-Thatcher era. Here we argue that contemporary American and British parties remain fundamentally different — both US and UK parties have become more ideologically polarized, more centralized and hierarchical. This convergence toward the American "party in service model' is not unique to America, it is also evident in the UK and other democracies (Schattscheider 1942; Ranney 1962; Beer 1965).

Results

The fundamentals of the American political party system have not changed since Eisenhower’s (1956) tenure, but the US parties have undoubtedly become more polarized and ideologically driven. The UK’s parties have, by comparison, remained more ideologically incoherent and ideologically driven while Britain’s – as we have seen in the preceding section – have become somewhat less so. The new mass party organizational form of the major parties has come considerable strain. From this it would appear that party polarization is not a product of rising party organizations but deeper societal forces. The old experience during the 20th century. This convergence toward the American ‘party in service model’ is not unique to America, it is also evident in the UK and other democracies (Schattscheider 1942; Ranney 1962; Beer 1965).

Acknowledgments

I would like to thank Dr. Nida Run Fat for her guidance, advice, and support during this project, especially all the encouragement in order to produce a clear, cohesive, and intuitive assessment of the changes within the parties.
My name is German Felipe Gomez. I am originally from Bogota, Colombia. I move United States at the age of 15 just in time to start High School. As a senior in Computer Engineering I realize that I will like to pursue my true passion and go to graduate school and obtain a Ph.D. in Computer Science. From a very young age I developed a passion for computers and technology in general. I decided to become a Computer Engineer to follow my passion and to understand the connection between and electronics and programming required to make things operate. The McNair program has allowed me to conduct research in order to be better prepared for future academic challenges. Financially speaking, programs like this facilitate our passion for learning by rewarding the effort and work that we put in our studies. I started FIU back in 2005; I participated on the National Student Exchange and spend a Year in California attending California State University San Bernardino. The summer of 2010 I attended University of California Berkeley to do research with The Team for Research in Ubiquitous Secure Technology working with in Cookies and Internet Privacy. My goal is to obtain a Ph.D. in Computer Science and work for academia and research about the Internet and future technologies available. I plan to give back to the community and especially to third world countries where technology is limited. One day I will be like my father and pass on the knowledge to my children and younger generations hoping to inspire and educate the future of this world.

HTTP cookies are small files that can make surfing the web faster and more convenient. They can allow sites to recognize returning users so that they can avoid repetitive log in procedures when they visit their favorite sites. Although these types of cookies can be beneficial, they can also be used by third parties to track users. When a user visits a domain and cookies are set on their machine directly from that site’s server, these are called first-party cookies. When a third-party site sets cookies on this same domain, activity as they navigate within the domain and even when they leave to visit other domains. In the past few years, the five major shipping browsers have all implemented new privacy settings to help stop users from having their activities tracked.

In this paper, we describe our investigation of the effects of cookie blocking and privacy. We conducted two experiments to determine the effectiveness of cookie blocking in different browsers. Our first experiment was to collect raw statistics from all five major browsers while visiting all of Quantcast’s top 100 sites. We wrote a code in Python that opened all 100 pages at once in each browser, and then counted the number of cookies that were set, prevalence of each cookie name and the number of unique domains that set cookies. We ran this experiment with third-party cookies blocked and unblocked to compare the difference in each browser. Our second approach was an analysis of traffic to get a closer look at the exchange of cookies between our machine and different web servers using Wireshark. When we opened individual packets, we were able to locate the source IP addresses and domain names that the cookies originated from so we could tell who was setting cookies.

In our numerical results, we found that tracking cookies make up about 25% of all of the cookies set throughout our testing. Through traffic analysis, we found that third parties are finding alternative ways to set cookies on user's machines by making them appear as first party cookies. That being said, we can say that many first party cookies could still potentially be trackers.
**INTRODUCTION**

The HTTP cookie was created to store textual information that a web application can use to identify clients and provide a state of information. A cookie is a small text file stored on a user’s computer. Cookies are employed for a variety of reasons including enhancing user’s online experience by helping sites recognize users when they return. Cookies can be used to track users on the internet. Our colleagues found in 2009 that over 70% of a large sample of websites contained tracking cookies for Google Analytics.

**METHODS**

We select two foundations for this project: we used the top five web browsers on the market to visit the top 100 websites, ranked according to Quantcast in July 2010. We focused on two browser scenarios: first, we visited the top 100 websites with the default cookie settings in the browser. Firefox, Chrome, and Opera accept all cookies by default, while Safari blocks third party cookies, and Internet Explorer accepts third party cookies on sites lacking a compact privacy policy. Second, we took a standard privacy intervention: we blocked third party cookies in the browsers and then visited the same websites.

**RESULTS**

Blocking third-party Cookies does reduce on average 40% the number of cookies on the browser as seen on Chart 1. From that same chart, one can see a 2:1 relationship between the number of unique cookie name and the unique cookie domain. However, despite blocking third-party cookies, we find that tracking cookies are still present in the form of first party cookies. The Results in Chart 2 represent a detail view from Apple’s Safari 5.0 web browser. In our domain analysis we found there are some cases when third-parties double the number of cookies set on the browser versus the top 100 websites. Among the top cookie name we found strings such as __umta, __qca, s_vi among others belong to companies like Google, Quancast and Omniture. In spite of the fact that cookies are only a small piece of information used for tracking, implemented by third party companies. New trends involve a technique call fingerprinting. Research should concentrate of providing a secure and safe internet experience not at the expense of users’ privacy.

**CONCLUSION**

In fact 33% of the sites that issue the most number of cookies, in our visit to the top 100 with cookies unblocked, were actually from different domains. These cookies were still set when we blocked third party cookies. Thus, users who wish to avoid web tracking through cookies must also block some first party cookies.

**FUTURE WORK**

Policymakers and web browser developers should take a closer look to resolve third party tracking. Recent research by EFF has shown cookies are only a small piece of information used for tracking, implemented by third party companies. New trends involve a technique call fingerprinting. Research should concentrate of providing a secure and safe internet experience not at the expense of users’ privacy.
I was born in Westmoreland, Jamaica and came to the U.S. when I was five years old. Ever since I was in elementary school, I knew I wanted to have a career working with children. After years of debating, I decided in my freshmen year of high school that I wanted to be a Child and Adolescent Counseling Psychologist. In the future I will like to work as a researcher, professor, and psychologist. My research interests include parent-child relationships, parental depression and child outcome, and the role of fathers. Right now (and for the next five or six years) school takes up a lot of my time, but I do enjoy time spent away from my studies. In my spare time, I like to read and watch television, especially old episodes of A Different World, Living Single, and Who’s the Boss. I also like to go out and eat with friends. My biggest dream is to help all at-risk youths in the world. I’ve always been fascinated with children and adolescents. During high school, I witnessed many of my peers on negative life trajectories, whether it was drugs, violence, or even depression. I always asked myself “why are these things happening?” and I realized during my first year at FIU, that research can help me find answers to such questions. During my spare time, I enjoy working out, reading and watching re-runs of A Different World, Bones, and The Nanny.

PARENT-adoLESCENT RELATIONSHIPS AT THE ONSET OF THE CHANGING LIVES PROGRAM INTERVENTION AND IMPLICATIONS FOR LATER IDENTITY DEVELOPMENT
Sashay A. Goodletty, Alan Meca, & William Kurtines

This study was conducted to determine the quality of parent-adolescent relationships using the Relational Data Analysis strategy at the onset of the Changing Lives Program intervention. It sought to examine contextual differences in maternal and paternal relationships, such as ethnicity, gender, and the interaction between the two across conditions at baseline. There was a sample size of 437 participants, with approximately 54% being African-American and approximately 46% being Hispanic-American. The participants were between the ages of 13-18 and attended four alternative high schools in the Miami area. It was hypothesized that participants in the CLP condition will have a poorer parent-adolescent relationship (i.e. low levels of communication and involvement) than the control condition. Results showed no difference between the participants in the CLP intervention condition and the participants in the control condition in terms of how they described their parent-adolescent relationships. The only difference detected was that of gender and paternal-adolescent relationships, with males reporting more positive relationships with their fathers than their female counterparts. Current literature illustrated the association between parent-adolescent relationships and the identity processing styles during adolescence and further research on the present study can also contribute to the current literature in groundbreaking ways.
# Table of Contents

## Background and Significance

- A growing literature on promoting positive youth development began to unfold in the 21st century. This new trend, known as the Positive Youth Development Movement, is due to three circumstances:
  1. The emergence of applied developmental science (ADS), which is the scientific investigation that focuses on the use of research and applications to promote positive development across the life span.
  2. The shift in the period of adolescence was viewed instead of being viewed as problems to be managed. Adolescents were conceptualized as resources to be developed (Bryk & Holland, 2005).
  3. Transformations in the intervention science allowed attention to be shifted from prevention and early intervention alone.

## Methods

### Participants

There was a sample size of 827 participants. Approximately 58% were African-Americans and approximately 42% were Hispanic-Americans. The participants were between the ages of 12-18 and attended four alternative high schools in the Miami area.

### Hypothesis

Research Aim I

- The first aim was to use the Relational Data Analysis to assess the quality of parent-adolescent relationships at the onset of the CLP intervention and to subsequently develop different categories that assess the quality of parent and child relationships.

### Figures and Tables

- Table 1: Father-Adolescent Relationship
- Table 2: Mother-Adolescent Relationship

## Results and Discussion

### Research Aim I

- During the conceptual phase of RDA, the theory was used to construct three categories to describe parent-adolescent relationships: Open Communication, No Relationship, and Weak Relationship.

## Acknowledgements

- Sashay Goodletty, Alan Meca, & William Kurtines

## Key References

I am a senior at Florida International University, double majoring in Psychology and the Humanities. This past summer 2010 I became a fellow of the UC Berkeley Summer Research Opportunity Program (SROP), through which I was able to carry out a research project examining social class influence on worldview formation. I am currently a research assistant for a lifespan development lab in the psychology department called the Miami Youth Development Project (YDP). I will be graduating in the spring of 2011 and plan on beginning a PhD program in the fall. In the meantime, I am working on my honor's thesis which will be a pilot study examining the effects on identity of the recently launched university-based positive Adult Development Project (ADP).

My research interests lie in the fields of personality and social psychology. Specifically, I am interested in identity development, perceptions of self and other (impression formation), and social behavior. I seek to examine how social and media factors affect cognition, both within the individual and across cultures. In my leisure, I enjoy writing, painting, gaining new perspectives, reading, art history, and drinking coffee in the mornings. I truly believe that traveling opens minds and presents us with necessary alternative perspectives.

Social class, socioeconomic status, or SES shapes how people experience and perceive events in their lives. In the present study (N = 202), we tested whether social class influences people's views of the world as predictable or unpredictable. We expected that lower social class gives rise to an unpredictability schema: a view that one's life and the world more generally are unpredictable and chaotic. We assessed social class using both objective measures (annual household income and educational attainment) and subjective measures (perceptions of rank vis-à-vis others), and assessed unpredictable worldviews using a 13-item measure (e.g., "The world is chaotic"). We found that lower-class individuals endorsed an unpredictable worldview, relative to their upper-class counterparts, who viewed the world as less chaotic and more predictable. Furthermore, when pitted against one another, subjective SES remained a significant predictor of unpredictable worldviews, whereas objective indices of social class were no longer significant. These findings have important implications for goal setting, risk-taking behavior, and interpersonal relationships.
Objective

We expected that lower-class individuals would endorse unpredictable worldviews, relative to their upper-class counterparts.

Methods

Participants
A national sample of 202 adult volunteers (137 women, 85 men, 7 declined to state), 64% European-Americans, 36% other ethnicities. Age ranged from 18-72 years (M = 33.93, SD = 13.33).

Procedure
Participants were provided with a link to the online survey. After giving consent, participants were instructed to complete a survey.

Measures

Objective social class: Participant educational attainment and income were standardized and averaged.
- 63% reported high school diploma as highest level of education, 40% reported annual incomes between $35,000-$50,000 or less.

Subjective Social Class: the MacArthur Scale of subjective SES uses a 10-run ladder to assess subjective perceptions of level of education, income, and occupation status relative to other members of the larger community (M = 6.99; SD = 1.98).

Unpredictable worldview beliefs: 13-item quantitative measure adapted from Ross & Hill's (2002) unpredictability schema. Rated on a scale 1(strongly disagree) to 7(strongly agree).
- Example: "At any moment, things in my life could change" and "The world is chaotic".

Personal Control: a one-item measure indicating how much control participants felt over their own lives on a scale from 1(none at all) to 10(a great deal). (M = 6.87, SD = 2.12)

Results

- We found that lower-class individuals endorsed an unpredictable worldview, relative to their upper-class counterparts, who viewed the world as less chaotic and more predictable.

Discussion

- Findings suggest that having economic resources to rely on provides the individual with a safeguard against unexpected hardship (e.g., car accidents, job loss), rendering life and the world in general as more orderly and predictable.

- The findings from the present study are consistent with previous research finding subjective perceptions of rank to be stronger predictors of class-based differences in social event explanations (Kraus et al., 2009), highlighting the utility of assessing subjective perceptions of individual experiences with the objective, material conditions of social class.

- Future studies should examine the relationship between unpredictable worldviews, interpersonal relationships, goal-setting, and the likelihood of engaging in risk-taking behavior to assess the role unpredictable beliefs play in planning for the future.

References


Federal Reserve Bank of Minneapolis Quarterly Review, 21, 3-21.

Acknowledgements

Thanks go to U.C. Berkeley’s Summer Research Opportunity Program & the FIU Ronald E. McNair Fellowship for this opportunity, and to Paul K. Piff, Michael W. Kraus, & Dr. Markman-Denton for their constructive comments, insight, and guidance in this project.

This material is based upon work supported by the National Science Foundation under Grant No. SMA-1005067.
Reinier Hernandez entered Florida International University in 2009 as a transfer student from a Radiochemistry Bachelor's degree program from Havana, Cuba. Reinier is currently pursuing a Bachelor of Science degree in Chemistry at FIU. Reinier joined the DOE/ FIU Science and Technology Initiative program in May 2009; program in which he has been involved in research focused on the evaluation of polyphosphate technology for uranium remediation at DOE Hanford Site in Washington State. As a result of his work on DOE related investigation he presented a poster at the National DOE conference: Waste Management 2010. In January, in recognition to his academic and research excellence he was selected to integrate the 7th FIU chapter of Ronald E. McNair Post Baccalaureate Achievement Program. In summer 2010, Reinier was selected by the AMGEN foundation to be part of its AMGEN Scholar Program, thanks to which he had opportunity to go to an internship at Massachusetts Institute of Technology. While at MIT he was selected to represent MIT scholar with an oral presentation at the annual AMGEN Scholars Symposium celebrated at UCLA, here he presented his work at John Essigmann Laboratory at MIT. Back at FIU he resumed his work with the DOE Fellowship program, and is currently working on a project related with the analysis of calcite dissolution as part of a uranium remediation technology. Recently, Reinier was invited to 2010 Berkeley Edge conference were he was oriented on how to succeed at applying for graduate school.

**VARIOUS FUNCTIONS ON DNA SUBSTRATES BY E. COLI ADAPTIVE RESPONSE PROTEIN AlkB**

Recent findings suggest that E. coli adaptive response protein AlkB can react with DNA substrates through various mechanisms rather than its regular oxidative dealkylation repair pathway. AlkB aging seems to play an important role in the manifestation of these concomitant reactions. In vitro reaction experiments of alkylated DNA substrates (3', N4-ethenoCystosine, 1- with one freshly prepared AlkB and two aged AlkB were performed; the results were analyzed using Liquid Chromatography Electro spray – Time of Flight Mass Spectrometry (LC-MS ESI-TOF).
Recent findings suggest that E. coli adaptive response protein AlkB can react with DNA substrates through various mechanisms rather than its regular oxidative dealkylation repair pathway. AlkB aging seems to play an important role in the manifestation of these concomitant reactions. In vivo reaction experiments of four alkylated DNA substrates (1-N6-ethenoAdenine, 3-N4-ethenoCytosine, 1-methylAdenine, 3-methylCytosine) with one freshly prepared AlkB and two aged AlkB were performed; the results were analyzed by using Liquid Chromatography Electro spray - Time of Flight Mass Spectrometry (LC-MS ESI-TOF).

**E. Coli Adaptive Response**

**Experimental Procedure**

AlkB reaction in vitro reactions

1. Eight different wells with a 9696 ELISA plate (96 ul) containing either a two independent DNA oligonucleotide and one enzyme (AlkB) were prepared.
2. Four sets of reactions were prepared (Table A) with fresh AlkB (two copies of each). Four µL of a mixture of HEPES buffer (pH 8.0), 67 mM NaCl, 0.2 mM DTT, 0.5 mM Fe(NH4)2(SO4)2·6H2O, 0.9 mM CuSO4, 2.16 mM ammonium sulfate) (solvent B, acetonitrile).
3. A 0.2 mL/min mixed gradient was used to elute the reaction products (solvent A, 3.5 mM HEPES buffer (pH 8.0), 0.2 mM DTT, 0.5 mM Fe(NH4)2(SO4)2·6H2O, 0.9 mM CuSO4, 2.16 mM ammonium sulfate; solvent B, acetonitrile).
4. Nitrogen gas was used as dryer (10 L/min) and nebulizer (15 psig) with a heated capillary at 300 °C.
5. The reactions were performed using 100 µM of DNA and 50 µM of AlkB for a total volume of 100 µL.

**Results**

- **Fig.1** Mass spectra (+4 charge state) of the DNA/AlkB in vitro reaction. A) Spectrum of 5'-GAGACTGGTGC3' [X=A] dealkylation products, B) Spectrum of 5'-GAGACTGGTGC3' [X=A] alkylation products in presence of AlkB.

- **Fig.2** Comparative mass spectra (+4 charge state) of the DNA/AlkB in vitro reaction. A) Spectrum of 5'-GAAGACCTXGGCGTCC-3' [X=A] oligonucleotide in presence of AlkB.

**Discussion**

- The reaction intermediates detected in the mass spectra agree with the type of mechanism proposed for AlkB dealkylation repair process.
- **Fig.3** Comparative mass spectra (-4 charge state) of the DNA/AlkB/aged AlkB in vitro reaction. Different mass peak profiles were observed between newly prepared AlkB and the aged ones. The presence of higher mass peaks indicate the oxidation of Guanine to 8-Deoxoguanine.

**Conclusions**

- The newly prepared AlkB showed only the regular oxidative repair products.
- Aged AlkB seems to form 8-Deoxoguanine preferably with A and C DNA substrates.
- The base excision mechanism was manifested to a great extent with aged AlkB.

**Future Directions:** Find the mutations/modifications in the protein responsible for its unusual behaviors. Relate them with the structure of the active site.

**References & Acknowledgement**


I would like to thank all the members of my mentor’s lab, especially my mentor John Essigmann and Deyu Li and my colleague Carrie, for giving me the chance to play in their league. It is been quite an experience.

I also would like to acknowledge Ronald E. McNair Post Baccalaureate Achievement Program because without them nothing of this would ever happen.

**Fig.4** Comparative mass spectra (-4 charge state) of the DNA/AlkB/aged AlkB in vitro reaction. B) Oxidation of Guanine to 8-Deoxoguanine.

**Fig.3** Regular AlkB reaction mechanism.

**Fig.2** Comparative mass spectra (-4 charge state) of the DNA/AlkB/aged AlkB in vitro reaction.

**Objective**

- The discovery of anomalous behavior of AlkB is of vital importance. The formation of 8-oxoguanine and AP sites very often lead to mutations that in many cases are genetic diseases and cancer precursors.
David Jaramillo is a senior at FIU who is double majoring in Human Resource Management & Psychology. David is a member of the FIU Honors College, and has the honor of being a 2009 APA PRIME (Psychology Research Initiatives & Mentorship Experience) Fellow. He is an also affiliate of The Society for Industrial-Organizational Psychology (SIOP), Academy of Management (AOM), and Society for Human Resource Management (SHRM). Outside of his McNair research, David has served as Lab Manager at FIU’s Industrial-Organizational Psychology Laboratory, and as a Research Assistant at FIU’s Infant Development Laboratory. David is also President of FIU’s Chapter of Psi Chi, The National Honor Society in Psychology, which this year celebrated its 36th anniversary on campus, and has been recognized as FIU’s best Honor Society for the last 6 years in a row. David also has some work experience under his belt, having interned as a Human Resources Generalist for a Fortune 500 company in the financial services industry. David is on track to graduate Summa cum laude in Spring 2011 and intends to pursue a PhD from either Harvard Business School, The Wharton School at the University of Pennsylvania, or MIT’s Sloan School of Management.

FACILITATING TEAM TRANSACTIVE MEMORY THROUGH PERFORMANCE FEEDBACK

In this study participants (N=76) were trained individually to assemble telephones, and performance reviews on the assembly task were collected at the end of the session. Approximately one week later, participants returned to assemble the telephones in groups of three. The experimenter manipulated how the performance feedback was distributed to the group. There were three conditions -- feedback given to one person, feedback to the entire group, and finally, no feedback returned at all. The study found that the group feedback condition committed significantly fewer errors, and on average took less time (though not of significance). In comparison, the single person feedback condition had a large variability in time taken to complete the task, and a significantly higher rate of error. The group without feedback took the longest and had a large variability in number of errors committed. Future research should investigate these effects on more complex tasks that span more than one sitting, as well as in virtual teams.
ABSTRACT
In this study participants (N=61) were trained individually to assemble telephones, and performance reviews on the assembly task were collected at the end of the session. Approximately one week later, participants returned to assemble the telephones in groups of three. The experimenter manipulated how the performance feedback was distributed to the group. There were three conditions – feedback given to one person; feedback to the entire group, or no feedback at all. The study found that providing the feedback to one person led to faster completion times, albeit with more errors. The group condition took longer, but committed significantly less errors on the task. The group without feedback took the longest and had a larger variability in number of errors committed.

LITERATURE REVIEW
Transactive memory is defined as a set of information possessed by each individual member of a group that allows an individual awareness of who knows what within the group (Wegner, 1987). Morrelland and Mykytovskiy (2000) found that it was possible to artificially create transactive memory systems by providing groups that were trained apart with feedback on each other’s skills and weaknesses, and that these groups performed as well as other groups that had been trained together. They argue that it is possible to enjoy the benefits of transactive memory without initial group training. We sought to build on their research, and hypothesized that groups in which one individual receives feedback would perform on par with groups in which all members receive feedback.

PARTICIPANTS
Ninety-two students (19 males and 53 females) participated in our research study. Excluding the pilot studies and five groups which were excluded due to either a lack of participants or experimenter error, the final sample consisted of 61 students. These students were divided into three conditions: Condition 1 (N=20), Condition 2 (N=23), and Condition 3 (N=28), as described in the Context section. Participants were 45.4% Freshmen, 25.6% Sophomores, 24.6% Juniors, 9% Seniors, and 1.6% Other (one graduate student). Participants also reported an average of 2.97 years of work experience.

METHODOLOGY
Participants signed up through the Psychology Dept’s online research participation system, for one 30 minute session and one 50 minute session approximately a week apart.

In the first session, participants were shown how to assemble half of a telephone kit by an experimenter. The telephone kit was divided into two halves, and at least 1 participant was familiar with each half for the second session. Afterwards, the participant was allotted 15 minutes to practice assembling the kit. Once the participant had completed the task, they were asked to fill-out a feedback form about their performance, and were dismissed. For the second session, participants were divided into groups of 3 according to the following conditions:
1. Separate training, performance feedback to one individual
2. Separate training, performance feedback to the entire group
3. Separate training, no performance feedback

At the beginning of the second session, participants filled out Lewis’ (2003) TMS Scale. Then performance feedback was distributed to the groups. Condition 1 teams had only one member who received the feedback for 3 minutes. Condition 2 teams had 3 minutes to review the feedback as a group. Finally, Condition 3 teams had no feedback returned to them.

Participants were then given 30 minutes to assemble the entire telephone as a group. Afterwards, they again filled out Lewis’ (2003) TMS Scale. After the feedback was given, the experimenter retested the teams and scored them on time taken and any errors committed.

RESULTS
A two-way ANOVA was run on the TMS scores for each condition. There were no significant differences between the conditions, indicating that distributing performance feedback to one person is enough to achieve satisfactory group performance. The group condition demonstrated the least errors, although taking longer, not significantly longer. This group performance feedback condition leads to the maximum desired outcome on tasks.

DISCUSSION & CONCLUSION
Contrary to our hypothesis, our study indicates that distributing performance feedback to one individual increases the total amount of errors committed, though on average leads to faster completion times. Distributing feedback to the entire group leads to a lower amount of errors committed and although taking longer, not significantly longer. This group performance feedback condition leads to the maximum desired outcome on tasks.

OBJECTIVE
To determine whether an entire group must receive performance feedback, or if relaying the feedback to one person is enough to achieve satisfactory group performance and transactive memory formation.

REFERENCES
Nadia Lima was born in Miami Florida of Cuban parents in 1988. She is currently pursuing her Bachelor’s degree in Civil Engineering with a focus in Structural Engineering at Florida International University. After completing her Bachelor’s degree, she plans to continue her current studies to obtain her Master’s degree in Structural Engineering, followed by her Ph.D in the same field. Her areas of interest include concrete structures, steel design, cementitious materials, and foundation design. Nadia interned at Savannah River National Laboratory (SRNL) the summer of 2010. Her main task involved studying the cured properties of cellular grout for its use in in-situ decommissioning of the 105-P Reactor Disassembly Basin D & E Canal. Her honors and affiliations include being a DOE Fellow, McNair Fellow, member of Tau Beta Pi and Chi Epsilon Engineering Honors Society, and President of Theta Tau- Omega Gamma Chapter Professional Engineering Fraternity.

The 105-P Reactor located at Savannah River National Laboratory (SRNL) at the Savannah River Site (SRS) in South Carolina is obsolete and no longer needed for production. The Department of Energy has set a goal to reduce its footprint at SRS, therefore identifying the 105-P Reactor for decommissioning. Part of the decommissioning process involves filling all below grade areas with cementitious materials; this is referred to as in-situ decommissioning. The 105-P Reactor Disassembly Basin D & E Canal is one of these below grade areas that are being filled with cementitious materials. The section that is to be filled is on top of an underlying chase; therefore, it is imperative to use a proper filling material to avoid collapsing the cavity. Cellular grout is the lead candidate for filling this space because of its light weight. Before filling in any sub-grade area, it is important to validate the material by conducting a series of tests. This technical report contains the results and conclusions of a series of cured tests including compressive strength, hydraulic conductivity, dry density, and moisture content.
CURED PROPERTY TESTING OF CELLULAR GROUT FOR THE USE IN IN-SITU DECOMISSIONING OF THE 105-P REACTOR DISASSEMBLY BASIN D & E CANAL

BACKGROUND

The 105-P Reactor at Savannah River Site (SRS) has been inactive since 1988. The Department of Energy has set a goal to reduce its footprint at SRS, therefore identifying the 105-P Reactor for decommissioning. Part of the decommissioning process involves filling all below grade areas with cementsitious materials; this is referred to as in-situ decommissioning. A cross-sectional view of the Disassembly Basin D & E Canal to undergo decommissioning can be seen in Figure 3. The cavity itself cannot be filled due to the worker’s safety issue of drilling through irradiated materials located above the concrete slab layer. Therefore, the area to be filled is the remaining space on top of the PR-105-P grouted layer. Modified cellular grout is the desired material to be placed into this section. Since the section that is to be filled is on top of the underlying D & E Canal slab, it is imperative to use a proper filling material to avoid collapsing into the cavity. Cellular grout is the lead candidate for filling this space due to the worker’s safety issue of drilling through irradiated materials located above the concrete slab layer. Therefore, the area to be filled is the remaining space on top of the PR-105-P grouted layer.

RESULTS AND CONCLUSIONS

Values attained are compared to literature values as seen in Table 2.

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<thead>
<tr>
<th>Property</th>
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<th>ACI 523.1</th>
<th>Trip Report Value</th>
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<tbody>
<tr>
<td>Dry Density (lb/ft³)</td>
<td>35.8</td>
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<td>34-43</td>
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<td>Moisture Content (%)</td>
<td>23.60%</td>
<td>N/A</td>
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<td>Compressive Strength (psi)</td>
<td>278.4</td>
<td>330-640</td>
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<td>Saturated Hydraulic Conductivity (cm/s)</td>
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The attained value of 5.0x10⁻⁵ cm/s was close to the range given by ACI 523.1. Values attained are compared to literature values as seen in Table 2. The following cured properties of the cellular grout were evaluated in agreement with ASTM testing standards:

- Dry Density
- Saturated Hydraulic Conductivity
- Compressive Strength
- Moisture Content

The lab result of 35.8 lb/ft³ fit within the values obtained by National Bureau of Standards Data from “Insulating Concretes,” ACI Journal (Nov. 1956) as well as ACI 523.1. The attained value of 5.0x10⁻⁵ cm/s was close to the range given by ACI 523.1. The lab result of 35.8 lb/ft³ fit within the values obtained by National Bureau of Standards Data from “Insulating Concretes,” ACI Journal (Nov. 1956) as well as ACI 523.1.

Objectives

Test the cured properties of a specimen of cellular grout in order to validate the grout.

METHODS AND EXPERIMENTAL SETUP

The following cured properties of the cellular grout were evaluated in agreement with ASTM testing standards:

- Dry Density
- Saturated Hydraulic Conductivity
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Test the cured properties of a specimen of cellular grout in order to validate the grout.
My name is Francis Matthews and I was born and raised in South Florida. I am currently majoring in Geosciences at Florida International University. I am graduating in December and have done multiple research projects dealing with the Everglades and other geology orientations. I am also an avid musician and plan to play professionally in the years to come. I am 23 years old and plan on attending graduate school within the near future, as well. My nationality is of Irish and Italian descent and I am trilingual. After graduating with a B.S. in Geosciences with a minor in Anthropology/Sociology, I plan to start a Ph.D. program concentrating in sedimentology/petrology. With this career path, I hope to work for a company that is developing alternative energy sources through fundamental earth forming processes. I am fairly optimistic in my approach to post-doctoral study and would prefer to work outdoors in the field environment, although I understand that not everything enjoyable is always appealing. No one in my immediate family has received a bachelor’s degree and surely, no one in my family tree has received a graduate degree. I have taken the McNair challenge personally and most definitely want to be the first of many in my family to receive such an academic achievement.

Francis Matthews

MIocene ForaminIFeral BioFacies Along the Caribbean Coast oF northwest Panama

One of the last straits in Central America that connected tropical Atlantic and Pacific waters was through the Panama Canal Basin, central Panama. The strait was closed in the middle Miocene, as shown by terrestrial deposits of the underlying Cucaracha Formation (central Panama Canal Basin), and was reopened by late middle to late Miocene time when sediments of the lower Gatun Formation were deposited in the northern part of the basin. The Gatun Formation is informally divided into lower, middle and upper parts, and foraminifera from all parts have primarily Caribbean associations. Overlying the Gatun Formation is the uppermost Miocene Chagres Formation, the youngest formation of the Panama Canal Basin. Foraminifera from the type Chagres Formation have primarily Pacific associations.

New foraminiferal collections were made from outcrops previously mapped as either undifferentiated volcanics or Miocene lutites, silts and conglomerates. Analyses of similarity between the foraminifera and those from different facies of the Panama Canal and Bocas del Toro basins are used to identify changes in biofacies along the 180 km of Caribbean coast between the basins. Twenty-two inner-middle neritic benthic foraminiferal assemblages from the lower, middle and upper parts of the Gatun Formation, and twelve assemblages from the middle neritic Rio Indio section and outer neritic/upperbathyal type section of the Chagres Formation are compared statistically to the newly collected assemblages from the lowermost Gatun Formation (east of the Panama Canal), and the coastline between Gobea (west of the Panama Canal) and Bocas del Toro. The paleoenvironments and biogeographic associations of the foraminiferal biofacies are incorporated into reconstructions of the history of uplift and Atlantic-Pacific connections, and to infer formational boundaries.
ABSTRACT

One of the last straits in Central America that connected tropical Atlantic and Pacific waters was the Gatun strait, which allowed abundant and varied benthic foraminiferal faunas to pass through. The Gatun biofacies are compared to those of the Chagres Formation that crops out west of the canal, and to extend the available basin record in the northwest coast of Panama still further eastward of where its boundary with the Rio Indio facies was defined. The Gatun facies (with all cluster algorithms) clearly shows the extent of the Gatun Formation at least 110 km east of the Panama Canal (blue) is distinctly different from that west of the Panama Canal (green). The east contains more moderately abundant carbonate foraminifera than the west and contains species that are present in the Pliocene formations of Bocas del Toro (Collins, 1993). The western facies were similar to those of the Panama Canal, or from different facies and formations.

INTRODUCTION

In a lab at Florida State University, master student focused on studying the foraminiferal faunas of the NW coast of Panama. These foraminifera are found in nearly all marine-influenced sediments and are generally to a range of water depths. Thus, from an assemblage of 50-200 m.

METHODS

New samples of sediments from areas of the Panama Canal were collected using a Core-ID sampler and ColletoID sampler, and compared to previously collected (PP) samples. Sediments were added to a sample forming a log of the sediment shape and size. Approximately 400,000 specimens were obtained from each sample. The dried residues were examined for their foraminiferal content. Each sample was compared with the lower Gatun Formation, with the lower middle Gatun Formation, and the upper middle Gatun Formation, as shown by terrestrial deposits of the underlying Cucaracha Formation.

RESULTS

The distributions were compared to their material content. Each sample was compared with a reference slide of each species, and the remaining slide was used as a control. The results of the classification were then plotted in a two-dimensional space. The classification was done from the samples using Super群, sample LC 510. 3. Ampullinella granulata, sample AT 07-29-1. 4. Uvigerina peregrina, sample AT 07-29-1. 5. Pararotalia boliviana, sample DP 4. 7. Pararotalia tongi, sample AT 07-32-1. 8. Pulvinula salesea, sample AT 07-29-1. 9. Ammonia tepida, sample AT 07-29-1. 10. Bolivina subaenariensis mexicana, sample LC 11. Conus, sample DP 11-2. Conus radians, sample DP 13-4.

CONCLUSIONS

The upper Gatun biofacies in the Panama Canal area shows the open-ocean characteristics of the Gatun Formation. The upper Gatun samples are more diverse than the lower Gatun biofacies. This is due to the presence of a range of water depths from the Panama Canal to the nearby inshore area.

ACKNOWLEDGEMENTS

I want to thank Florida State University for the opportunity to work on this project. I also want to thank my advisor who provided guidance and support throughout the project. I would like to extend my gratitude to the McNair program for funding this project.
I started FIU in August 2005 after graduating magna cum laude from Southwest Miami High School. When I decided to pursue a career in biomedical sciences, my family cannot have shown more support. Being the first to receive a bachelor in my family, receiving the McNair Fellowship was the second zenith of my academic career next to graduation. With this prestigious fellowship I got the opportunity to explore my academic interest in biomedical research and was offered the chance to visit the University of Notre Dame and experience how students work in their MD, PhD program with Indiana University School of Medicine. There I performed some work satisfying my interest in cancer research and developmental biology. Since then, I have accomplished much and have acquired my bachelor in Biological Sciences. Coming from a Cuban family where the only thing more important than baseball and cigars is education, achieving this has been paramount in my home. Thanks to McNair I have been able to expand and implement my experiences along with my academics to pursue a career in medicine. I am even glad to say that thanks to these achievements I have been invited to present my work in the Annual Biomedical Conference for Minority Students in Charlotte, North Carolina in November due to this Post baccalaureate Program. I hope, in the future, I may return to the McNair office in FIU and serve as an example to other cohorts in my success and provide some sort of mentorship to students following my path. Until then, I serve as an example to my siblings and lay wait for my graduate studies to begin. If I could say anything else I would like to say that I am who I am, I do what I do, and have gotten to where I am now thanks to the grace of God and the support of family.

Camilo Mohar

OVEREXPRESSION OF P190B RHOGAP IN VIVO ALTERS EXPRESSION LEVELS OF MITOTIC GENES INVOLVED WITH CHROMOSOMAL INSTABILITY
Camilo Miguel Mohar1,2, Peter McHenry1,2, Tracy Vargo-Gogola1,2

Over 70% of breast cancers are diagnosed as invasive ductal carcinomas showing a high degree of aneuploidy. Aneuploidy results from chromosomal instability (CIN), unfaithful segregation of DNA during cell division. The most consistent characteristic of tumors is CIN and the Rho signaling network is known to be altered in breast cancer. Cell Rho signaling is pertinent in mitosis suggesting that its disruption may cause CIN. An important regulator of the Rho signaling network is p190B Rho GTPase activating protein (GAP). The importance of p190B is observed in mammary gland development especially during ductal morphogenesis. Overexpression of p190B increases mammary tumor formation in onco genetic mice models of breast cancer. P190B RhoGAP has also been observed to localize in mitotic structures such as the centrosomes and kinetochores in MCF-7 cells. We hypothesize that overexpression of 190B RhoGAP is involved in CIN. Preliminary studies have already suggested that inducible overexpression of p190B in MCF-7 breast cancer cells have shown mitotic abnormalities that could lead to aneuploidy and CIN. Carter SL, et al, identified a “CIN signature” list of genes that are common in poor clinical outcomes of various cancer particularly breast cancer. This list contained over 70 genes, and interestingly, 29 of these genes are involved in mitosis. A preliminary experiment involving a microarray analysis of p190B overexpressing mammary epithelial cells indicated that a number of mitotic genes, including genes implicated in CIN, are altered by p190B overexpression. From this analysis, a list of 31 genes that were most consistently altered via p190B overexpression and associated with mitosis/CIN was generated.

1Walther Cancer Research Center/Department of Biological Sciences, University of Notre Dame,
2Department of Biochemistry and Molecular Biology, Indiana University School of Medicine
Overexpression of p190B RhoGAP Alters Expression Levels of Mitotic Genes Involved With Chromosomal Instability.

Camilo Miguel Mohar1, Peter McHenry2,3, Tracy Vargo-Gogola2,3

1Department of Microbiology and Immunology, St. Louis University School of Medicine, St. Louis, MO 63104.
2Department of Biochemistry, St. Louis University School of Medicine, St. Louis, MO 63104.
3Department of Biochemistry and Molecular Biology, Indiana University School of Medicine, South Bend, IN 46617.

Abstract

Overexpression of p190B RhoGAP alters expression levels of mitotic genes involved with chromosomal instability.

Methods

Results

Conclusion

Fig. 3 DE of p190B OE MCF-7 cells showing abnormalities while undergoing mitosis.

Future Work

Acknowledgments

Overexpression of p190B RhoGAP alters expression levels of mitotic genes involved with chromosomal instability.
My name is Alex Moncion, and I am currently a senior majoring in physics. I was born in the Dominican Republic and migrated to the United States at the age of 6, and ever since then I have lived in South Florida. I have many siblings, ten in total, from my mother and father. I am the youngest of all and the first and only in the family to reach a college level education. I entered Florida International University as a transfer student from Miami Dade College. I currently do research in the Chemistry department under the guidance of Dr. John Landrum with respect to carotenoid aggregation. I am interested in medicine and thoroughly enjoy natural science. For my graduate studies I would like to work in these two fields, and I believe medical physics is the ideal field of study for me. My ultimate goal is to acquire a MD/Ph.D. degree in Molecular and Cellular Pharmacology with hopes of using an extensive background in chemistry and medicine to synthesize medication and develop chemical mechanisms that will aim at curing diseases and not just treating them. Being a McNair Fellow gave me the opportunity to network with people who are dedicated and believe that success relies more on hard work than solely on intelligence. My goal is to develop new methods to save lives without endangering the people I am trying to serve.

Alexander Moncion
Measurement of the $^{12}C+^{12}C$ Fusion Cross Section at Sub-BARRIER Energies

Alexander Moncion, Advisor: Dr. Xiao-Dong Tang
Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556

Abstract

The goal of nuclear astrophysics is to understand the nuclear processes which power the stars and synthesize heavier elements. Our important nuclear process is the $^{12}C+^{12}C$ fusion occurring in innerspace. The $^{12}C+^{12}C$ reaction produces $^{24}Mg$ which can decay to $^{24}Ne$ or $^{24}Ne^+$ via particle evaporation. Shown in Fig 1. Most of these states decay into the ground state of $^{24}Mg$. The detection of certain gamma rays is important for understanding the detector's efficiency at various energies. The absolute peak efficiency of the detector may not be the same for all gamma rays due to the limited exposure area of the detector. For this analysis, the absolute peak efficiency was determined for the $^{12}C+^{12}C$ reaction within the center of mass energy range of 4.1 MeV to 6.5 MeV in the center of mass frame using the $^{12}C_2^+\text{beam}$ from the Florida Institute of Technology. The 12C+12C fusion reaction has been measured in a energy range of 4.1 MeV to 6.5 MeV in the center of mass frame using the $^{12}C_2^+$ beam from the Florida Institute of Technology. The 12C+12C fusion reaction has been measured in a energy range of 4.1 MeV to 6.5 MeV in the center of mass frame using the $^{12}C_2^+$ beam from the Florida Institute of Technology.

Introduction

The $^{12}C+^{12}C$ fusion reaction occurs in innerspace several times the size of the Sun. The main products of the carbon fusion reaction are $^{24}Mg$ through the alpha channel ($^{12}C_2^+\text{}^{12}C\to^{24}Mg+2\alpha$) reactions, $^{20}Ne$ through the proton channel ($^{12}C_2^+\text{}^{12}C\to^{20}Ne+2p$) reactions, and $^{20}Ne$ through the neutron channel ($^{12}C_2^+\text{}^{12}C\to^{20}Ne+n$) reactions. However, limited by time, our studies focus solely on the proton channel. In order to determine the reaction probability at a given energy, we detect the gamma radiation emitted as a byproduct of the alpha, proton, and neutron channels, with a germanium gamma particle detector. Each channel emits gamma particles that are characteristic of the produced fusion residue. The detector's ability to detect gamma rays at specific energies is determined by the detector's efficiency at specific energies. The detector's efficiency at specific energies is determined by the detector's efficiency at various energies. The absolute peak efficiency of the detector may not be the same for all gamma rays due to the limited exposure area of the detector.

Experimental Method

Efficiency Calibration

We initially determined the relative efficiency of our germanium detector using the $^{12}C+^{12}C$ fusion reaction. In order to determine the detector's efficiency at various energies, we used a germanium detector with peak efficiency at 440 keV. The detector's efficiency at 440 keV was determined to be 0.4% using a germanium detector with peak efficiency at 440 keV. The detector's efficiency at 440 keV was determined to be 0.4% using a germanium detector with peak efficiency at 440 keV. The detector's efficiency at 440 keV was determined to be 0.4% using a germanium detector with peak efficiency at 440 keV. The detector's efficiency at 440 keV was determined to be 0.4% using a germanium detector with peak efficiency at 440 keV. The detector's efficiency at 440 keV was determined to be 0.4% using a germanium detector with peak efficiency at 440 keV.

Branching and Summing Effect Correction

When determining the branching we must account for the probability of the fusion occurring at a particular proton channel. Previous work has been done to determine the branching ratio for the $^{12}C+^{12}C$ reaction at an energy of 5.5 MeV by detecting the 440 keV and 1634 keV gamma lines using a germanium detector. The total fusion reaction cross-section is determined after correcting decay branching ratios and summing effects.

Calculating Cross Section

The $^{12}C+^{12}C$ fusion reaction has been measured in an energy range of 4.1 MeV to 6.5 MeV in the center of mass frame using the $^{12}C_2^+$ beam from the Florida Institute of Technology. The beam intensity is below 400 μA. A 20 μg/cm$^2$ carbon foil is used as a target. Two Teledyne gas proportional counters are used to detect the alpha particle produced in the $^{12}C+^{12}C$ reaction. The $^{12}C+^{12}C$ reaction is initiated by the fusion of 2 carbon nuclei, $^{12}C_2^+$, in the presence of a fluorescent screen. The fusion cross section for the proton channel is then determined by a 100% detector efficiency.

For future experiments, an experimental standard should be placed. The sub-bARRIER fusion reaction, being the cross section is very sensitive to energy, a careful beam energy calibration is required. The target thickness is also crucial for the yield determination as well as the effective beam energy. Because of overlap buildup problems, the target thickness is a function of reangled dose at the beam particle. In the future experiment, the target thickness need to be monitored with elastically scattered beam particle. A comprehensive study should be performed in the future.

Acknowledgements

I'd like to thank the NSF for funding my research experience at the University of Notre Dame. My gratitude is also extended to Dr. Umesh Gang for giving me the opportunity to be part of the REU program. Many thanks to Dr. Charlie Hones and Mr. Sean Bhurst for their kindness and concern. I am extremely grateful to Dr. Xiao-Dong Tang, Brian Bucher and Xiao Tang for their help, support, advice, and ongoing patience. Finally, I would like to thank Dr. Hamilton and Dr. Simms for giving me the opportunity to be a McNair fellow.

References

Alvaro Quinonez was born in New Jersey, U.S.A, and is of Colombian heritage. When he was younger, he lived in Colombia for four years. He then moved back to New Jersey, and then Miami. He has lived in Miami for about 12 years. He is a graduate of Coral Reef Senior High School. Upon graduating high school, Alvaro enrolled at Florida International University, deciding to study civil engineering because of his fascination with structural engineering.

In addition to studying civil engineering, Alvaro is also a student in FIU’s Honors College. Furthermore, Alvaro is a member of Chi Epsilon – The National Civil Engineering Honor Society. During the spring semester of 2009, he served as the Secretary/Treasurer of the society’s FIU chapter, and in the fall semester he was the chapter President. In 2010, Alvaro was chosen as a McNair Fellow by the Ronald E. McNair Postbaccalaureate Achievement Program at FIU.

In 2007, Alvaro worked at the National Science Foundation (NSF) with the program director of the Network for Earthquake Engineering Simulation (NEES). In 2008 and 2009, Alvaro worked as an Undergraduate Research Assistant at FIU’s Laboratory for Wind Engineering Research. At the laboratory’s Wall of Wind facility, capable of subjecting full-scale building models to hurricane winds and wind-driven rain, Alvaro assisted graduate students in preparing experiments. In the summer of 2009 and 2010, Alvaro was part of the Massachusetts Institute of Technology Summer Research Program. During both summers, Alvaro worked on analyzing the stability of unreinforced masonry structures. In one of the studies, Alvaro and the research team he formed a part of used a novel method for generating small-scale structural models of masonry structures. From this study, Alvaro and the team published a paper titled Small-Scale Models for Testing Masonry Structures, of which he is the first author. He presented this paper at the 7th International Conference on Structural Analysis of Historic Constructions, held in October 2010 in Shanghai, China. Alvaro also presented some of the research he helped conduct at MIT at FIU’s 7th Annual Ronald E. McNair Scientific Research Symposium. At the symposium, Alvaro was awarded first place presentation and second place poster. Alvaro’s future plans are to obtain Master of Science and PhD degrees in structural engineering. After graduate school, he wants to continue his research and consult in industry.

**PHYSICAL MODELING OF CURVING MASONRY STRUCTURES**

Experiments on small-scale brick models are used to investigate the lateral stability of unreinforced curving masonry walls. Understanding the mechanics of curving walls will advance the knowledge of the stability of historic masonry structures, enabling engineers to accurately assess their safety. Five geometries are studied to observe the effect of curvature on wall stability. Small-scale models are manually constructed using clay bricks measuring 54x27x14mm. The walls are tilted on an inclining platform until collapse occurs. Tests are recorded using a high-speed video camera to capture the collapse mechanisms. Results demonstrate that wall stability increases with the amount of curvature, and that collapse mechanisms are caused by hinge lines forming due to a combination of brick rotation and sliding. Such experiments provide invaluable observations of collapse mechanisms, which can be compared to theoretical predictions and numerical models. Construction issues presented by brick imperfections and the construction method are also discussed.
Objective

Study the lateral stability of curving unreinforced masonry walls using small-scale masonry wall models.

Abstract

Small-scale masonry wall models are used to study the lateral stability of curving unreinforced masonry walls. Understanding the mechanics of curving wall geometries advances the knowledge of the stability of historic masonry structures, enabling accurate assessments of their safety. Five geometries are studied to observe the effect of curvature on wall stability. Models are manually constructed using clay bricks measuring 54x27x14mm, and tilted on an inclining platform until collapse occurs. Tests are recorded on high-speed video to capture the collapse mechanisms. Experimental results reveal that wall stability increases with curvature, and that collapse mechanisms are caused by hinge lines forming due to a combination of brick rotation and sliding. Such experiments provide invaluable observations of collapse mechanisms, which can be compared to theoretical predictions and numerical models. Construction issues presented by brick imperfections and the construction method are also discussed.

Physical Modeling of Curving Masonry Structures

Alvaro Quiñonez
aquino11@fiu.edu

Mentor: Professor John Ochsendorf
Supervisor: Jennifer Furstenau
Building Technology Lab
Massachusetts Institute of Technology

Why Curving Masonry Walls?

• No engineering studies

Serpentine Wall, Maryland, U.S.A. (Harmon)
Serpentine Wall at UVa (Virginia)

Jefferson: Curving Walls vs. Plane Walls with Piers (Columbia)

Small-Scale Structural Models:

• Theoretical model based on rigid block
• Wall geometry based on α
• Wall dimensions:
  • Scale 1 - 32 x 23 cm (h/L = 72%)
  • Scale 2 - 45 x 36 cm (h/L = 80%)
• Case Study - 60 x 24 cm

Results

Number of Bricks Used in Case Study Models

<table>
<thead>
<tr>
<th>Wall Geometry</th>
<th>No. of Bricks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serpentine</td>
<td>187</td>
</tr>
<tr>
<td>Straight + Piers</td>
<td>323</td>
</tr>
<tr>
<td>Straight</td>
<td>187</td>
</tr>
</tbody>
</table>

Conclusions & Future Work

• Small-scale structural models are advantageous
• Curvature increases lateral stability of walls
• Serpentine walls have high material efficiency
• Variation in brick geometry affected model construction
• Future work

Acknowledgements

• 2010 MIT Summer Research Program, McNair Scholars Program
• Prof. John Ochsendorf, Jennifer Furstenau, Rolando Bermudez
• Building Technology Lab, Edgerton Center

References:

From a young age I developed an interest for mathematics and sciences. Despite the fact that I was born in a small town, called Santa Clara in Cuba, with very limited resources, I was always borrowing the old Russian math books from the local library and reading them at my own pace. Unfortunately, my severe visual problems have always been an obstacle in my life. I suffer from a very advanced myopia, astigmatism and worst of all, rotatory nystagmus. This visual impediment makes it difficult for me to read for prolonged periods of time. However, through the study of Tai Chi I have been able to control my eye jitters. My father introduced me into the world of martial arts when I was eight years old. From then on I have studied Judo, Muay Thai, Jiu Jitsu and Krav Maga. This training of discipline, commitment and self reliance has carried on with me throughout the rest of my life. These skills made me able to adapt to my disability and push myself to complete my preliminary studies with a very high point average. After that, I was inducted into the Polytechnic Institute for Exact Sciences at the age of 14. I was unable to complete my studies there because at age 15 my mother and I migrated to the United States seeking an opportunity for a brighter future and advanced treatments for my eyesight. I currently do research under Dr. Konstantinos Kavallieratos, in the department of Chemistry and Biochemistry at Florida International University. In this lab I focus on the synthesis of fluorescent dyes for the detection of Nitric Oxide in human tissue. In addition to this, I am an Undergraduate Research Assistant at the Optical Imaging Laboratory in the Engineering Center at FIU, where I focus on programming Graphical User Interfaces for the clinical translation of an in house developed optical imaging system.
Comparison between the Voigt and Reuss Models for Composites, as it Pertain to the Mineral Content Effects on the Modulus of Biomaterials with Isotropic and Anisotropic Distributions

Rigoberto Roche
Michael Christie Ph.D
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ABSTRACT

The characteristics and properties of the Voigt and Reuss models for composites are discussed and described in detail. A comparison and contrast between these two models was made in order to determine the particular behavior of certain composite materials as described by the respective expressions. In addition to this, the effect of mineral content on dental filling composites, ceramic and porous implants, bone and particulate composites in orthopedic implants was described in detail by means of a series of mathematical models that reflected specific trends which differentiate the modular response in isotropic and anisotropic dispersions. Mathematical simulations were performed using a MATLAB program that took into account all the relevant variables and initial conditions that affect these systems. The model was able to produce a series of graphs that symbolically depict the behavior of the systematic parameters under varied conditions for the respective models as well as isotropic and anisotropic conditions. From this mathematical simulation, it was obtained that the Voigt model followed the behavior of a linear system whereas describing Young modulus with respect to volume fraction of inclusions. The Reuss model shows an exponential behavior of the modulus as a function of the inclusion volume fraction. For both the isotropic and anisotropic systems, the modulus showed decreasing behavior as mineral inclusion fraction increased. This is demonstrated in the inclusion the magnitude of subject values that were observed after initial compostion was simulated. Finally, errors were identified regarding the assumptions of the model. Other extraneous factors which could influence the observed response are also discussed and described.

METHODS

For the purpose of this project we will adopt composite characteristic models (one each of Voigt and Reuss composite models in a given volume fraction of inclusion phases, the stiffness of the Voigt and Reuss composite for an elastic two phase composite represent upper and lower bounds on the Young’s modulus. Neglecting Poisson’s effects and allowing no restriction on the shape of the two phases, the modulus for the Voigt composite is given by:

\[ E_V = (1 - V_1) E_1 + V_1 E_2 \]

and for the Reuss composite:

\[ E_R = (1 - V_2) E_1 + V_2 E_2 \]

where \( E_1 \) and \( E_2 \) are the moduli of the two phases, \( V_1 \) and \( V_2 \) the volume fractions of the two phases. Below is the graph showing the upper and lower bounds on the Young’s modulus. The inclusions present in the different components were transversal. The symbol shown by * is an indicator of a set of complex numbers with a specific modulus and phase. A statement made for the bounds being posed for assumption that both phases are in a minimum elastic energy state. They lead to have positive stiffness. Also, work maintaining that the volume inelastic in elastic strain is the chemical strain and mechanical strain. Thermodynamic effects may be ignored. For a vectorial composite, use of the stated dynamic comparative principles is:

\[ E^{\text{iso}} = \frac{E_1 V_1 + E_2 V_2}{V_1 + V_2} \]

The symbol shown by a \( \mathrm{T} \) is an indicator of a set of complex numbers with a specific modulus and phase.

RESULTS

A graphical view was created in order to compare the difference between the Voigt and Reuss model as function of inclusion volume fraction. There were several assumptions made in order to simplify the model and obtain a single parameter model that could be evaluated for the two models. The base variable used to generate the scopes presented below is given by a \( \mathrm{T} \) is an indicator of a set of complex numbers with specific modulus and phase. A statement made for the bounds being posed for assumption that both phases are in a minimum elastic energy state. They lead to have positive stiffness. Also, work maintaining that the volume inelastic in elastic strain is the chemical strain and mechanical strain. Thermodynamic effects may be ignored. For a vectorial composite, use of the stated dynamic comparative principles is:

\[ E^{\text{iso}} = \frac{E_1 V_1 + E_2 V_2}{V_1 + V_2} \]

The overall modulus of the Reuss composite (neglecting Poisson effects on isotropic and anisotropic dispersion. Mathematical simulations were done to establish the appropriate response that the different composite will have upon an increased specified parameter of inclusions represented in the Voigt modulus.

A comparison of the Voigt and Reuss models for specific composites including dental filling composites and ceramic onlays implants and carbon-reinforced UHMWPE showed a loglinear result that passed approximately where the analysis of the isotropic and anisotropic Reuss models are applicable for isotropic composites. This result along with the analysis of the Voigt composite model for composites demonstrated different responses when compared to the Reuss model. These laminates are anisotropic. They represent an identical response isotropic and anisotropic dispersion. Mathematical simulations were done to establish the appropriate response that the different composite will have upon an increased specified parameter of inclusions represented in the Voigt modulus.

This allows for the user to determine a ranking for different material for a bioengineering challenge, biomaterial selection. This set of assumptions allowed for the simplification of the calculations in order to model the phenomenon that was being simulated. However, regardless of its limitation, this model can be used for biomaterials evaluation. By knowing the properties of the isotropic and anisotropic composite and its corresponding modulus. Examination of two models that can be input such properties in the model and generate a mathematical distribution that describes the mechanical properties of the composite as a function of inclusions, using the Young’s modulus. This allows for the user to determine a ranking for different material for a bioengineering challenge, biomaterial selection. The symbol shown by a \( \mathrm{T} \) is an indicator of a set of complex numbers with specific modulus and phase. A statement made for the bounds being posed for assumption that both phases are in a minimum elastic energy state. They lead to have positive stiffness. Also, work maintaining that the volume inelastic in elastic strain is the chemical strain and mechanical strain. Thermodynamic effects may be ignored. For a vectorial composite, use of the stated dynamic comparative principles is:

\[ E^{\text{iso}} = \frac{E_1 V_1 + E_2 V_2}{V_1 + V_2} \]

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\[ E^{\text{iso}} = \frac{E_1 V_1 + E_2 V_2}{V_1 + V_2} \]

The symbol shown by a \( \mathrm{T} \) is an indicator of a set of complex numbers with specific modulus and phase.

COMMENTS

Mineral content in composite materials affects the properties of the composite and its corresponding modular. Examination of two models classified as the Voigt and Reuss Models demonstrated different levels of stiffness within the composite materials of interest. Isotropic and anisotropic modulus response was closely scrutinized among various composites, including dental fillings, porous implants, and particulate in orthopedic implants. The Voigt model was shown to portray linear behavior with respect to Young’s modulus while the Reuss model exhibited an exponential behavior as seen in figure 3 and 10. This was due to the resemblance between the moduli and volume fraction behavior. It is also evident that the behavior of the isotropic modulus response was also linear for all types of composites examined. This was shown in figure 4, 5, 7, 8, 9, 11 and 12. Upon analyzing the outputs, one can conclude that the modulus response is linear but when the composites have a certain degree of mineral content. A higher level of mineral content in a given composite will increase the strength of the composite. Sources of error identified within our parameters were attributed to the assumptions made within our mathematical model. The set of assumptions allowed for the simplification of the calculations in order to model the phenomenon that was being simulated. However, regardless of its limitation, this model can be used for biomaterials evaluation. By knowing the properties of the isotropic and anisotropic composite and its corresponding modulus. Examination of two models that can be input such properties in the model and generate a mathematical distribution that describes the mechanical properties of the composite as a function of inclusions, using the Young’s modulus. This allows for the user to determine a ranking for different material for a bioengineering challenge, biomaterial selection. This set of assumptions allowed for the simplification of the calculations in order to model the phenomenon that was being simulated. However, regardless of its limitation, this model can be used for biomaterials evaluation. By knowing the properties of the isotropic and anisotropic composite and its corresponding modulus. Examination of two models that can be input such properties in the model and generate a mathematical distribution that describes the mechanical properties of the composite as a function of inclusions, using the Young’s modulus.

DISCUSSIONS

This allows for the user to determine a ranking for different material for a bioengineering challenge, biomaterial selection. This set of assumptions allowed for the simplification of the calculations in order to model the phenomenon that was being simulated. However, regardless of its limitation, this model can be used for biomaterials evaluation. By knowing the properties of the isotropic and anisotropic composite and its corresponding modulus. Examination of two models that can be input such properties in the model and generate a mathematical distribution that describes the mechanical properties of the composite as a function of inclusions, using the Young’s modulus.

I WOULD LIKE TO EXPRESS MY GRATITUDE TO
Dr. Michael Christie
For countless hours of consult and help in all aspects of this project and for the orthodontic advice are recognized.

FGI Internship: Michael Propper
For all the assistance during the grant and my appreciation to the members of the office and special thanks to Dr. Simms.
I was born in Barranquilla, Colombia on the 22nd of August, 1988. I grew up with my parents, two older sisters, and my grandparents. I attended the Italian school Galileo Galilei for elementary, middle and high school and graduated valedictorian of my class. The day after my high school graduation, my father and I moved to the United States to reunite with my mother and my two sisters who were already residing in Miami, Florida. About a month after, I enrolled at Miami Dade College in the pursuit of an Associate’s Degree in Chemistry. My decision to pursue Chemistry came from the advice of fellow students and academic advisors who told me that if I wanted to go to medical school, then Chemistry was the obvious choice since it would give me the proper science background. During this time at Miami Dade College I began to recognize that my declared major did not meet my expectations to the fullest and I did not want to consider my four or five years of undergraduate studies as nothing more than a means to an end. One afternoon, while working at the library at Miami Dade College, I came across this article about a field of study that I had heard of before and was very intrigued about. It talked about a relatively new but fast-growing field called Biomedical Engineering. By the time I finished reading the article there was a big smile on my face; I immediately left the computer and ran outside to call my dad, “I found it! I have also had the opportunity to work in research projects both at my home institution as well as at Brown University and the University of Colorado at Boulder during the summers of 2009 and 2010 respectively. My plans after completing my current studies is to move directly into graduate school and work towards my PhD in Biomedical Engineering.

**Electrospun NanoFiber Scaffold Impregnated With Growth Factors For Small-Diameter Vascular Grafts**

Andrea Rolong¹, Walter Bonani², and Wei Tan²

Current graft treatments of vascular disorders include the use of autografts or allografts; these grafts present scarce availability and discrepancies in size between their original location and their destination site. Non-biodegradable grafts have thus been used in these conditions, but they are found to cause several problems such as graft occlusion, infections, and rejection, which eventually lead to graft failure. To decrease the incidence of these complications, we have designed molecule-impregnated biodegradable grafts which provide a scaffold and environment to stimulate endothelial cell (EC) adhesion, migration and proliferation. EC activities can be increased by incorporating growth factors into the material. PCL and PLGA are widely-used biodegradable polymers; they are selected as scaffolding materials for engineering vascular grafts here. Growth factors such as VEGF are incorporated into a PCL-PLGA graft, and released when the graft degrades. Using a new double-electrospinning technique we developed, the rate of polymer degradation can be adjusted by changing the chemical composition and the nanostructure. Through control over the polymer degradation, a controlled release of the growth factors impregnated in the polymer will be accomplished. The spatial and temporal release of these growth factors into the extracellular space for modulating cell behaviors was studied using MTT assay, cell migration assay as well as spectrofluorometry. The expected outcome is to find an exponential relation between cell proliferation and elapsed time; this will demonstrate continuous release of growth factor. Results from the spatial test, which involves testing the material in a double chamber, are expected to show that release of a specific growth factor occurs only on the side where it was placed.

¹Florida International University, ²Mechanical Engineering Department, University of Colorado at Boulder, Boulder, CO
Objective

Cohort

Introduction

Objective

To design molecule-impregnated biodegradable grafts which provide a scaffold and environment to stimulate endothelial cell (EC) adhesion, migration and proliferation.

Abstract

PCL and PLGA are widely-used biodegradable polymers; they are selected as scaffolding materials for engineering vascular grafts here. Growth factors such as VEGF are incorporated into a PCL-PLGA graft, and released when the graft degrades. Using a new double-electrospinning technique we developed, the role of polymer degradation can be adjusted by changing the chemical composition and the nanofibers. Through control over the polymer degradation, a controlled release of the growth factors impregnated in the polymer will be accomplished. The spatial and temporal release of these growth factors into the extracellular space for modulating cell behaviors is studied using MTT assay, cell migration assay as well as spectrofluorometry. The expected outcome is to find release of a specific growth factor occurs only on the side where it was placed.

Motivation

Non-biodegradable synthetic grafts

Autografts and allografts

Infections

Discrepancies in size

Scarce availability

Rejection by the organism

Non-biodegradable grafts

Biodegradable grafts impregnated with growth factors

Nanofiber scaffold increases cell adhesion

Biodegradability allows for remodeling and regeneration

Growth factors (VEGF, PDGF, TGF-β) promote tissue formation and eventually replace the graft

Reagent

Growth factors (VEGF, PDGF, TGF-β) promote tissue formation and eventually replace the graft

Testing

Perform MTT test after incubation with VEGF impregnated graft sample

Perform cell migration test of the albumin impregnated samples in dual chamber

Expected Results

The amount of EC proliferation depends on VEGF concentration and elapsed time

Dose-response curves can be generated through absorbance and fluorescence detection

Discussion

Desired characteristics of vascular grafts:

Mechanical stability

Biocompatibility

Non-thrombogenicity

Availability

Cost effectiveness

Acknowledgements

SMART Program

The Leadership Alliance

Dr. Wei Tan – Faculty mentor

Walter Bonani – Graduate mentor

Dr. Devon Scott – Post-doc

Florida International University

McNair Program

OBJECTIVE

To design molecule-impregnated biodegradable grafts which provide a scaffold and environment to stimulate endothelial cell (EC) adhesion, migration and proliferation.
Experience is a major component involved in making us who we are. I was born in Miami, FL into a wonderful Nicaraguan family. Between helping my grandma cook in the kitchen and playing softball, my curiosity about the world and the nature of human thought developed. After graduating top ten in my high school class, I was admitted into Florida International University and began my studies in the psychological and biological sciences. As a sophomore I was accepted into the Child Anxiety and Phobia Program (C.A.P.P) as a research assistant under the supervision of Dr. Wendy Silverman. C.A.P.P sparked my interest in development and behavior and allowed me to get a firsthand experience of the research process. It was then I realized that scientific investigation would be necessary to answer the questions I had as a child and young adult. Soon, I began to assist in the Developmental Psychobiology Lab (D.P.B) under Dr. Robert Lickliter. It was there that I began to scientifically explore the mechanisms involved with experience, such as sensory perception from a developmental systems perspective. While assisting in the lab, I was given the opportunity to conduct a research project focusing on how different patterns of stimulus distribution can influence prenatal learning. With the help of my mentor, I presented the project to the Dr. Ronald E. McNair program for a summer research opportunity and thus became a McNair fellow. I am highly interested in how the brain operates as a whole and particularly how external factors can influence internal mechanisms. Following graduation this December, I hope to be admitted into a doctoral program in neuroscience.

**DOES THE DISTRIBUTION OF SENSORY STIMULATION INFLUENCE? PRENATAL LEARNING IN NORTHERN BOBBWITE QUAILS**

This study explores the relationship between the prenatal frequency of stimulus delivery and the total duration of stimulation to see if a specific combination of these components can provide an optimal context for recruiting attention and facilitating prenatal auditory learning in bobwhite quail embryos. Previous research has shown that when bobwhite quail embryos are presented with an individual variant of the bobwhite maternal call for 10 min/hr for 24 hours, they subsequently show a postnatal preference for that familiar call. However, when the same maternal call is presented for 10 minutes per for 12 hours, they no longer show a preference for familiarized call (Lickliter et al., 2002). We hypothesized that if the frequency of stimulus delivery is increased and the duration of each stimulus is decreased (without varying the total amount of prenatal stimulation provided), there may be more opportunities to attend to the stimulus and subsequently show a postnatal preference.
Distribution of Sensory Stimulation: Prenatal Learning in Northern Bobwhite Quails

Karina Saravia & Robert Lickliter
Florida International University
Miami, FL

Introduction

Previous studies have shown that the type and amount of prenatal sensory stimulation available to precocial avian embryos can influence prenatal and postnatal perceptual learning and organization. The present study assessed the influence of the distribution of prenatal sensory stimulation to the auditory modality and subsequent prenatal learning. Relationships between frequency of stimulus delivery and total duration of stimulation were explored to see if an optimal context for recruiting attention and facilitating prenatal learning could be established by manipulating the distribution of stimulation during the late stages of the prenatal development in bobwhite quail embryos.

Methods

Northern bobwhite quail (Colinus virginianus) embryos (N = 61) were exposed to an individual bobwhite maternal call in one of two conditions 12 hours prior to hatching. In experimental condition 1 (N = 18), embryos received auditory exposure to CALL B, a bobwhite maternal call variant, for 1 minute every 6 minutes for a period of 12 hours (a total of 120 minutes of exposure). In experimental condition 2 (N = 14), embryos received the same maternal call (CALL B) for 10 consecutive minutes, every hour for a period of 12 hours (total of 120 minutes). The naive/control group (N = 29) did not receive any prenatal auditory stimulation. All chicks were tested postnatally at 24 hrs of age in a simultaneous choice test between the familiarized maternal call and an unfamiliar variant of the bobwhite maternal call. During these tests, the two calls were played from opposite sides of a circular testing arena and chicks were scored for their latency and duration of approach to both calls. A Chi-square test was used to find a p-value.

Results

The experimental conditions of this study examined the effects of distributed patterns of prenatal sensory stimulation on subsequent auditory responsiveness to maternal calls in bobwhite quail chicks. Preliminary results showed that chicks that received a variation of the familiar call received a short duration of prenatal auditory stimulation over an even number of cycles showed a significant preference for the familiar maternal call (Chi sq = 9.125, P = .0104). Group of chicks that received a longer duration of prenatal auditory stimulation over fewer cycles showed a slight preference for the unfamiliar call (Chi sq = 6.1429, P = .046). Group of chicks that did not did receive any prenatal stimulation. Did not demonstrate any preference for either maternal call during the simultaneous choice test (chi sq = .8966, P = .639); see Table 3.

Conclusions

A major limitation of this study was the small sample size. Further exploration of this topic may provide insights into the optimal range of stimuli distribution for learning in bobwhite quails. The data presented is not sufficient to allow any precise predictions regarding prenatal learning and the optimal thresholds or levels of stimulation required to achieve perceptual learning in embryos or neonates. The neural structures responsible for these mechanisms of prenatal selective attention and memory formation should also be explored.

Acknowledgements

I would like to thank the following individuals for their support and help throughout the course of this research project:
- Dr. Robert Lickliter
- Dr. Simms and Dr. Hamilton
- Graduate students: Namitha Raju and Jimena Valliant
- The Ronald E. McNair staff
- Dr. Simms and Dr. Hamilton

Objective

Explore the relationship between the prenatal frequency of stimulus delivery and the total duration of stimulation.
My name is Luis E. Saumell San Martin, I am a McNair Fellow from the 7th cohort. I was born in La Habana, Cuba on September 29th, 1985 (I am 25 years old). While I was in Cuba, I started my university studies in Computer Science in University of Havana. After my first year at the university in Cuba I came to Miami, USA, in January 2006. In May 2006 I started my English studies in Miami Dade College, and in the Spring 2007 I started to pursue the Associate in Arts in Miami Dade College. Then, in Summer 2008 I transferred to FIU (honors college) with my A.A. and started my major in Mathematics because while I was in Cuba studying Computer Science I discovered that Mathematics was my passion. Nevertheless, I continued taking Computer Science classes too. Then I became a McNair Fellow (7th cohort) and I had the opportunity to do research this Summer 2010 at University of Notre Dame. I graduated this past Summer (2010) with a bachelor in Mathematics and a minor in Computer Science. I am now working on my Master Degree in Mathematical Sciences at FIU.

SMOOTH PROJECTIVE TORIC VARIETIES

The relation between Mathematics and Physics has proven to be very fruitful: Mathematics methods are developed for serving the needs of Physics as well as accurate math models help physicists find new phenomena in their field. The second part of the last Century was full of great achievements both in Physics and Mathematics based on that relation: the standard model for particles in Physics, applications of Yang-Mills theory in Mathematics, string theory, to name some of them. In this project, we study one aspect of that relation. The focus of this work is to study a class of mathematical objects, called toric varieties, which are used to model the mirror symmetry phenomenon in physics. Toric varieties are complex manifolds on which a complex torus acts with a dense orbit. These manifolds can be studied by algebraic and combinatorial methods (they belong in a common ground of algebraic geometry and the theory of convex cones in Euclidean spaces). These objects are important because it was realized in the decade of 1980 that many nice examples of physics theories can be based on toric varieties. In particular, the mirror symmetry - a phenomenon related to the super-string theory, the theory that hoped to unify the forces in physics, can be modelled easily on such varieties. Therefore, the core of this work is to study toric varieties, and more specifically smooth toric varieties in the Projective Space.
The focus of this work is to study a class of mathematical objects called toric varieties which are used to model the mirror symmetry phenomenon in physics.
My name is Maria Talavera and I am 23 years old. My ethnicity is Cuban and Spanish descent and I was born in Hialeah, Florida. My current academic standing is a Senior and my major is Biology. My current research topic is observing alterations, generally inhibition, of restriction enzyme activity that has been employed frequently to determine the sequence specificity of the binding of many types of molecules to DNAs. While examining the competitive binding of a variety of intercalators (Netropsin, bis((di((aminoethyl)amino)ethyl)amino)anthracene-9,10-dione, tetra(N-methyl-4-pyridyl)porphine, Ethidium bromide) to a mixture of supercoiled and relaxed circular phiX174RF DNAs using restriction enzymes which cleave once or twice. I conducted this research under Dr. Stephen Winkle at Florida International University. I became interested in my research topic because Cancer has impacted my life several times, I've lost loved ones due to this disease and my mom is a colon cancer survivor. I found the topic very interesting because it could help improve our understanding of how certain drugs interact in mutative conditions. This way we can develop drugs which would be a lot more effective to treat cancers. I really enjoy cooking and sports. My favorite food is New York-style cheese pizza and Fettuccini Alfredo.

RESTRICTION ENZYME ACTIVITY ANALYSIS OF SMALL MOLECULE BINDING TO DNA: CONSIDERATIONS OF TOPOLOGY AND FLANKING SEQUENCES

We will be observing alterations (generally inhibition) of restriction enzyme activity that has been employed frequently to determine the sequences specificity of the binding of many types of molecules to DNAs. Generally, these studies have either employed restriction enzymes which cut the target DNA several times or employed “short,” linear DNA fragments. In this study, we examined the competitive binding of a variety of intercalators (Netropsin, bis((di((aminoethyl)amino)anthracene-9,10-dione, tetra(N-methyl-4-pyridyl)porphine, Ethidium bromide) to a mixture of supercoiled and relaxed circular phiX174RF DNA using restriction enzymes which cleave once or twice, e.g., Ava II, BstH II, Dra I, Mlu I, Nci I, Nru I, Pst I, Stu I, Xho I, Nar I, AL W44. All studies will be at low ligand/base pair ratios so that binding to primary sites is monitored. For many of these molecules are known to twist DNA and may bind cooperatively – perhaps more readily done with linear DNA.
Restriction Enzyme Activity Analysis of Small Molecule Binding to DNA: Considerations of Topology and Flanking Sequences

S.A. Winkle, M.D. Talavera, Department of Chemistry and Biochemistry, Florida International University, Miami, Florida 33199

ABSTRACT

We will be observing alterations (generally inhibition) of restriction enzyme activity that has been employed frequently to determine the sequence specificity of the binding of many types of molecules to DNA. Generally, these studies have either employed restriction enzymes which cut the target DNA several times or employed “short” linear DNA fragments. In this study, we will examine the competitive binding of a variety of intercalators (Netropsin, bis(((di(aminoethyl)amino)ethyl)amino)anthracene-9,10-dione, tetra(N-methyl-4-pyridyl)porphine, Ethidium, and others) to a mixture of supercoiled and relaxed circular 6.9kbp DNA using restriction enzymes which cleave once or twice, e.g., Ava II, Bam H I, Dra I, Mlu I, Nci I, Nru I, Pst I, St I, Xho I. All studies will be at low ligand/base pair ratios so that binding to primary sites is monitored.

INTRODUCTION

Restriction enzymes are enzymes that cleave DNA and cleave at specific nucleotide sequences. In this case, they will be used to help locate particular sequences where several drugs of interest would bind to. We plan to study the drugs’ behavior when competing with restriction endonucleases, as well as how they interact with DNA upon binding. PhiX174RF DNAs will be used in this experiment. Drugs used in this study included Netropsin, Ethidium Bromide, tetra(N-methyl-4-pyridyl)porphine (Porphyrin), bis(((di(aminoethyl)amino)ethyl)amino)anthracene-9,10-dione, Ametantrone, and EB stands for Ethidium Bromide. Restriction Enzyme Activity Analysis of Small Molecule Binding to DNA: Considerations of Topology and Flanking Sequences

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If a drug’s affinity is great for a sequence that resembles the cleavage site of the enzyme of interest, there should be some sort of interference which ultimately would inhibit cleavage.

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All Restriction Endonucleases and buffers used were ordered from Promega Laboratories and Fisher Scientific Laboratories. Enzyme dilutions were prepared using 2 µl of the pure restriction endonucleases of interest, 5 µl of its corresponding buffer and 40 µl of Glycogen. Samples were numbered from 1 to 6. In this study, we used 1:10 dilution of ΦX174 DNA.

Samples one through six were incubated for 15 minutes at a temperature of 37°C. After fifteen minutes, these samples were taken out of the incubator. Samples 2 through 6 were given 3/4 of enzyme dilution and placed back to be incubated for 15 more minutes. After the incubation period ended, 5 µl of 0.8% sodium dodecyl sulfate was added to samples 1 through 8. The samples were then incubated at 65°C for eight minutes. An amount of 4 µl of tracking dye was added to every sample. A 1% Agarose gel is made; contents include 2 grams of Agarose (s); 178mL of deionized H2O; and 20mL of TBE. Agarose gel electrophoresis was carried out in a FisherBiotech Mini-Horizontal Unit; model FB-SB-710.

For specific information on this process, view article in references (2). After gel electrophoresis is complete, the Agarose gel is to be placed for 15 minutes in a Ethidium staining bath. After completing this staining bath, the gel is ready to be viewed under UV light for results.

Table 1: Sample protocol

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EXPECTED RESULTS

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We would like to thank the Ronald E. McNair Post-baccalaureate Achievement Program for allowing me to conduct research during the summer. My mentor, Dr. Winkle, for allowing me to work in his lab and for all his help. I would also like to thank the staff of the McNair program, Dr. Simms, Dr. Hamilton, Ms. Thompson and Ms. Colon, for all their help and support. Finally I would like to thank my parents and my boyfriend, for all their love, but particularly for always believing in me especially during times when I didn’t.

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ACKNOWLEDGEMENTS

The McNair program staff and students gratefully acknowledge the following individuals and departments for their continued support and contribution:

Office of the Provost
Office of the Vice President for Research & Graduate School
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