

**McNair Research Journal**  
THE UNIVERSITY OF TEXAS AT ARLINGTON

Summer 2005 • Volume 9



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THE UNIVERSITY OF TEXAS AT ARLINGTON

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## Message from the Provost

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In 1986, the U.S. Department of Education established the McNair Scholars Program in honor of Ronald McNair who died in a space shuttle explosion that year. Dr. McNair's life was one that constantly cleared obstacles and was dedicated to fulfilling his

dreams. An African-American who grew up in a poor community in the South, Dr. McNair earned a Ph.D. in laser physics and became a NASA astronaut. The McNair Scholars Program was created to encourage students from similar backgrounds to pursue graduate studies, engage in research, and develop scholarly skills by working with a faculty mentor.

Students who participate in the McNair Scholars Program at The University of Texas at Arlington receive a stipend to fund a summer research project and are paired with a faculty member who supervises their research and serves as their mentor. Once the research is complete, the students present their findings at the annual McNair Research Presentations.

On behalf of The University of Texas at Arlington, I want to congratulate each of the McNair Scholars and their faculty mentors. The research published in this journal is a reflection of their hard work, dedication, and their willingness to dream. The skills they have acquired will serve them well as they pursue their graduate education and other endeavors throughout life. More importantly, their research exemplifies the core mission of institutions of higher education, and makes all of us at The University of Texas at Arlington proud.

A handwritten signature in black ink, appearing to read 'Dana Dunn'.

Dr. Dana Dunn  
Provost and Vice President for Academic Affairs

## Notes from the Director



It is with pride that I congratulate the research interns in the McNair Scholars Program at The University of Texas at Arlington on the successful completion of their eleven-week Summer 2005 research projects. The research summaries in this journal are evidence of the level of effort these scholars devoted to researching, developing, writing and presenting their findings. They are to be commended for their dedication in pursuing and reporting new information in their respective fields.

Equally deserving of recognition and appreciation are the outstanding faculty mentors who gave of their time, talent and expertise in guiding and directing the research process, and the numerous professional staff members throughout campus who conducted beneficial seminars and workshops. Additional appreciation is extended to President James D. Spaniolo, Provost & Vice President for Academic Affairs Dana Dunn, Vice President for Research Ronald L. Elsenbaumer, and Dean of the Graduate School Philip Cohen for their ongoing assistance and support.

Congratulations, McNair research interns, on your achievements this summer. Best wishes on your continued academic success!

A handwritten signature in cursive script that reads "Kathryn Head".

Kathryn Head

Director of SOAR/McNair Scholars Program

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## Acknowledgements

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## The McNair Scholars Program



Dr. Ronald E. McNair/Scholar, Scientist, Astronaut, 1950-1986

The history of the McNair Scholars Program at UT Arlington commenced in 1990 when the U.S. Department of Education funded a grant proposal to bring it to campus. The goal of this program (and of the many McNair programs nationwide) was to assist disadvantaged undergraduates—either first-generation/low-income and/or

underrepresented (African American, Hispanic, Native American) students—to prepare for future graduate study culminating in the Ph.D. and a life of research and teaching. Since its inception on campus, the McNair program has encouraged and assisted over two hundred students in various majors with their preparation for graduate study.

Currently the McNair Scholars Program at UT Arlington works with a minimum of twenty-five students (sophomores through seniors) each academic year, providing seminars and classes on a wide range of topics relating to graduate school, offering a spring institute to heighten Scholars' understanding of the culture of research, and, subsequently, affording them the opportunity to engage in one summer of research with a faculty mentor prior to graduation. The program also enables Scholars to present their research at McNair (and other) undergraduate or professional conferences, provides guidance with the graduate school application process, and funds graduate school visits.

The McNair Scholars Program at UT Arlington enjoys strong, campus-wide support and greatly benefits from the expertise and enthusiasm of its faculty and staff. An expression of this institution's commitment to McNair Scholars was the creation of the UT Arlington McNair Graduate Assistance Package (M-GAP) in spring 2002, offering a fellowship/assistantship combination in a wide range of disciplines.

# Presidential Behavioral Patterns that Lead to the Strategic Use of Executive Orders, 1953-2005

**BIANCA R. CANALES**

Mentor: Dr. Victoria Farrar-Myers, Department of Political Science



## INTRODUCTION

Executive orders have become commonplace in the American presidency and pose two important questions. First, what is the constitutionality surrounding the issuance of executive orders. Second, what are the evolutionary changes en-

compassing the usage of executive orders as a means of unilateral power. By signing an executive order, the president can usurp the power of Congress, disrupting the balance of government defined by the *Constitution's* system of checks and balances and separation of powers. The dilemma of usurping power from Congress and disrupting the framework of the government leads one to explore the conditions under which presidents exercise strategic unilateral power by issuing executive orders.

## LITERATURE REVIEW

Past research provides the foundation on which to examine the issuance of executive orders. Scholars such as Kenneth Mayer and Phillip Cooper explore the number of executive orders issued during a presidential term. Other scholars question the factors surrounding the issuance of executive orders. For example, Mayer, George Krause and David Cohen, and Carlos Pereira, Timothy J. Power and Lucio Rennó introduce conditions under which to study when a president is more likely to issue an executive order, such as the level of congressional support and divided or unified government.

Integration of past research with the work of presidential scholar Paul C. Light gives one a new way of looking at the issuance of executive orders. Mainly, the issue of timing represents a key factor when examining the strategic use of executive orders. For example, Light describes the first year of the first term as one marked with confusion and inexperience. In addition, Light states that presidents and their staff should be fully trained in their employment duties by the third and fourth year of their first term. Finally, Light makes distinctions between the first term and the second term. For example, the second term is characterized as more organized, shorter and requiring the restricting of agenda items. This characterization of the second term may lend to the explanation that there are fewer executive orders signed in the second term as compared to the first.

## METHODOLOGY

This research utilizes a multi-method approach to identify key variables that will help explain the strategic use of executive orders. First, this research collects all executive orders per year for analysis, starting with Dwight D. Eisenhower (1953-1961), who was the first president that the Twenty-Second Amendment of the *Constitution* applied to, up to the end of George W. Bush's (2001-2005) first term, January 19, 2005. This research focused on a number of variables: president's political party, divided/unified government, majority party of the House, majority party of the Senate, and year within the administration. Finally, additional variables from the "Congressional Quarterly Almanac," such as presidential support score by Congress, House support scores of the president, Senate support scores of the president, president's party support score, and oppositional party support scores of the president were collected for analysis.

Next, an Ordinary Least Squares (OLS) regression model was developed utilizing the independent variables stipulated above along with the dependent variable, which is the number of executive orders per year. Then a more discrete analysis examining executive orders monthly (January 20<sup>th</sup> to January 19<sup>th</sup>) within the first year of the first term was conducted. Finally, the application of case studies helped to explore further the explanations provided by the research.

## RESULTS AND DISCUSSION

First, the analysis identified that the largest number of executive orders occurred in the first year of the first term. The results of the monthly distribution of executive orders within the first year of the first term found that the number of executive orders peaked in the ninth month (September 20<sup>th</sup> to October 19<sup>th</sup>). Next, the most significant regression model to emerge from this research identified the variables, presidential support score and Senate support score, both significant at the .05 level.<sup>1</sup> The variables identified in the quantitative analysis described above were used to target a major executive order by each of the following presidents: Lyndon B. Johnson (1963-1969) with the highest presidential support score of 93% in 1965; Jimmy Carter in 1980 with the highest number of executive orders; and George W. Bush in 2002 with the lowest number of executive orders. This qualitative case study analysis found that different explanations regarding the issuance of executive orders proved contingent upon the identification of the timing and context surrounding the issuance as the quan-

titative model predicted. Finally, a comparison of two, two-termed presidents, Dwight Eisenhower and Bill Clinton, produced similar findings that Light describes in his research. For example, both presidents have the highest number of executive orders in their first year of their first term, and both signed fewer executive orders in their second term than in their first term.

## CONCLUSION

A president's strategic use of executive orders has become a principal issue in the study of American politics, and their use will continue to evolve over time. Part of that evolution requires research that will help explain the behavioral patterns associated with the issuance of executive orders. This research provided such analysis and identified timing and conditions surrounding the issuance of executive orders as key factors worthy of examination.

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## FOOTNOTES

- <sup>1</sup> According to the "Congressional Quarterly," the variable presidential support score is "the percentage of roll calls on which members [of Congress] voted in agreement with the president." In addition, the variable Senate support score is the percentage of roll call votes in which the Senate is in agreement with the president.

# Love, Race and the Law: A Comparative Analysis of Interracial Relationships in the United States, 1865-1967

**NYLA DAVIS**

Mentor: Dr. Stephanie Cole, Department of History



## INTRODUCTION

This study will look to distinguish how interracial marriage takes effect in a geographical context. As slavery became a racially based system, white legislators designed laws to segregate blacks and whites and kept those laws well

into the twentieth century. Interracial marriage is one of the areas in which laws separated blacks and whites, and sometimes other racial groups. By comparing interracial marriage amongst different regions of the United States, consisting of various populations, how whites went about separating racial categories can be exemplified.

## LITERATURE REVIEW

The literature has examined social and psychological issues concerning anti-miscegenation laws but has not broken it down regionally. *Interracialism* edited by Werner Sollars had key essays showing laws important in constructing race. Charles W. Chestnut's "What is a White Man?" published in 1889, explored the definition of white in various states in the 1880s and how race relates to the anti-miscegenation laws, which state legislators wrote to keep the white race pure. Published in 1918, "The Beginnings of Miscegenation of the Whites and Blacks" by Carter G. Woodson, examined race relations and interracial marriage through early laws and commonalities amongst those

who lived in society, from the settlement of English colonies to the early 1800s. "Interracial Marriage and the Law" published in 1965 by William D. Zabel, further examines interracial marriage through state laws and the implementation of those laws in twentieth century court cases. "Racial Purity and Interracial Sex in the Law of Colonial and Antebellum Virginia" published in 1989 by A. Leon Higginbotham Jr. and Barbara K. Kobytzoff, revealed research and analysis of the legal history of interracial marriage in Virginia from its origin until 1924, showing interracial relations as being at the root of racism. In addition to Sollars's collection there are a number of case studies, including Phyl Newbeck's *Virginia Hasn't Always Been for Lovers*, which traces the Loving v. Virginia case in detail and explores the laws in other states as well. In addition, Charles Frank Robinson II's *Dangerous Liaisons: Sex and Love in the Segregated South* examines stories and court cases in the south from the inception of the laws.

## METHODOLOGY

This study examined anti-miscegenation laws to see who was not allowed to marry, how the laws were interpreted and enforced, and the penalties for interracial marriages, as well as court cases to find people who fought the interracial laws and the consequences of having a relationship with a person of another race. Virginia, Alabama, and Texas were examined to represent the southern, slave states, and Oklahoma, Arizona and California represented the western, non-slave states.

## RESULTS

Most states had some prohibitions against interracial marriage, and prejudice against relationships between whites and non-whites was nationwide. However there were differences between states having a long and profitable relationship with slavery and those that did not. A comparison of six states – Virginia, Alabama, Texas, Oklahoma, Arizona, and California – illustrates that the former three had slightly harsher approaches than the latter three. The southern states had a more punitive approach and wider enforcement of these laws. The western states, though they maintained laws prohibiting many different racial groups from intermarrying, were less likely to enforce those laws and did not make violators go to prison. They also ended their anti-miscegenation laws sooner than the southern states.

## CONCLUSIONS AND FUTURE RESEARCH

Future research should include more court cases which are concerned with interracial marriage and additional states, and examine how the history of the state affects interracial marriage laws.

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- and selected articles, legal databases and related websites.

# Correlating Reading Abilities, Phonological Abilities, and Cognitive Word Tasks

NICOLE M. GRIFFIS

Mentors: Drs. Daniel Levine and Timothy Odegard, Department of Psychology



## INTRODUCTION AND BACKGROUND

Dyslexia is a common reading disorder which affects approximately 10% to 15% of all school-aged children in the United States (Vellutino et al., 2004). It is a basic cognitive disability which involves a specific impairment with phonological awareness (PA; Clark and Uhry, 1995; Goswami, 2003), which is a person's ability to decode the individual sounds which make up words (called phonemes) and to cognitively manipulate these sounds (Soifer, 1999; Uhry, 1999, Clark and Uhry, 1995).

Many children learn to read without having to be directly taught the rules underlying reading. Dyslexics, however, must be explicitly taught the rules surrounding how graphemes (i.e., individual letters) and phonemes interact (i.e., the alphabetic principle; Uhry, 1997). This research tests the ability of people with core phonological deficits, such as those experienced by dyslexics, to implicitly learn linguistic and symbolic rules through categorical learning tasks.

## METHOD

Twenty-one college students participated in this experiment. Participants performed two ability tests and two cognitive tasks. The first ability test, the Comprehensive Test of Phonological Processing (CTOPP; Wagner 1999), measured phonological awareness, phonological memory, and rapid naming. The second ability test measured partici-

pants' orthographic (spelling) knowledge (Cunningham 2001). The first cognitive task, the symbols task, measured participants' ability to categorically learn generic rules for symbols and to switch from one rule to a second rule. The second cognitive task, the phonemic-graphemic task, measured participants' ability to categorically learn either a phonemic or a graphemic rule and to switch rules once the first rule had been learned.

## RESULTS AND DISCUSSION

Participants were divided into three groups based on PA as derived from the CTOPP. Group 1 (Low PA;  $n = 5$ ) had PA scores of less than 25% ( $M = 10\%$ ). Group 2 (Middle PA;  $n = 12$ ) had PA scores ranging between 25% and 75% ( $M = 62.75\%$ ). Group 3 (High PA;  $n = 4$ ) had PA scores above 75% ( $M = 81.5\%$ ). Results for each task are reported as an average by PA group. Results for the orthographic test did not show discrimination between the groups and are not reported.

Participants in the Low PA group averaged lower scores for both phonological memory and rapid naming compared with the Middle and High PA groups (see Table 1). Additionally, note that all participants (100%) learned both rules regardless of their respective group (see Table 2). It is important to note that the High PA group on average took fewer trials to learn a rule regardless of rule type compared to the Low PA or Middle PA groups (see Table 3). All of the participants in the high PA group learned the phonemic or graphemic rules, but not all of the participants from the other two groups did.

## CONCLUSION AND FUTURE RESEARCH

The question posed in this research was whether or not people with low PA have difficulty with implicit learning. The results indicate that individuals low in PA demonstrated difficulties with implicit learning. This is evidenced by the participants low in PA on average requiring more trials to implicitly learn linguistic and symbolic rules than the middle and high PA groups. Participants scoring low on PA also failed to learn the rules as often as the other two groups. These results stress the importance of using direct instruction methods with dyslexic students.

This research is ongoing and will include additional adult participants as well as child participants. A special population of children pre-diagnosed with dyslexia will also be tested. Correlations between gathered data will be compared with neural network models in an effort to better understand the areas of the brain involved in reading disorders such as dyslexia.

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	Phonological Awareness	Phonological Memory	Rapid Naming
Group 1 (Low PA)	10.00	46.80	37.80
Group 2 (Middle PA)	62.75	56.33	46.08
Group 3 (High PA)	81.50	66.50	65.00

Table 1. Mean CTOPP Core Composite Percentiles by Group

	Maximum Trials Block 1	Maximum Trials Block 2	Rule 1 Learned	Rule 2 Learned
Group 1 (Low PA)	17.60	24.00	100.00	100.00
Group 2 (Middle PA)	17.33	20.67	100.00	100.00
Group 3 (High PA)	18.00	16.00	100.00	100.00

Table 2. Symbols Task - Means by Group

	Maximum Trials Phonemic Block	Maximum Trials Graphemic Block	Phonemic Rule Learned	Graphemic Rule Learned
Group 1 (Low PA)	62.00	69.33	40.00	20.00
Group 2 (Middle PA)	51.00	51.20	33.33	50.00
Group 3 (High PA)	30.00	32.00	100.00	100.00

Table 3. Phonemic-Graphemic Task - Phonemic and Graphemic Means by Group

# The Influence of First Language Communication Patterns in the Development of Written Communication Patterns in the Second Language

**CLAUDIA V. GUTIÉRREZ**

Mentor: Dr. Luis Rosado, College of Education (Center for Bilingual Education)



## INTRODUCTION AND LITERATURE REVIEW

According to Hudelson (1988), "second language learners apply the knowledge about writing gained in first language settings to second language settings" (p. 2). Therefore, students learning a second language (L2) use their native language (L1) as a foundation to cope with the new language. Sometimes, elements from L1 transfer to L2 which is called positive transfer. On the other hand, elements that do not transfer create overgeneralization and language interference. Some of the superficial components of L1 such as vocabulary, punctuation, and capitalization are easily transferred to the second language. However, more abstract components of the language such as the rhetorical patterns can create confusion and affect the ability of the students to produce acceptable writing samples. The analysis of the concept of language interference and transfer in writing samples constitute the main objective of this study. This study analyzed the Spanish and English writing samples of ten fourth-grade students participating in a two-way dual language program, and identified how the structure of the first language affected their writing performance at the lexical, structural, and organizational level.

## METHODOLOGY

This study involved five English-dominant and five Spanish-dominant fourth-grade students who had been enrolled for at least two years in a two-way dual language program in a small urban district in North Texas. Each of the two

groups (Spanish- and English-dominant students) consisted of three females and two males. Two of the ten students were Latino English-dominant, one was African American, two were European Americans, and five were Spanish-dominant Latino students. Each student was asked to write one composition in English and one in Spanish, based on the prompts from released Texas Assessment of Knowledge and Skills (TAKS) tests. Three raters were used to analyze the compositions. The data were analyzed based on the following components: the rhetorical pattern used, that is, linear or curvilinear; the performance on L1 and L2 compositions scored based on the TAKS rubrics; and the influences of L1 in the written development of L2.

## RESULTS AND DISCUSSION

In the case of the rhetorical patterns used by Spanish- and English-dominant students attending a two-way dual language program, both groups followed a linear progression in the English writing samples and a curvilinear pattern in Spanish. Thus, the rhetorical patterns of the native language did not appear to affect the choice of the rhetorical pattern used in L2. It seems that the school system is doing a good job in teaching the linear progression required to be successful on the writing portion of the TAKS test. Since fourth graders are not traditionally tested in Spanish writing, the same preparation in Spanish was not as evident.

The rubric used to score the TAKS test in Spanish and English was used to assess the written performance of students in L1 and L2. Results of the holistic scoring showed that scores in L1 were higher than the scores in L2 for both groups of students. To analyze the proficiency in L1 and L2, a biliteracy index was created by combining the rating

scores from both languages. A comparison of the average biliteracy index showed that the Spanish-dominant index was slightly higher than the index for the English-dominant students. The difference between the two groups may be due to the fact that English is reinforced at school and in the community. Thus, both groups have developed proficiency in English. Spanish, on the other hand, is reinforced in school and in the home environment of Latino students only. Thus, English-dominant students might not get the exposure to Spanish needed to become fully bilingual. It seems that the Spanish exposure of Spanish-dominant students at home is contributing to the maintenance and development of the language, thus making the path to bilingualism a little bit faster than for English-dominant children. The overall performance of the students in L1 and L2 compositions suggests that students are stronger in L1 written communication, but show that the writing skills in the second language are quickly emerging.

In the case of the influences of L1 in the writing development of L2 of English- and Spanish- dominant students, there were several errors that were directly connected to L1. However, the influence from L1 to L2 was more evident in the words and phrases used by English-dominant students in Spanish (L2) composition than Spanish-dominant students in their English (L2) composition. It seems that the Spanish proficiency of English-dominant students is still developing, and they are relying on English as a foundation for writing in Spanish.

## CONCLUSION

Results of this study suggest that the two-way dual language program is achieving the intended results of promoting the goals of full bilingualism and biliteracy for both Spanish- and English-dominant students. Even though there are several influences of L1 that have affected the development of L2, students in this study are beginning to identify those skills that transfer and those that do not. The topic of language transfer and interference is a complex topic to be addressed in one study only. Additional research is needed to explore all the benefits and challenges typical of students in a two-way dual language program.

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# An Analysis of Tricksters in Mythology and Folklore among the Native North Americans and Peoples of Africa

**ANGEL MAYORGA**

Mentor: Dr. Lester Robbins, Department of Anthropology



## INTRODUCTION AND BACKGROUND

Mythology is the most common aspect of human culture. Myths are a reflection of the desires and fears of all peoples and serve not only as a religious foundation but also as a form of entertainment. A number of cultures include tricksters

within their mythologies. Trickster tales are usually about anthropomorphic animals or hybrids (half-human, half-animal) that may or may not help people. The tales tend to be very humorous and the trickster tends to lie, cheat, steal, betray, perform erotic acts, commit incest, and engage in half-witted acts that end in self-defeat. The trickster is simultaneously the creator and destroyer, the giver and negator. It is apparent that the trickster had an important place in early peoples' views on the world that surrounded them.

## METHODOLOGY

This research is based on analysis of primary sources such as ethnographic studies of tricksters conducted by leading anthropologists. It consisted of analyzing the cultures of the Native American and African peoples by comparing and contrasting the mythologies of the two groups. The purpose of this analysis is to examine correlating themes and the social implications of tricksters.

## RESULTS AND DISCUSSION

This research found that themes such as the theft of fire and water, trickster relationships with the god(s), and the motives of tricksters are shared by both Native American and African cultures. For example, the Native American trickster Coyote and the African trickster Ture both steal fire from a higher authority in order to aid mankind. Theft of water is a theme commonly found among African mythologies. According to the Zande mythology, the trickster aids man in obtaining water that is being hoarded by a higher authority. The research also determined that there is an emphasis on the role of tricksters in the cultures of the two continents, mainly on the social implications of the use of tricksters within the myths and the violation of taboos.

## CONCLUSION AND FUTURE RESEARCH

In retrospect it is possible to conclude that the mythologies of the Native American Indians and those of the peoples of Africa are similar. The trickster takes on the role of a friend of humans and struggles with the gods in order to aid humans throughout much of the mythology. The trickster does fit the role of a complex cultural hero, rather than the selfish buffoon that many have described. The trickster takes on very human faults by breaking the rules which the social order depends on. He takes on the "sins" of mankind and sets humans free by the process of redemption. In many ways the trickster seems to act as a pressure valve that is allowed to relieve social tension and frustration. By breaking the rules the trickster affirms them by setting the cultural boundaries for the people of a particular group.

It is possible that the trickster figure in each of these cultures fulfills the needs of social groups subconsciously by breaking rules. In a few cases this may be to justify breaking a rule. Customarily when the trickster violates the rules it is so that the rules are understood and explained. Further research may take a deeper look into the complex social structures of these groups and their relationships with the trickster figure. It is possible that hunters may have imagined their tricksters very differently from other groups of people that happened to be agriculturalists. In turn, the more complex a society by means of agriculture the less emphasis is placed on the meaning of the trickster tales. It should not be forgotten that the trickster myths are satisfying simply as entertainment, regardless of the culture. Moreover, these myths are entertaining at many different levels. They are also important to those who tell the myths within their respective religious systems and to those who study them formally, attempting to find meaning within the narratives and within the culture.

It is important to remember the manner in which myth and folktales have been recorded and passed on. There is no historical record to examine how the tales have changed over time. It is likely that the tales of today are not the tales of the past. This is a huge problem when examining stories that have been passed on from person to person. Indeed, there is no telling how much they have altered due to oral tradition over the centuries.

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# The Texas Two-Step, Hmong Style: A Delicate Dance Between Culture and Ethnicity

**FAITH NIBBS**

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## INTRODUCTION

"Being a Texan requires a certain attitude about life. If you have the right attitude, then being a Texan is only a matter of style."

- Michael Hicks on the "Texas perspective" (*On Being Texan*).

According to 2000 U.S. Census data, more than

186,000 Hmong men, women, and children live in the United States. While Hmong live throughout the country, the majority are clustered in five mega-communities located in Minnesota, California, Wisconsin, North Carolina, and Michigan (Ranard 2004:29). Over the last thirty years since relocation, individual Hmong communities in America have evolved with varying needs and outcomes adding to the complexity and diversity of the Hmong in the United States. The extent of this diversity among a people who are held together with such a well-documented history of commonalities is a topic of emerging interest.

Mark Pfeifer (2005), Director of the Hmong Resource Center and editor of the *Hmong Studies Journal*, noted the lack of research that examines the growing complexity and diversity of the American Hmong called for further study to help understand the role of locality in the adjustment and diversity of refugees. In response to Pfeifer's concern, this research began a discussion of the unique Hmong adaptation in Texas, identifying an array of confounding factors germane to the Texas socio-political environment, from which has emerged a distinctive, more cosmopolitan Hmong with uncharacteristic ideas of individualism and collectivism.

## BACKGROUND

While the conceptual paradigms of culture change in anthropology are debated, Hmong communities in America since early resettlement continue to be viewed as a homogenous group. Works examining intracultural variation of the Hmong community in the United States are sparse. In light of these challenges, this study asked whether there could be a threshold of agreement among the Hmong below which a cultural trait could no longer be considered a part of the cultural repertoire, despite its being shared by some members of the society. And if so, can a community, such as the Texas Hmong, be described as ascribing to "their" culture in the absence of such traits of sharedness, despite a community's claim to be Hmong (or are identified by others as Hmong)? Finally, what social implication, if any, does a community's contradictory relationship between culture and ethnicity carry within its society at the macro-level?

## METHODOLOGY

This research was done over a five-month period using a qualitative approach. Data were gathered from key informants, participant observation and structured interviews within the Hmong community. Twenty-five structured interviews were conducted, aimed at capturing at all levels of its social stratification. I conducted 39 site visits as a guest in Hmong homes and at community events. Key informants included community leaders, religious specialists, men, women, youth, first- and second-wave refugees, those who had been originally settled in Texas, those who had migrated from elsewhere, and community leaders and members in more populous Hmong areas.

## RESULTS AND DISCUSSION

Social policy and attitudes in Texas are shaped to some extent by beliefs in individual responsibility, distrust of "big government," and fiscal conservatism. The initial forty-five Hmong refugee families that resettled and remain in Texas entered this sea of variables, eventually adopting its philosophies and justifications as their own. They were quickly able to accomplish what no other Hmong population in the United States had: economic self-sufficiency.

With jobs and prosperity, the Texas Hmong community had opportunities to develop marked differences from larger Hmong settlements elsewhere, which were faced with serious problems of unemployment. As a result, differences emerged in felt needs, kinship reliance, religious practice, value orientation, cultural identity, traditions, and female representation. None were ever intentionally adopted as "anti-Hmong," but as a constructive and logical response to the circumstances and resources available in their environment. What has emerged is an anomalous community of Hmong whose cultural repertoire is so vastly different from other Hmong communities that it challenges the domain of what is conventionally agreed upon as "Hmongness."

## CONCLUSION AND FUTURE RESEARCH

A study of the Hmong in Texas is a necessary addition to research on the Hmong diaspora. One benefit would be a new dialogue about how factors of the sociocultural environment shape the cultural complexity of an ethnic group that has been perceived in popular discourse as a monolithic "Other."

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# Pantheism: A Viable Possibility?

**KYLE VERNON**

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## INTRODUCTION AND BACKGROUND

For thousands of years, man has sought answers to many questions of deep import, yet none has more significance than the question of whether or not there is a divine being. And of even further implication is what the nature of this being is or could be. The purpose of this research is to explore an alternative to the monotheistic and polytheistic conceptions of deity, namely, pantheism. For a particular view to be considered viable, it must be logically sound (i.e. not contradictive), as well as fit the evidence. It is the analysis of the pantheist position with which this research is concerned.

## METHODOLOGY

For the purposes of this research, several texts and journal articles were analyzed and a synthesis of major pantheistic views was created and critiqued. Primary among these were Baruch Spinoza's *Ethics*, G.W. Leibniz's *Monadology*, and G.W.F. Hegel's *Phenomenology of Spirit*.

## RESULTS AND DISCUSSION

After careful analysis of the Spinoza text, it was determined that despite the logical consistency of the pantheist position therein, Spinoza's views are suspect based on three criteria: 1) he simply defines God into existence 2) he claims a mind-body duality<sup>1</sup> and 3) there is some confusion as to what his conception of essence is and how it is perceived. Given the fallibility of the Spinozist position, the Leibnizian position was analyzed and found to be a cogent description of consciousness if we remove its theistic trappings. Leibniz claimed that the universe is made up of monads (simple substances with no parts, unable to be further divided into constituents). These monads do not interact; however, through a pre-established harmony they affect all of the macro-level events that we experience in day-to-day life. When combined with the Hegelian position of spiritual evolution through human society, we find a compelling pantheistic picture of the universe and divinity. If we are to take pantheism seriously, as we should, then this analysis shows that it is indeed a viable position (at least as viable as theism), and should be seriously considered in man's search for the divine.

## CONCLUSION

It is the position of this research that a pantheistic conception of divinity, properly grounded is quite viable. Specifically, it is a synthesis of the views of Spinoza, Leibniz, and Hegel that provide a philosophical and metaphysical grounding for this position. Further research in this area should focus on relating pantheist themes to modern religions as well as providing some physical evidence for the position<sup>2</sup>.

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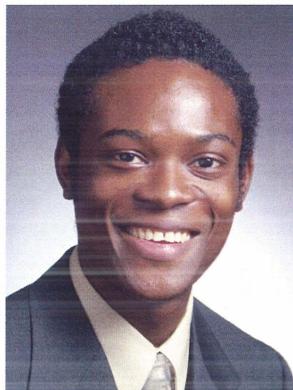
## NOTES

- <sup>1</sup> The mind-body problem has been the primary concern of philosophers since the time of Descartes, and the dualist perspective is fraught with problems. See *Matter and Consciousness - Revised Edition: A Contemporary Introduction to the Philosophy of Mind*, by Paul M. Churchland, MIT Press, 1988 for a complete discussion.
- <sup>2</sup> Some physicists have already begun making pantheist claims about the nature of the universe. See *The Conscious Universe: Part and Whole in Modern Physical Theory*, by Menas Kafatos and Robert Nadeau, Springer-Verlag, New York, 1990

# A Pilot Study to Test the Reliability and Efficiency of Methods Used to Evaluate Colon-Cleansing

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## INTRODUCTION AND BACKGROUND

Colon-cleansing is the stimulated discharge of colonic contents with the use of enemas, laxatives and oral lavage solutions. Its main purpose is to prepare patients for certain procedures (e.g., colonoscopy) which require that all stool be removed from the colon and rectum. The American Society of Gastrointestinal Endoscopy (ASGE) recommends three cleansing preparations, but all have disadvantages and none are adequate for patients with decreased motility who require more potent cleansing methods (Faigel, Eisen, Baron, et al., 2003). We do not know how often the ASGE recommended preparations are actually used in practice or what is being used for those who need more potent medications.

Eventually, the researchers will conduct a prospective, descriptive national study of colon-cleansing practices being used in a variety of endoscopic settings serving different groups of patients in order to discover the types of colon-cleansing preparations used, their effectiveness and patient tolerance. Since all participating sites will need identical, reliable, efficient measurement methods to allow comparisons of data, this pilot study tested the measurement methods at one site and identified problems with data collection. Pilot study data were also used to calculate the appropriate sample size for the national study.

## METHODS

The study was conducted at a gastroenterologist's private office, where five different regimens are used to clean the colon for colonoscopy: (1) a combination of large volume polyethylene glycol-electrolyte lavage solution (PEG-ELS) and bisacodyl tablets (laxative), (2) a combination of bisacodyl tablets, lactulose (laxative) and saline enemas, (3) a combination of smaller volume PEG-ELS and bisacodyl tablets, (4) a combination of large volume PEG-ELS, bisacodyl tablets, and lactulose, and (5) a combination of large volume PEG-ELS, bisacodyl tablets, lactulose, and saline enemas. Patients with decreased bowel motility are prescribed option 5, the most potent combination, or option 4 if they cannot tolerate enemas.

A comparative-descriptive design was used and there was no intervention or manipulation of variables. Demographic and background data were collected. Subjects completed a modified visual analog scale designed to measure their experiences with the bowel cleansing preparation. It included a list of possible discomforts and a question about the ease of taking the preparation. Subjects completed it twice to establish test-retest reliability. The physician used the colon cleanliness scale to describe the colon's cleanliness during colonoscopy.

## RESULTS AND DISCUSSION

Eighty-two subjects were recruited over a six-week period. The subjects ranged in age from 21 to 80 years. The majority were Caucasian (72%) and female (59.8%). Fifty-two percent gave bleeding as the reason for colonoscopy, and another 20% reported colorectal cancer screening.

Fifty subjects (61%) received regimen 1, 14 received regimen 2, six received regimen 3, five received regimen 4, and seven received regimen 5. Analysis of variance tests found no significant differences between groups in terms of discomfort experienced during the preparation ( $df = 4, 77; F = 0.433, p = 0.84$ ) or colon cleanliness ( $df = 4, 70; F = 0.623, p = 0.647$ ). Almost everyone had clean colons; only three subjects needed to have the colonoscopy rescheduled because of inadequate colon cleansing.

It is not surprising that there were no differences in subjects' experiences with the colon preparations or colon cleanliness since the study was descriptive. All five regimens were more potent than those recommended by ASGE and the physician deliberately prescribed the strongest preparation for those with decreased bowel motility to ensure that all the colons were clean.

The tools were efficient and easy to use. Subjects had no difficulty completing the subject experiences form and statistical analysis of test-retest reliability found a Pearson's correlation of 0.906 ( $p < 0.00$ ). The physician suggested several modifications to increase the clarity of the colon cleanliness scale. A power analysis showed that a sample size of about 1,000 would be sufficient to detect differences in terms of colon cleanliness and subject experiences for the future national study.

## CONCLUSIONS AND FUTURE RESEARCH

Overall, the measurement methods were efficient and provided important information. The pilot study identified problems with the measurement tools and data collection methods that will be corrected for the national study. The researchers also recognized the difficulties of detecting differences when using a descriptive design and the importance of including bowel preparations with different potencies. The pilot study also determined that the future national study should have a sample size of 1,000 subjects.

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# Supramolecular Materials from CO<sub>2</sub> and Lysine-based Peptides

ANJENIQUE ANDERSON

Mentor: Dr. Dmitry Rudkevich, Department of Chemistry and Biochemistry



## INTRODUCTION

Carbon Dioxide (CO<sub>2</sub>) is one of the major greenhouse gases that circulate through the environment in the carbon cycle. It is being produced faster than the earth's natural processes can absorb it. There has been an ongoing attempt to

utilize the overproduction of this gas, of which carbamate chemistry offers much potential in this direction.

## LITERATURE REVIEW

For decades, the reaction of CO<sub>2</sub> with amines has been known to yield thermally unstable carbamates, releasing CO<sub>2</sub> upon heating. This research focused on making supramolecular polymers using CO<sub>2</sub>. Supramolecular polymers are a class of macromolecules in which monomeric units are held together by reversible forces. Thus, by employing the traditional chemistry of CO<sub>2</sub> and lysine-based amines, supramolecular linear polymer and cross-linked 3D material were designed.

In the polymers, CO<sub>2</sub> was used as a cross-linking agent. Such cross-linking carbamate-based polymers 3,4 will be used to encapsulate other molecules. There are a number of cross-linked supramolecular polymers known, but there has not been any reported experiment where they have been used for

guest release purposes. The plan of this research project was to introduce novel organogels that trap small organic molecules and drugs with the release due to temperature change.

## METHODOLOGY

A recent successful approach developed in this lab consisted in the utilization of calix[4]arene tetraureas, monomeric units, attached to a dipeptide, dilysine chain. Calix[4]arene tetraureas are popular self-assembling modules, capable of forming well-defined hydrogen bonded dimers in apolar solution ( $K_D \geq 10^6 M^{-1}$ ). On the other hand, these calix[4]arene-based polymers represent very complex structures, and are quite difficult to synthesize. Therefore, the researcher decided to simplify the synthetic approach and used only short lysine-based peptides as

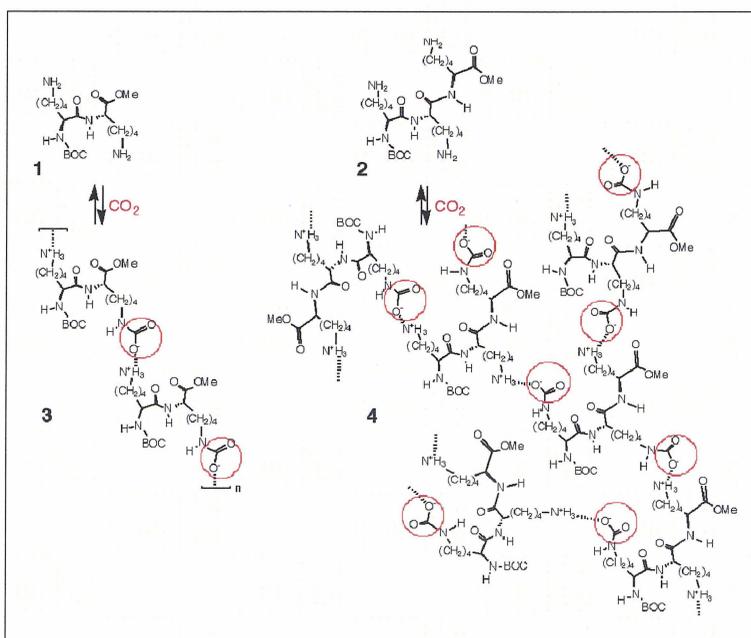


Figure 1. Linear supramolecular polymer 3 and cross-linked network 4.

basic building blocks. The main advantage of this approach is the biological degradability of lysine, the easy accessibility of building blocks (reactions based on basic peptide coupling protocol) and the possibility of further functionalization.

For the synthesis of a supramolecular polymer, short lysine-based peptides 1,2 were used as the initial monomers to compose the final product 3,4 (Fig. 1).

The lysine-based peptides were synthesized according to the standard protocol for peptide chemistry using commercially available lysine. The exposed amine end of the lysine reacted with CO<sub>2</sub> to form the supramolecular polymer product. After the peptide was reacted with CO<sub>2</sub> an organogel was formed.

## RESULTS & DISCUSSION

Using <sup>13</sup>C and <sup>1</sup>H NMR spectra, the formation of the products was confirmed for each step. Since the linear supramolecular polymer 3 was formed, a series of steps to measure the actual mechanism of the encapsulation of the foreign molecules will now be performed. Spectroscopy will allow the monitoring of the storage and release of these objects. On the other hand, there is current progress in the direction of increasing the solubility of the tripeptide 2 to obtain the cross-linked supramolecular polymer 4.

## CONCLUSION & FUTURE RESEARCH

So far, results for the synthesis of the carbamate 3 and carbamic acid have proven to be successful. In comparison to the previously noted experiment on calixureas, the

use of the lysine-based peptides has been proven to be just as efficient. In this stage, tripeptide 2 was found to be only marginally soluble in various apolar solvents, so the researcher was able to prepare the corresponding cross-linked polymer 4. For this reason, other functionalization (for example the introduction of longer alkyl chain) leading to better solubility is necessary. The work in this direction is in progress.

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# The Disability Profile of the MMPI-2

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## INTRODUCTION

Clinical researchers have now embraced a new biopsychosocial perspective of pain that emphasizes the close interaction of several biological, psychological, and social factors that affect chronic pain patients (Gatchel & Weisberg, 2000). Consequently, psychological and social factors are being added to the biological index of pain in many studies (Gatchel, 2004). The *Minnesota Multiphasic Personality Inventory-Second Edition (MMPI-2)* and the *Structured Clinical Interview for the DSM (SCID)* are just two assessment tools that are now effectively used to evaluate chronic pain.

## BACKGROUND

The most common profiles of the MMPI-2 associated with chronic pain are the Neurotic Triad (NT) and the Conversion V (CV) Profile. Sternbach and colleagues (1973) found significant differences in the first three scales of the MMPI-2, called the Neurotic Triad, when analyzing chronic low back pain. Other studies have also found that the Neurotic Triad predicts the worst surgical outcomes in low back pain (Masters, Shearer, Ogles, & Schleusener, 2003). Friedman and colleagues (2001) described patients with a Conversion V profile as having notable personality factors that show a need to interpret their psychological problems in socially accepted ways. Another important profile of the

MMPI-2 is the "Floating Profile, the most difficult to interpret. Gatchel and Mayer (2005) suggest that individuals with the Floating Profile are incapable of effectively dealing with stress and seem to be resistant to treatment. The Neurotic Triad, the Conversion V, and the Floating Profile of the MMPI-2 have all been associated with predicting treatment outcomes. However, there has been some inconsistency in the ability of the MMPI-2 to successfully predict all patient outcomes. Gatchel and Mayer (2005) have focused on a new profile for the MMPI-2 called the Disability Profile (DP). In their study, the Disability Profile predicted psychopathological conditions among chronic disabled occupational spinal disorders (CDOSD) patients. The Disability Profile also classified a larger percentage of patients than the other abnormal profiles.

## METHODOLOGY

This study effectively used the MMPI-2 and the SCID to analyze chronic pain patients. The Disability Profile, examined by Gatchel and Mayer (2005), was analyzed closely and compared to the other profiles of the MMPI-2, the Neurotic Triad and the Conversion V to determine its ability to be as effective as or even more effective than the other profiles in predicting psychopathology.

## RESULTS AND DISCUSSION

An initial data sample of 1,384 patients with chronic work-related musculoskeletal pain disability was categorized into four MMPI-2 profiles. Subjects consented to, and started, treatment at a tertiary rehabilitation regional referral facility — the Productive Rehabilitation Institute of Dallas

for Ergonomics (PRIDE). After initial analysis, 19.1% (N=265) of the initial sample failed to meet the criteria of one of the four profiles for the current study and were therefore eliminated. This left a final sample of 1,122 patients. The four MMPI-2 profiles analyzed in this study were the Disability Profile (DP); the Conversion V Profile (CV); the Neurotic Triad Profile (NT); and the Normal Profile (NP). They were distinguished from one another by clinical scale elevations, where T scores were greater than 65. After being analyzed according to one of the four MMPI-2 profiles, the patients were administered the SCID to determine any Axis I clinical disorders or Axis II personality disorders.

The DP accounted for 65.7% of the sample, and represented the majority of the classifiable patients. The CV profile classified 15.7% of the patients, the NT profile classified 9.6%, and the NP represented 9.0%. Computation of the odds ratios showed the likelihood of the abnormal profile groups to predict the diagnosis according to the SCID. The DP yielded more significant results when predicting psychiatric disorders compared to the CV and NT profile.

#### CONCLUSIONS AND FUTURE RESEARCH

Due to the complexity of chronic pain, perspectives like the biopsychosocial view are crucial to experimentation. Factors of biology, psychology, and social surroundings must be taken into consideration (Gatchel, 2004). With these findings, researchers have found it wise to use the MMPI-2, the most popular personality inventory in the world, and the SCID to conduct chronic pain research (Masters, Shearer, Ogles, & Schleusener, 2003). Gatchel and Mayer

(2005) described the Disability Profile of the MMPI-2 as the best screen for psychopathology in chronic occupational spinal disorders. In this study, the DP supported past research by significantly predicting psychiatric diagnoses. In the past, the NT and CV profiles have been the main points of focus for MMPI-2 predictions (Riley, 1993; Masters, Shearer, Ogles, & Schleusener, 2003). However, as the current research revealed, the other MMPI-2 profiles (NT, CV, and NP) only classified 34.3% of the chronic pain patients. With future usage of the DP, more understanding of chronic pain and better prediction of treatment outcomes may be possible. As an expensive health problem in the United States (Gatchel, 2004), chronic pain and its future research have important applications to the real world. Overall, this study supports the notion that the MMPI-2 should continue to be used for the advanced understanding of chronic pain (Masters, Shearer, Ogles, & Schleusener, 2003).

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# Experimental Comparison of Ionic Polymer-Metal Composites and Conventional Actuation Technologies for Biomedical Applications

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## INTRODUCTION

Conventional actuation technologies such as fluid power cylinders have been reliably used for many applications in engineering. However, these actuators often incorporate several discrete mechanical components such as gears and bearings, which increase their complexity. Over the last fifteen years, interest in soft and light-weight actuators has flourished. These actuators, known as electroactive polymers (EAP), exhibit shape change in response to electrical stimulation and require no ancillary discrete mechanical components (Bar-Cohen, 2004). Until recently, EAP technologies were of little interest due to limited actuation capacity and difficulty in manufacturing because of limited available materials. However, since new materials which provide larger displacement are available, much research is underway. One of the available materials, called ionic polymer metal-composite (IPMC), is classified as an ionic electroactive polymer. Before IPMC and other EAP technologies can be considered viable actuators for biomedical, biomimetic, and other applications, a critical comparison of new IPMC technology versus established conventional technologies is needed. The purpose of this paper is to compare experimentally the electrical-to-mechanical energy and power conversion characteristics of IPMC actuators to pneumatic cylinder actuators.

## LITERATURE REVIEW AND BACKGROUND

IPMC poses complicated technological issues in characterization and modeling of its inherent nature (Bar-Cohen,

2004). Current studies have been able to focus on the fundamentals, modeling behavior, controlling, and application of IPMC materials. Even though progress is being made in characterization of IPMC, much more needs to be known if they are to be practically utilized as actuators. While the progression of modeling and characterization is developing, it has not yet characterized the power output and efficiency of IPMC as actuators. Once this information is known, it is necessary to understand how IPMC compare to conventional actuation modalities.

A critical comparison of new IPMC technology versus established pneumatic actuation technology will show whether or not IPMC can be used as effective actuators. If so, these actuators can be used to produce medical devices that will dramatically improve the quality of life of the recipients. While conventional actuators have been used to produce these devices (such as an electromechanical heart), due to their nature, IPMC stand to improve the performance, reliability, simplicity, and cost of many biomedical applications. This includes more effective prosthetics, smart implants, more biocompatible drug delivery systems, artificial heart pumps, catheters, and even replacements for damaged human muscles (Shahinpoor et al 2005, Bar-Cohen, 2004). Furthermore, much of the research on the application of IPMC actuators is for robotic propulsion and actuation (Kim et al, 2003; Laurant et al, 2001; Noh et al, 2002; Tadokoro et al, 2002; Richardson et al, 2003). Therefore, biomedical applications of IPMC and other EAP technologies are needed and will be of benefit to this field (Noh et al, 2002).

## METHODOLOGY

In this study, the fundamental electromechanical input/output characteristics, power and efficiency, were consid-

ered for the comparative analysis. The IPMC strips were mounted in a custom-designed testing apparatus; tests were run using current step input and varied loads, and data acquired using a computerized acquisition system. The pneumatic cylinders were also mounted in a custom-designed testing apparatus, following similar testing procedures. The acquired raw data was processed and plotted.

#### RESULTS AND DISCUSSION

The results have shown the output power and efficiency of the pneumatic cylinder to be three orders of magnitude greater than that of the IPMC test sample. However, it was thought that the specific power would favor IPMC because its mass is substantially lower than that of the pneumatic cylinder. Thus, the specific power was calculated for each of the actuators. Unfortunately, even with the difference in mass of the IPMC and pneumatic samples, the specific power remains separated by approximately three orders of magnitude: 25 mW/kg for the IPMC test sample versus 100 W/kg for the pneumatic cylinder. Thus, even in specific power rating, IPMC does not compare favorably with established technologies.

#### CONCLUSION AND FUTURE RESEARCH

Despite the experimental results of this study, IPMC remain potentially beneficial due to their intrinsic simplicity, reliability, and cost (when mass manufactured). While the phenomenological explanation of IPMC actuation is complex, IPMC is simple in that it requires no ancillary discrete mechanical components to deliver motion and force. This simplicity offers a certain amount of reliability because there are fewer components to assemble and integrate for a given application. If this technology can be developed, then it would also be cost effective since worn-out parts would not have to be maintained or replaced.

These characteristics present great potential for IPMC to be used for large-scale production of bio-implantable devices and surgical tools, such as stents and any device which benefits from low power and high actuation (Bhat et al, 2004). Surgical tools, such as angioplasty equipment or other catheters, might also be improved by using IPMC actuators.

In closing, it should be noted that this was a preliminary study and further research is needed for the technology to be fully developed for use in practical applications. This study was performed to characterize the mechanical power output and efficiency. Knowing the performance characteristics of IPMC, applicable uses, such as those mentioned above can be developed. Thus, further characterization of IPMC and other EAP technologies will increase their acceptance as a viable actuator modality (Bar-Cohen, 2004).

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## Element Homeostasis in Bacteria

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### INTRODUCTION

All living things require mineral nutrients. For some organisms, mineral nutrients are maintained in fixed ratios (homeostasis). Other organisms are more flexible in their requirements for minerals; ratios of mineral elements vary relative to avail-

ability in the environment (Sternier et al. 1993).

In aquatic systems, the movement of mineral nutrients from the dissolved abiotic state to the living state is mediated by bacteria and algae. The mineral composition of cells then becomes an important determinant in trophic ecology since homeostatic predators feeding on homeostatic prey may encounter an imbalance between metabolic mineral requirements and availability of required minerals in prey (Sternier et al. 1998, Sternier and Elser 2002). Such an imbalance may drive a predator to extinction and bring about a shift in trophic structure. Bacteria are prey items for protozoa and this predator-prey relationship forms the basis of the aquatic trophic structure.

Bacteria in natural environments frequently encounter habitats in which dissolved nutrients are not adequate to support optimal growth. Little is known about the mineral composition of bacteria existing under such conditions. This study reports on the element composition of a model freshwater bacterium, *Pseudomonas fluorescens*, when grown under conditions of limiting mineral nutrients and we speculate on how nutrient limitation of bacteria may influence trophic structure of aquatic systems.

### METHODS

Optimal growth temperature of *Pseudomonas fluorescens* (ATCC 17579) was determined at temperatures ranging between 14 and 35 C. All other experiments were conducted between 16 and 28 C using Standard Minimal Base medium (SMB) (White 1998) amended with glucose or  $\text{KH}_2\text{PO}_4$  to create carbon (C)-limited or phosphorus (P)-limited media. Samples were drawn at irregular intervals and growth rate was calculated as the slope of a line fitting the natural log of optical density against time. Cells were harvested during mid-exponential growth for determination of C, nitrogen (N), P, cell abundance, and cell volume. C and N: CHN analyzer, Perkin Elmer 2400 series II; P: colorimetrically, Menzel and Corwin (1965); cell abundance and volume: epifluorescent microscopy.

### RESULTS AND DISCUSSION

*Pseudomonas* was found to grow well between 14 and 32 C with an optimal growth temperature of 28 C. Growth kinetics and element composition were determined under C limitation and P limitation at 16, 22 and 28 C. Cells were found to follow Monod-type growth kinetics and curves confirm C and P concentrations required for limiting nutrient conditions. The C:P and N:P ratios of cells were determined under each type of limitation (only C:P ratios are presented here).

**C-limitation:** Figure 1 shows the relationship between C:P ratio and growth rate. Apart from data collected for cells grown under high C availability, the C:P ratio ranged between 35 and 80 with no apparent relationship to temperature or growth rate.

**P-limitation:** The relationship between C:P and growth rate for cells grown under P-limitation is shown in Figure 2. C:P ratios ranged between 40 and 190. The highest C:P

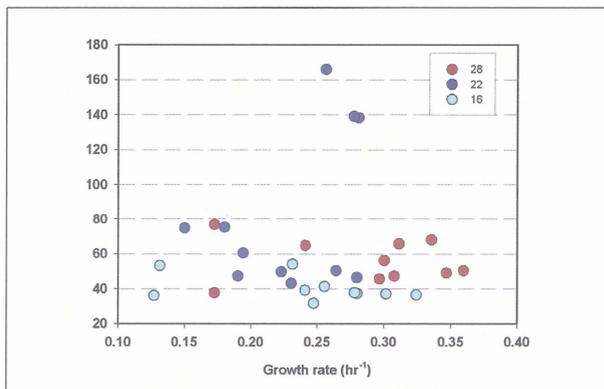


Figure 1. C:P ratio in *Pseudomonas* when carbon was the limiting element

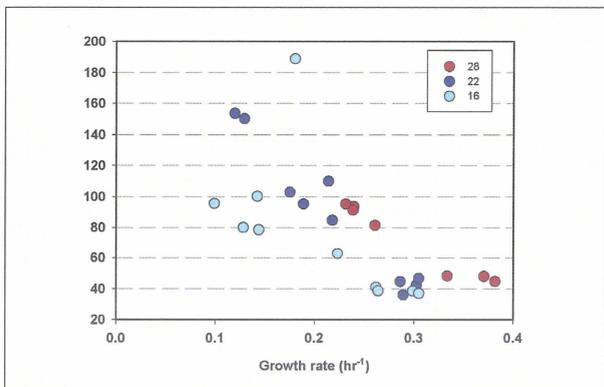


Figure 2. C:P ratio in *Pseudomonas* when phosphorus was the limiting element.

ratios were associated with slowly growing cells while the lowest C:P ratios were associated with the most rapidly growing cells. Cells grown under C limitation appear to regulate the composition of elements and maintain a narrow range of C:P and N:P. Cells grown under P limitation adjust the cellular levels of elements resulting in a dramatic range in C:P and N:P. Such shifts in element ratios may be brought about by an increase in C or N relative to P or an increase in P relative to C or N. To examine this, the P content ( $Q_p$ ) of cells was normalized to cell abundance and cell size. Under C limitation  $Q_p$  ranged between  $0.2$  and  $1 \times 10^{-5} \text{ mmol P } \mu\text{m}^{-3}$ .

Under P limitation  $Q_p$  ranged between  $0.1$  and  $1.5 \times 10^{-5} \text{ mmol P } \mu\text{m}^{-3}$ . Cells growing below approximately  $0.25 \text{ hr}^{-1}$  maintained cell  $Q_p$  between  $0.1$  and  $0.2 \times 10^{-5} \text{ mmol P } \mu\text{m}^{-3}$ . P quota rose dramatically as growth rate increased above  $0.25 \text{ hr}^{-1}$ . Clearly, rapidly growing cells require more P than do slowly growing cells. Rapid growth requires cells to synthesize more ribosomal RNA to permit increased rates of protein synthesis. RNA is P rich compared to most macromolecules ( $\sim 9\%$  by weight) so it is reasonable to expect that increased RNA accounted for the change in  $Q_p$ . Cells grown under C limitation were able to grow at rates similar to cells grown under P limitation but there was no apparent increase in the  $Q_p$  of C-limited cells. Conceivably, cells grown under C limitation were not able to fully utilize available P because there was not enough C to fully fuel biosynthetic demand. We conclude that cellular nutrient ratios are dependent on the nature of the element regulating or limiting growth of cells. From an ecological perspective, this assumes importance for nutrient utilization and regeneration. In systems where bacteria are limited by available C, essential nutrients such as P accumulated in bacterial biomass will be limited and therefore unavailable for transfer into high trophic level by predation.

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# Inhibition of Mycothiol S-Conjugate Amidase (MCA) and Anti-tubercular Drug Treatment

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## INTRODUCTION

There is a growing effort to discover new drugs that can be used to treat disease caused by *Mycobacterium tuberculosis*. Approximately one-third of the world's population is or has been infected with tuberculosis (TB). An estimated 8 million contract the disease per year and in the order of 2 to 3 million people die from it. It is similarly found in different areas of the world, but it affects industrialized and developing countries differently. In industrialized countries, tuberculosis is seen mainly in the elderly resulting from an endogenous reactivation of infection contracted in the past and is rarely a consequence of recent infection. The estimated death toll makes tuberculosis the leading cause of death by any single pathogen in the world. This problem is further compounded by a dramatic increase in multi-drug resistant strains of *M. tuberculosis*. An additional factor is that the incidence of tuberculosis has increased due to human immunodeficiency virus (HIV). Tuberculosis is the leading cause of death in HIV patients and subsequently acquired immune deficiency syndrome (AIDS) patients as well. It also affects other immunocompromised individuals, and, due to adverse reactions to drugs, it has become progressively difficult to treat and manage in these patients. Hence, there is a renewed interest in and a need for anti-tubercular drugs with novel molecular targets that attack different mechanisms within the cell. The rise of mycobacterial resistance to common anti-tubercular drugs, along with prevalence of tuberculosis in AIDS patients, has led to a renewed

interest in the discovery of anti-mycobacterial agents with new modes of action. Mycothiol biosynthetic and detoxification enzymes are novel and unique to actinomycetes and thereby represent potential anti-mycobacterial targets. It is the objective of this research to produce the truncated analogs along with the natural product to be tested for the inhibition of MCA.

## BACKGROUND

While there are promising new antibiotics, such as the longer-acting rifamycins, fluoroquinolones, oxazolidinones, and nitrimidazopyrans, there are as yet no extensive clinical trial data to determine the efficacy of these compounds. Finding new drugs represents a challenge. However, they are urgently needed in the effective fight against the growing number of drug resistant strains and against bacilli that may be in a state of latency. It is known that mycothiol (MSH) is a low molecular weight thiol found in actinomycetes, including *M. tuberculosis*. A similar thiol, glutathione, present in all eukaryotes and most bacteria, is a cofactor in many processes which protect the cell from oxygen toxicity and reactive electrophiles. It has a significant role in the protection of these organisms against oxidative stress and functions in the detoxification of thiol-reactive substances, including various antibiotics. As a thiol, MSH is thus far shown to be exclusive to actinomycetes. All this data suggests that targeting of mycothiol-associated biochemistry may be a valid approach to identifying new types of antibiotics specific to actinomycetes, which include *M. tuberculosis*. Recently, the discovery of a novel bromotyrosine-derived marine natural product by the laboratories of Bewley and Fahey represents one of the first examples of inhibitors of the relatively new mycobacterial

enzyme mycothiol S-conjugate amidase. With little understanding of MCA and the absence of a three-dimensional structure of the enzyme or its homologue, the search for MCA inhibitors has been done by screening natural product extracts using a fluorescence-detected assay for inhibition of MCA activity on the substrate mycothiol bimane (MSmB). Cleavage by MCA results in a glucosamine-inositol disaccharide, which is recycled into MSH biosynthesis, and an N-AcCys-S-conjugate that is excreted from the cell resulting in the detoxification.

#### METHODOLOGY

In an effort to complete the brominated quinolone, the starting material for the reaction was the commercially available 3,6-dimethoxy-2-nitroaniline. A Sandmeyer reaction was then used for the bromination of the amine; the compound was then cyclized.

#### RESULTS AND DISCUSSION

The approach to completing the inhibiting target has not yet been accomplished; however the proposed route is discussed below, along with the cross coupling of the imidazolyl and the brominated quinolone. The future route to complete this project involves the cross coupling of the imidazolyl and the brominated quinolone, and the subsequent synthesis of the spiro-isoxazoline species in order to completely piece the entire molecule together. Several marine-derived alkaloids have been tested and serve as inhibitors for MCA, and though they vary slightly in structure, they have common elements.<sup>6, 8, 10</sup> Our goal, in addition to total synthesis, is to complete truncated analogues that may be less difficult to synthesize but that largely retain inhibition characteristics as effective as the entire molecule.

#### CONCLUSION

Efforts are underway to synthesize small molecules that either inhibit MCA or its homolog AcGI deacetylase or function as substitute substrates for these enzymes. For the inhibition of MCA, targets include natural product-inspired inhibitors, which, in our case, is the marine bromotyrosine alkaloid natural product. For its total synthesis, the project began with the synthesis of three manageable moieties: a spiro-isoxazoline, an imidazole, and a brominated quinolone. Once the synthesis of these three components has been accomplished, the next step for the synthesis of the complete product will be to make a biaryl linkage between the imidazole and the quinolone. The remaining key reaction will be the final coupling reaction of the spiro-isoxazoline fragment. In an effort to complete the brominated quinolone, the starting material for the reaction was commercially available. The aim of this project is to develop the flexible synthesis of the natural product and truncated analogs, and the verification of the natural stereochemistry. The analogs can be biologically tested in route to the total synthesis in the model system *M. smegmatis* for inhibition of MCA, and successful targets will be further evaluated in *M. tuberculosis*.

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# Are There Differences in Attitudes by Racial Background Regarding Corporal Punishment in Domestic Abuse Perpetrators?

## KAN'DACE COUNCIL

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### INTRODUCTION

Domestic abuse is an increasing form of violence that transcends all ethnic and racial backgrounds (NLA, 2005). In America today not only is domestic abuse increasing, but the use of corporal punishment is also rising. With the growing trend of parents using corporal punishment as a means to discipline children, there has been a developing concern regarding the number of child abuse cases that are being reported. As the two trends continue to increase, there is concern that they are correlated. For example, Hart (1995) found that when a man abuses his spouse, it is likely that he abuses the children as well. With the findings of Hart and the increase in domestic violence, it is likely that there is a relationship between these two trends. Using a sub-sample of 226 African American, Hispanic, and White males, the researcher will seek to determine if attitudes regarding corporal punishment are statistically significant among the three racial groups.

Domestic violence has been a significant area of research in social work. Within the last decade, researchers and

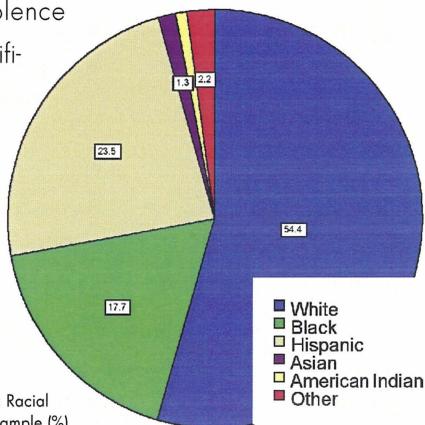


Figure 1: Racial composition of sub-sample (%)

social workers have learned that though domestic violence may be demonstrated more in one race than another, once macro- and micro-level factors were controlled, it was found instead to stem from subculture beliefs and traditions (Benson & Wooldredge, 2004). African Americans tend to use corporal punishment more than other ethnic groups (Strauss, 1998). Socioeconomic Status (SES) (Horn, Cheng & Joseph, 2004), education level, gender roles, learned behavior, and culturally acceptable behavior have been researched to see if they are significant causal factors of domestic abuse behavior. After controlling for macro-level variables, domestic violence was found to be related to cultural beliefs. Research found that within Hispanic culture, men are raised with strong cultural values that sometimes lead to the misconception that "disciplining" your wife is acceptable (Da Silva, 1990). Though attitudes toward corporal punishment have not been researched in depth in relation to domestic violence, this research seeks to determine if the race of domestic violence perpetrators is a factor in attitudes toward corporal punishment.

### METHODOLOGY

The research was conducted through secondary data analysis, using data collected at The University of Texas at Arlington, School of Social Work Community Service Clinic. The data was taken from a sub-sample of 226 African American, Hispanic and White males. These three groups were the largest of the sample. Information collected from the Punitive Discipline Questionnaire (PDQ) (Hymann, 1997) was then placed into Statistical Package for the Social Sciences (SPSS) for further analysis. Using SPSS frequen-

cies, means, and one way ANOVA tests were run. These tests were used to find the demographics of the subsample, the marital status, average age, total PDQ scores, and the significance of total PDQ scores among the groups.

#### ANOVA

PDQ Total Score					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	840.480	2	420.240	2.433	.090
Within Groups	38342.160	222	172.712		
Total	39182.640	224			

Table 1: Punitive discipline questionnaire

#### RESULTS AND DISCUSSION

The results found that race does not affect the attitudes of domestic abuse perpetrators. After running a one way ANOVA test, it became clear that the differences within the races were not significant ( $p < .09$ ) (see Table 1).

#### CONCLUSION AND FUTURE RESEARCH

This study revealed that it is not the race of the perpetrator, but rather other factors that affect one's environment that are responsible for attitudes toward corporal punishment and that need further research. Also, research into the roles of being married versus being single, and parenthood versus step-parenthood, to see if attitudes within these relationships vary toward corporal punishment, would provide further insight on the subject.

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# Patterns of Nontraditional Student Service Usage and Satisfaction: Single Parenting Students Versus Non-parenting Students

TIFFANY POWELL

Mentor: Dr. Emily Spence, School of Social Work



## INTRODUCTION

In higher education non-traditional students are considered to be adults age 25 or older. These students face very different experiences than traditional students in terms of completing their college education. The non-traditional student population faces a host of financial, social, and academic challenges that tend to interfere with their educational goals (Troupoucis, 2004). Researchers have found that the frequent demands of family responsibilities along with the demands of attending college can cause barriers to academic success for nontraditional students, especially single female parents (Anderson & Mieziitis, 1999).

Thus, this research study will provide information that should be helpful to college administrators by describing the characteristics of single student parents and how they differ from non-single parenting students on a college campus, as well as the type of support they seek, their usage of campus services, and finally their satisfaction with campus services.

## METHODOLOGY

The research methods for this exploratory study involved secondary analysis of a cross-sectional survey using descriptive and bivariate statistical tests. The data source utilized for this exploratory study was the 2004 Student Af-

fairs Survey Instrument (SAS). The data was retrieved and analyzed utilizing Statistical Package for the Social Sciences (SPSS) software. The results of the survey were then coded in SPSS.

According to Table 1, a total of 910 students participated in the survey and their median age was between 23 and 25; thus, a large number of the respondents can be categorized as nontraditional students. Four percent of those surveyed are single parents representing a total of 36 individuals. The 874 remaining respondents were not single parents.

	Frequency (f)	Percent (%)
Not a Single Parent	874	96.0
Single Parent	36	4.0
Total	910	100.0

Table 1: Survey Participants' Parenting Status

## RESULTS AND DISCUSSION

The majority of survey respondents for both groups reported that they rarely use campus services but they are mainly dissatisfied with those services. The data shows that there was not a significant difference between the two groups in terms of campus service usage and satisfaction. Student patterns of service usage are minimal. Based on the analysis, the only campus service which was statistically significant was that of attorney services ( $+ \leq 8.595$ ,  $df = 2$ ,  $p = .014$ ). The analysis shows that differences between the two groups were not significant for student satisfaction. For example, in most cases very similar percentages of single parenting and non-single parenting students

were dissatisfied with the following campus services: student congress, student activities, student governance, UTA Hosts, and the dean of students (an identical 88.9% for both groups). This could be a result of the low number of single-parenting student responses to the survey. Thus, campus service usage should be a concern for UTA administrators. The implications of the results should entice college administrators to investigate this information more closely in order to determine reasons why overall student service usage is low.

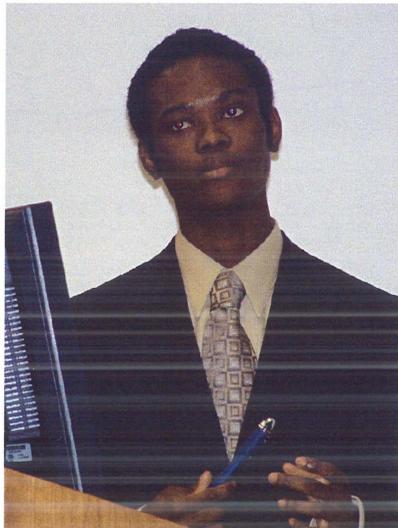
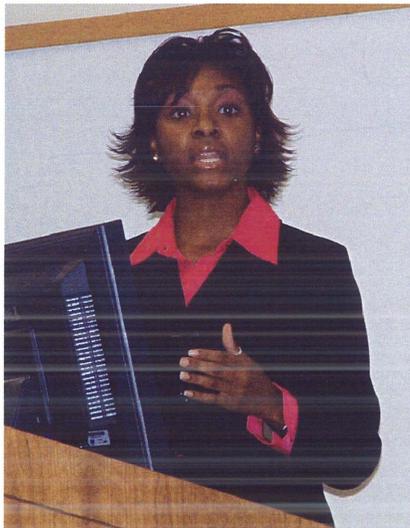
#### CONCLUSION

The results of this study, although exploratory in nature, do have some significance in assisting college educators and administrators to better meet the needs of single parenting students on a college campus. This study can extend the work of other studies and may lead to the future improvements of recruitment and retention rates of nontraditional students.

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## Research Presentations



## Summer Research Banquet



# Summer Research Banquet



## Around the Office and in the Lab

