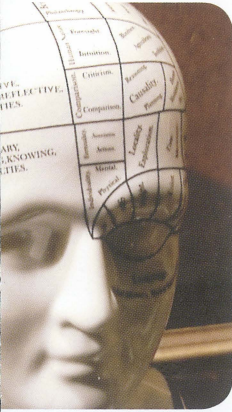


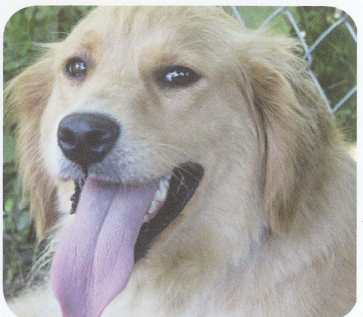
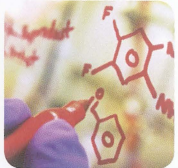
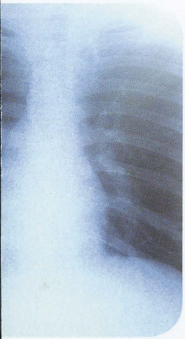
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RESEARCH REPORT

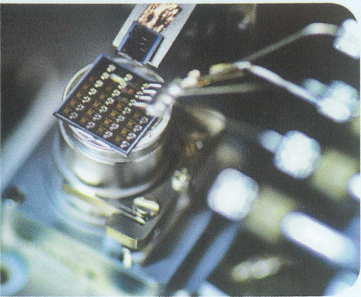
Summer/Fall 2013



Preparing Students for Careers
in Research and Teaching



THE UNIVERSITY OF TEXAS AT ARLINGTON



About

THE MCNAIR SCHOLARS PROGRAM

The McNair Scholars Program (officially known as the Ronald E. McNair Post-Baccalaureate Achievement Program) came to the campus of The University of Texas at Arlington in 1990. Created by the U.S. Congress in 1988, it is named after Dr. Ronald E. McNair, who perished with his fellow astronauts on the space shuttle *Challenger*.

The McNair program endeavors to assist talented undergraduates—either first-generation/low-income or underrepresented students—to prepare for graduate study leading to the Ph.D. and the professoriate. Since its beginning at the University, the McNair program has encouraged and assisted more than 300 students in various majors. Currently it works with a minimum of 34 students each academic year, providing seminars and classes on topics relating to graduate school and the GRE, a May institute to heighten scholars' understanding of the culture of research, and the opportunity to engage in a summer research internship as rising seniors. The program also provides guidance with the graduate school application process and travel funds to participate in conferences and visit prospective graduate programs.



Dr. Ronald E. McNair, Scientist and Astronaut, 1950-1986



Notes

FROM THE DIRECTOR

I congratulate our interns on their energy, creativity, and dedication during the 2013 McNair Research Internship. The knowledge that they acquired and the skills that they developed last spring and summer will assist them well as they move toward graduation and entry into graduate school. Of course, none of this would be possible without the guidance and support of so many excellent mentors. I would also like to thank the entire UT Arlington community—upper administrators, faculty, and staff—that has for more than two decades encouraged McNair scholars to reach for the stars!



Dr. Joan Reinhardt, Director

Joan W. Reinhardt, Ph.D.
Director, McNair Scholars Program

STAFF MEMBERS



Cheri Counts,
Administrative Assistant



Piper Davis, MA
Learning Specialist II



Alumni

EARNING DOCTORATES

During the past year, the following McNair alumni acquired their doctorates:

Diana Cervantes ('99 B.S., '02 M.S., Biology) earned her doctorate in public health with a concentration in epidemiology from UNT Health Science Center. Her area of research was the *Helicobacter pylori* bacterium and its transmission during childhood. As of July 1, 2013, Dr. Cervantes began a new position as the lead epidemiologist for the Texas Department of State Health Services located in Arlington.



Diana Cervantes with family

Angelica Eddington ('07 B.S., Psychology) earned her M.S. ('09) and Ph.D. ('12) in clinical psychology at Oklahoma State University. Her dissertation was entitled *Stress Reactivity in College Students with Asthma: A Replication and Extension*. Dr. Eddington recently accepted a position as assistant professor in the Department of Pediatrics at the University of Oklahoma Health Sciences Center in Oklahoma City.



Angelica Eddington



Patrick Ramirez

Patrick Ramirez ('07 B.S.) received his Ph.D. in psychology from UTA in spring 2013. As a master's ('11) and doctoral student, Dr. Ramirez worked with Daniel Levine, who had served as his McNair research mentor. His dissertation was entitled *Repeated Decision-Making With High and Low Affect for Monetary and Social Resources*. Ramirez is currently teaching at the University of North Texas at Dallas and Tarrant County College while seeking a post-doc position or a tenure-track appointment.



Padmini Veerapen

Padmini P. Veerapen entered the graduate program in mathematics at UT Arlington after earning her B.S. in psychology in 2005. She received her master's degree in 2008 and her Ph.D. in 2013. Dr. Veerapen's dissertation was entitled *Point Modules Over Regular Graded Skew Clifford Algebras*. As of fall 2013, Veerapen began a position as assistant professor of mathematics at Tennessee Tech University, which has a combined undergraduate and graduate population of about 11,000 students. TTU is located in Cookeville, a town of 25,000 people that is approximately 82 miles east of Nashville.

Scholarships

AWARDED TO MCNAIR SCHOLARS

Kathryn A. Head Scholarship Winner

In summer 2013 the UT Arlington McNair Scholars Program awarded the Kathryn A. Head Scholarship to Linda Dao, a biochemistry major engaged in program-sponsored summer research under the mentorship of Liping Tang (bioengineering). Dao was selected for this award based on her scholarship essay, GPA, and letters of recommendation. She

plans to graduate in 2014-15 and focus on advanced research in graduate school in the area of immunology. Dr. Tang in his recommendation letter described Dao as “a brilliant, energetic, and collaborative individual with an excellent scientific and clinical mind and a promising future.”

The Kathryn A. Head Scholarship alternates each year between Student Support Services and the McNair Scholars Program. It honors the long and exemplary career



Linda Dao with Kathryn Head

of Kathryn A. Head, former director of the McNair Scholars Program and SOAR Learning Services. Head’s presence at the 2013 McNair summer research banquet made the evening very special. Not only did she join us for a celebration of undergraduate research and mentoring, but she also announced the award of \$750 and presented Dao with a unique art glass piece.

Piper Davis, former McNair learning specialist, chaired the scholarship committee. Other committee members included Dawn Remmers, University College executive director; Jennifer Luken-Sutton, Student Support Services director; and Jason Shelton, sociology assistant professor (and a former McNair mentor). We thank our committee members for their commitment to selecting the best candidate for this honor and we congratulate Dao on receiving it.

Friends of the UTA Library McNair Scholarship Awards

At their November 8 meeting, the Friends of the UTA Library awarded two \$500 scholarships (and plaques) to Jeremy Cortez and Bailey Sayles for their McNair research presentations and papers. The awards are determined by the excellence of the scholars’ oral research presentations and papers, as assessed by members of the Friends of the UTA Library McNair Scholarship Committee: Martha Broom, Melissa Deur, and Robert Ressler. The first of these scholarships was awarded in 2005.



Photo by Kristin Swenson

Jeremy Cortez (left) and Bailey Sayles (far right), the 2013 winners of the Friends of the UTA Library McNair scholarships. They are standing with Kit Goodwin, current president of the Friends, at the November 8 meeting/award ceremony.

The McNair Scholars Program congratulates its 2013 scholarship winners for their excellent work and thanks the Friends of the UTA Library for their continued support of this program. Special thanks to UTA Library Dean Rebecca Bichel; Associate Director (retired) Julie Alexander; and current Friends of the UTA Library officers Kit Goodwin, president; Melissa Deur, 1st VP-membership; Martha Broom, secretary; LaVerne Knezek, treasurer; Robert Ressler, 2nd VP-programs; and Robert Browning, parliamentarian.



Scholars

2013 SUMMER INTERNS AND THEIR RESEARCH ABSTRACTS



SARAH K. ANDERSON

Biology Major

Molecular Signal Adaptations Caused by Cocaine, Conditioned Reward, and Estrogen

Cocaine exerts its rewarding effects by increasing neural activity in the nucleus accumbens (NAc) of the midbrain. Changes in levels of neural activity can be measured by examining levels of Fos family transcription factors (i.e., FosB). Previous research has established sex- and hormonally-mediated differences in behavioral responses to cocaine addiction; however, little is known regarding potential differences in neural activation after cocaine consumption. Thus, the goal of the study was to evaluate the influence of the gonadal hormone estradiol on cocaine-induced FosB protein expression in the NAc. Ovariectomized female rats were pretreated with estradiol (or a vehicle solution) and then received one single injection of cocaine (15mg/kg). Three hours after cocaine treatment, brains were removed and coronal sections through the NAc were stained for FosB protein antibody, and its expression was quantified in the core and shell sub-regions of the NAc. No significant differences were seen between hormonal treatment groups in either the NAc core or shell ($p > 0.1$). Although the results in this experiment are not significant, the data add to a body of literature elucidating the influence (and lack thereof) of hormones on drug-related neural changes. Experiments are currently underway to confirm and extend the findings presented here.

Mentor: Dr. Linda Perrotti,
Psychology Department



MIREYA ARROYO

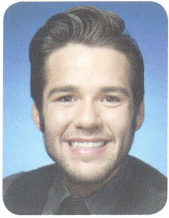
Biology Major

The Effect of Ocean Acidification on the Growth Rate and Metabolic Activity of Various Vibrio Species

Ocean acidification, a decrease in ocean pH that results as carbon emissions continue to dissolve into the ocean, is one of the consequences of climate change. On average, ocean pH has decreased from pH of 8.2 to 8.1 and is projected to decrease by 0.3-0.4 units by 2100. This study looks at the effects of these changing pH levels on the growth rate and metabolic activity of various species of *Vibrio* bacteria in an attempt to study the effects of acidification on the health of coral reefs. Optical density measurements were taken over time to calculate growth rate and an alamar blue assay was done to measure the metabolic activity. Overall, the strains had faster growth rates at pH of 8.0 to 8.2 and metabolic activity at pH 8.0 to 8.2 varied greatly between strains. This research suggests that *V. campbelli* 1B4 and *V. splendidus* 3F8 will produce virulence factors such as photosynthetic inhibitors faster with increasing acidity resulting in zooxanthallae loss, and therefore coral bleaching and coral disease. However, results indicate that *V. campbelli* 3B7 will not produce more virulence factors with pH fluctuations and *V. splendidus* 38A will produce virulence factors more slowly with less of an impact on coral health.

Mentor: Dr. Laura Mydlarz,
Biology Department





CHAD AUSTIN

Sociology Major

Exploring the Latino Homelessness Paradox: The Social and Cultural Buffers of Race, Poverty, and Homelessness

The “Latino Homelessness Paradox” asks the question: Why are Hispanics underrepresented in the homeless population compared to other racial/ethnic groups? This study looks not only at national level data from analyses over different periods of time, but also at levels of poverty and homelessness rates within the Dallas area. This exploratory research project utilizes two distinct methodologies: secondary data analysis and in-depth interviews. By examining and comparing secondary data, which includes past data analyses as well as contemporary data on homelessness, the researcher seeks to find evidence of statistical discrepancies that contribute to the Latino Homelessness Paradox. By utilizing in-depth interviews, the study uncovers the policy, socio-cultural, and methodological factors and trends over time that may contribute to the Latino Homelessness Paradox. Interviews include a schedule of questions designed to uncover whether the factors examined in this study reveal whether the Latino Homelessness Paradox may exist in the Dallas region and contribute to it. The results of the secondary data analysis combined with the findings from the in-depth interviews strongly suggest that there is evidence to support that the Latino Homelessness Paradox does in fact exist within the Dallas area.

Mentor: Dr. Suzan Gonzalez Baker,
Sociology and Anthropology Department



DIANA BUENO

English Major

Teenagers at War: Double-Consciousness and Adolescence in Two Novels of the Japanese Internment

From *The Diary of Anne Frank* to Harper Lee’s *To Kill a Mockingbird*, adolescence has played an important role in literary works that address race. This study examines the reasons why adolescence offers an apt and enduring vehicle for the exploration of sociocultural issues—specifically, of the Japanese internment—by analyzing the use of adolescence in two widely acclaimed novels of internment, *Snow Falling on Cedars* by David Guterson (1994) and *Hotel on the Corner of Bitter and Sweet* by Jamie Ford (2009). Because adolescents exist in a state of ambivalence,

caught between childhood and adulthood, they experience the same double-consciousness, or “twoness,” described by W.E.B. Du Bois in *The Souls of Black Folk*. In capitalizing on their adolescent characters’ “twoness” and on their growing awareness of the adult social world’s impact on self-perception, both Ford and Guterson are able not only to describe and humanize the varied experiences of racial division, but also to critique social constructs of race. Ultimately, because the dividedness inherent in adolescence is universal, literary adolescence provides common ground from which both authors, despite different backgrounds, can create a dialogue about the internment—and, more broadly, about racial identity—that transcends constructed boundaries of race.

Mentor: Dr. Joanna Johnson,
English Department



BRANDON DAVID BUTLER

Anthropology Major

Dog Behavioral Patterns in Dog Parks

Domestication has enabled dogs to become integrated into human society by mediating the behavioral systems concerned with fear and aggression. Dogs are able to interpret human communicative social cues within their phylogenetic constraints. Previous studies have examined dogs’ abilities to communicate with both conspecifics (i.e., other dogs) and heterospecifics (specifically, humans), but few have given serious consideration to how dogs navigate a dynamic social environment where both species gather in large numbers outside of the context of walking, namely a dog park. This paper first provides a review of the literature surrounding dog behavior and the role domestication may have played in dog behavioral evolution. Then it details the results of a new empirical study using behavioral observation methods (focal follow and ad libitum sampling) to elucidate how dogs behave differently toward other dogs and toward humans (owners and non-owners) in a dog park setting. Four behavioral categories are analyzed: agonistic behavior, play behavior, attention behavior, and stress behavior. The results indicate that dogs are more likely to utilize play and attentive behaviors toward other dogs. Agonistic behavior accounts for only a small percentage of total observed behaviors, and when it occurs, it usually involves other dogs rather than people.

Mentor: Dr. Shelley L. Smith,
Chairperson, Sociology
and Anthropology Department





JEREMY D. CORTEZ

Microbiology Major

Role of Reverse Transcriptase Domain 0 in Non-LTR Retrotransposon Integration

Transposable elements (TEs) are genomic parasites (mobile DNA) with the ability to replicate within the host genome. Of these TEs, non-long terminal repeat retrotransposons (NLR) are responsible for making up over 34 percent of the human genome. NLRs use a “copy out as RNA, copy in as DNA” replication mechanism. NLR integration occurs through target primed reverse transcription (TPRT) where the element-encoded DNA endonuclease generates a free 3'-OH used to prime cDNA synthesis at the site of cleavage. NLRs must encode the ability to recognize element RNA. The reverse transcriptase (RT) of NLR elements has a domain (domain 0) not present in the RT found in long-terminal repeat retrotransposons or retroviruses. It is hypothesized that this domain 0 of the NLR RT may be involved in recognizing element RNA. Using R2 *Bombyx mori* as a model of study, site-directed mutagenesis was used to generate a point mutation within domain 0. The mutant protein was purified and tested for loss of function using *in vitro*-based DNA and 3' RNA binding reactions and analyzed by electrophoretic mobility shift assays and denaturing gel electrophoresis. Preliminary experiments suggest that 3' RNA binding and TPRT activity are unimpaired in the mutant protein.

Mentor: Dr. Shawn Christensen,
Biology Department



LINDA DAO

Biochemistry Major

Fabrication of Cytokine-Loaded Cancer Traps

Various cytokines are responsible for increasing the malignancy of cancer and/or inducing cancer metastasis, all of which severely decreases a patient's likelihood of survival. Recently, it has been shown that biomaterial implantation sites attract circulating cancer cells conceivably through cytokines. This paper therefore hypothesizes that implanting biomaterials loaded with cancer-attracting cytokines might further lure cancer cells. In this study, B16F10 melanoma is used as a model to explore cytokine and cancer cell migration interactions. *In vitro* cell culture conditions that can adversely affect cell phenotype, such as trypsinization time, were optimized in order to preserve cell authenticity. Subsequently, a potential cancer cell-recruiting cytokine, erythropoietin (EPO), was tested for its ability to attract melanoma cells using

Boyden Chamber assays. In order to deliver the cytokines, a vessel prototype was developed by fabricating protein-infused Poly(lactic-co-glycolic acid) (PLGA) scaffolds using a microbubble technique. Erythropoietin (EPO) was able to increase melanoma cell migration two times compared to control, while the prototype exhibited desired cancer trap structure characteristics such as 90 percent porosity. Importantly, the study prognosticates well for the development of cytokine-loaded cancer traps that could localize metastatic cancer cells, which can be eradicated by localized treatments.

Mentor: Dr. Liping Tang,
Bioengineering Department



LAURA DRZICH

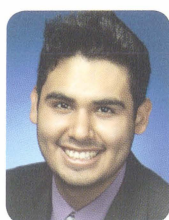
Biology Major

Using High-Throughput Illumina Sequencing to Infer Evolutionary Dynamics of Simple Sequence Repeats Across Squamate Genomes

Reduced sequencing costs have made the comparative analysis of genomes feasible for independent investigators interested in non-model organisms. Squamate reptiles represent a speciose order of vertebrates that is underrepresented in genomic studies. Recent studies have shown that even partial sequencing of genomes (at less than 1x coverage) can provide substantial information about vertebrate genome structure, content, and evolution. The study uses this sample sequencing approach to collect low coverage genome sequence from samples of 21 lizards and 20 snakes from 19 families, representing 32 species. It uses these data to estimate simple sequence repeat (SSR) content, providing the largest single comparative study of SSR content in vertebrate genomes to date. A total of 2.02 billion bases of high quality paired-end reads were sequenced, representing an average of 0.023 fold coverage per genome, assuming an average genome size for squamates of 2.1 Gbp. Analysis of repeat content revealed an expansion of SSRs in snake genomes. Tandem repeat abundances were estimated per Mbp from merged raw sequence reads. The SSR motif AATAG showed increased expansion in snake genomes, with little to no representation in lizards. Tracing SSR expansion in squamate evolution has the potential to link changes in SSR content with changes in transposable element content, and further identify how these changes in repeat content might have altered genome structure, function, and evolution in squamate reptiles.

Mentor: Dr. Todd Castoe,
Biology Department





GABRIEL ESCOBEDO

Anthropology Major

Loss of Language and Cultural Identity: U.S.-Born Mexican Americans in North Texas

The growth of the Mexican American population in the United States in recent decades has been accompanied by a strong pressure to assimilate. Assimilation processes are gradual and often lead to the loss of the ethnic language of a minority population. This study explores the experiences of language loss and how the connections between ethnicity and language competence relate to self-perception of ethnic identity. Structured and online surveys revealed four distinct themes regarding ethnic identity: the environment in which the participants were raised, ethnic ancestry, expectations of maintaining a dual identity, and patterns of familial and community communication. The current study contributes to understanding the role of Spanish language proficiency among Mexican Americans in North Texas as it relates to their perceptions of what it means to be truly Mexican American. The study revealed that while Spanish language proficiency was the most important marker of ethnic identity for some participants, others did not share that view. Future studies should explore the dynamics between groups with different stances with respect to the importance of fluency in Spanish and Mexican American identity.

Mentors: Dr. Josephine Caldwell-Ryan and Dr. Christian Zlozniski, Sociology and Anthropology Department



VICTOR ISAIAS GONZALEZ HERNANDEZ

International Business/Spanish Major

British Petroleum Gulf Deep-Water Oil Spill: When a Business Becomes Unethical

This research study analyzes the British Petroleum (BP) deep-water gulf oil spill as a case study in order to answer the question: When does a business become unethical—before, during, or after an action? It reviews 12 data cases occurring before the oil spill, 29 articles published during the spill, and eight articles published in the aftermath of the oil spill. The study judges the culture and history of British Petroleum through Immanuel Kant's categorical and practical imperatives, determining when BP violated Kant's universal laws, hence making BP unethical. Evidence suggests that the root cause of ethical or unethical actions is

the people within the company, specifically, the leaders that direct the business as a whole. Before the oil spill CEO John Browne set the course for what would become BP's business standard, valuing profits above obligations. Tony Hayward, who later replaced Browne, intended to focus BP on safety, people, and performance; however, he failed to renew BP's cultural mentality. During the oil spill BP faced transitional moments: leadership shifted to Bob Dudley, board members were replaced, and BP focused on purpose instead of profit. After the oil spill, Dudley's leadership demonstrates a clearer sense of compliance to BP's universal obligations. This study suggests that leadership is a determining factor of a business's ethical actions.

Mentor: Dr. James Campbell Quick, Goolsby-Fouse Endowed Chair, Goolsby Leadership Academy, Management Department



DESTINY PRICE

Marketing Major

An Analysis of Sports Industry Career Preparation with a Focus on Sports Marketing Undergraduate Curricula

This paper reports on a research effort that analyzes existing undergraduate sports marketing degree programs and the desires of sports professionals to address the educational needs in the industry. A study was conducted that involved the collection of both secondary and primary data. Existing sports marketing degree programs were evaluated to establish a core set of courses vital to effective sports marketing education. The top areas of study in sports marketing education were found to be field experience, sports marketing, management and organizational skills, legal aspects of sports, and ethics in sports. Interviewees from the sports industry unanimously agreed that internships prepare sports professionals better for careers in the sports industry than existing undergraduate degree programs. This study develops a unique undergraduate sports marketing curriculum with the potential to more effectively prepare students for careers in the sports industry than the standard degree program. The recommended curriculum involves internal and external internships throughout the four years of the students' undergraduate career, a real-world sports marketing research project during their final semester, sport-specific courses, and seminars featuring sports professionals. The recommended curriculum could benefit institutions considering the modification or introduction of an undergraduate degree program in sports marketing.

Mentor: Dr. Elten Briggs, Marketing Department





ALICIA RICCI

Mathematics Major

Exact Solutions to the Korteweg-De Vries Equation

This study analyzes certain exact solutions to the Korteweg-de Vries equation, which is a nonlinear partial differential equation with important applications in propagation of surface water waves in shallow and long canals and acoustic waves in ionized gases. It presents a formula for the so-called n -soliton solution, the solution containing n solitary wave components (solitons) interacting with each other only when they are close to each other. The n -soliton solution formula uses as input three constant matrices A, B, C with sizes $n \times n$, $n \times 1$, and $1 \times n$, respectively; it is expressed in terms of matrix exponentials; and it is valid for any positive integer n . The study relates the mathematical parameters in the n -soliton solution to the velocities and widths of individual solitons and to the eigenvalues of the matrix A. It further analyzes solitons and their interactions by using *Mathematica* animations. Exact solutions such as multi-soliton solutions are important not only physically but also mathematically, as they may be used to test the accuracy of computational methods developed for solving nonlinear differential equations numerically.

Mentor: Dr. Tuncay Aktosun,
Mathematics Department



ASPEN SAMUEL

Psychology Major

Sex Differences in Morphine-Conditioned Place Preference

Previous research has demonstrated that women are more vulnerable to addiction and have higher rates of relapse triggered by exposure to environmental drug cues. The aim of the present study is to investigate the influence of sex and the estrous cycle phase on conditioned morphine reward. Intact females have four phases of the estrus cycle in which hormone levels vary: estrus, proestrus, metestrus, and diestrus. Adult male and female rats were subjected to a morphine-conditioned place preference protocol to assess the rewarding effects of morphine-associated environmental cues. Results showed males and females had no statistically significant preference in the morphine 5mg/kg CPP paradigm ($N=13$), $p=0.5768$. Females in pro/estrus phases had the highest preference score, during which levels of estrogen were high. Females in met/diestrus had lower preference scores, during which estrogen levels are low. Overall, the results suggest that

females in estrus and proestrus had higher preference possibly due to high estrogen levels, and females in metestrus and diestrus followed with lower estrogen levels.

Mentor: Dr. Linda Perrotti,
Psychology Department



BAILEY SAYLES

Biology (BS) to Bioengineering (MS) Program

Quantitative Comparison of Metastasizing and Non-Metastasizing Breast Cancer Cell Migration Via Various

Dimension Microchannels

Breast cancer is one of the leading causes of death in women. Treatments include surgery, radiation, and chemotherapy. The most common chemotherapy drug right now is Paclitaxel, which binds to microtubules inside the cell and restricts replication. Using soft-lithography techniques to make PDMS-based microchannel devices, this study investigated the effect of this drug on metastasizing breast cancer cells at several different concentrations and microchannel dimensions. It also quantified the distinct migratory patterns between metastasizing, MB-231, and non-metastasizing, MCF-7, breast cancer cells through six dimensions of microchannels (20, 15, 10, 8, 5, 3 μ m). While both are able to fit through microchannels as small as 3x3 μ m, the rate of migration between the two types of cells is significantly different. Three different substrates on which cells could be cultured were tested. Glass, a collagen coating, and collagen gel were all used, with the collagen coating giving the best environment for cells to grow. This paper provides the groundwork for future testing of migration patterns as well as the causes and effect of migration through microchannels on cell proliferation and morphology.

Mentor: Dr. Young-Tae Kim,
Biomedical Engineering Department



KRISTINA TOTH

Education, Math/Science Major

Analyzing Differences in Scientist and Science Perceptions, Self-Efficacy, and Science Enjoyment Between Fourth-Grade English-Speaking

Students and Hispanic English-Language Learners



Changing demographics of classrooms in the United States are marked by a significant influx of Hispanic English-Language Learners (ELLs). The language and cultural dichotomies that now exist among school children demand that educators gain information for promoting academic success among all students, which includes perceptions of scientists and science, as well as self-efficacy and enjoyment of science. Therefore, this study analyzes possible patterns of difference between fourth-grade Hispanic ELL and English-speaking students' views of scientists, understandings of the nature of science (NOS), self-efficacy toward learning science, and their overall enjoyment of science. This study consisted of 176 students (97 English-speaking, 78 ELL) with 36.3 percent designated as "at-risk." Questionnaires were administered to students at the beginning of the school year to measure students' views of scientists, understandings of NOS, self-efficacy, and science enjoyment. Results revealed a significant difference between ELL and English-speaking students' views of scientists, with ELLs holding a "broader" view of scientists. There was no significant difference between the two groups in understanding of NOS. Hispanic ELLs were shown to have a lower self-efficacy toward learning science compared to English-speaking students. Both groups indicated an equally high enjoyment of science. This study informs educators of students' views and beliefs that may impact their learning and academic success in science.

Mentor: Dr. Ann Cavallo,
Curriculum and Instruction Department
Academic Partnerships Math
and Science Program Coordinator



ANDREW VELASQUEZ
Aerospace Engineering Major
*Design of NACA 0012 Airfoil
and Calibration Setup for
Transonic Wind Tunnel*

This research proposes the use of a designed wing model in order to perform tests in a transonic wind tunnel to obtain the resulting lift and drag forces. A full-span NACA 0012 wing model was designed for testing in a transonic Ludwieg tube at Mach and Reynolds numbers, and angles of attack representative of rotorcraft flight. The large dynamic pressure required that the model be made of stainless steel while the complex shape was machined using a numerically controlled mill. Forces would be measured using a sidewall balance mounted to one end of model while some flexing was allowed on the other side with a unique design. The

force tests will continue in the future and all force data will be eventually obtained. Dynamic calibration of the force balance is proposed due to the lack of a steady state during the short test time of about 0.1 s. As part of the study, a numerical simulation was initiated using the flow solver ANSYS Fluent™ for the same conditions as the test program to obtain lift and drag. Different angles of attack will be used in the computer simulations and the force data will be compared to the experimental data gathered in the wind tunnel in the future.

Mentor: Dr. Frank Lu, Director, Aerodynamics
Research Center, Mechanical
and Aerospace Engineering Department



KHANH VU
Biology Major
*Temperature-Sensitive
Nanoparticles for Lung Cancer
Treatment*

Lung cancer incidents in the United States are the highest among any other type of cancer with an estimate of more than 200,000 new cases of afflicted patients and more than 150,000 deaths for 2013 (American Cancer Society). Although several treatment methods such as chemotherapy, radiation therapy, and surgery exist today, they are limited by adverse side effects such as fatigue, nausea, chest pain, hair loss, and memory loss. Nanomedicine offers an advantage over conventional methods in terms of providing accurate and controlled drug delivery. The greatest challenge in cancer treatment is effective drug delivery of anticancer agents to cancer sites without causing toxicity to normal cells. This study proposes the development of three new types of temperature-sensitive nanoparticles for lung cancer treatment. These nanoparticles are biodegradable, biocompatible, and stimuli-responsive. The three types of nanoparticles are synthesized using methyl cellulose-acrylic acid (MC-Aac), poly-N-isopropylacrylamide-carboxymethylchitosan (PNIPAAm-CMC), and poly-N-isopropylacrylamide-methyl cellulose (PNIPAAm-MC). Characterization studies show that these particles are stable with diameters of about 200 nm, zeta potential of about -30 mV, and lower critical solution temperature (LCST) at around 41 Celsius. Drug release studies show these particles have sustained release over seven days for PNIPA-MC and 21 days for MC-AAc and PNIPA-CMC nanoparticles.

Mentor: Dr. Kytai Nguyen,
Bioengineering Department





2013

MCNAIR RESEARCH INTERNS AND STAFF



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UNIVERSITY OF
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The Ronald E. McNair Postbaccalaureate Achievement Program is a federally funded **TRiO** program.