

McNair Research Journal



The University of Texas at Arlington

Summer 2003 • Volume 7

THE UNIVERSITY OF TEXAS AT ARLINGTON

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TRIO

The Ronald E. McNair Postbaccalaureate Achievement Program is a federally funded TRIO program

The McNair Research Journal is the annual research publication of the Ronald E. McNair Postbaccalaureate Achievement Program (McNair Scholars Program), a TRIO Program funded by the U.S. Department of Education, at the University of Texas at Arlington. The journal consists of summaries of papers written by McNair Scholars who participated in the McNair Research Fellowship the preceding summer. Journal contents solely reflect the research and opinions of the individual authors. Presentation of this material was made possible by a limited license grant from the authors who have retained all copyrights in the contributions. All other elements of the journal such as its structure and organization are also protected by copyright. The University of Texas at Arlington holds copyright to the journal but permits reproduction of its contents (not to exceed 100 copies) for non-commercial or educational purposes.

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MESSAGE FROM THE INTERIM PROVOST



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', with a stylized, flowing script.

Dr. Dana Dunn
Interim Provost and Vice President for Academic Affairs

NOTES FROM THE DIRECTOR



The publication of this journal marks the thirteenth year of the existence of the McNair Scholars Program at The University of Texas at Arlington. A total of 231 UTA aspiring scholars have participated in the program during this time. As evidenced on the following pages, outstanding undergraduate research continues to thrive at our campus.

On behalf of the staff of the McNair Scholars Program, I wish to congratulate our Scholars on the successful completion of their 11-week Summer 2003 research internships. Their diligence, insight, and innovative thinking, as reflected in their research summaries, confirm the potential we knew they possessed. Each can be confident of having rightfully earned a place in advancing the knowledge of the future.

We would like also to congratulate, and to thank, our faculty mentors who devoted their time, energy and talent in the development and accomplishment of the research projects. The quality of the research efforts included here are testimonies of the level of commitment of both Scholars and mentors.

Best wishes, McNair Scholars, 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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THE McNAIR SCHOLARS PROGRAM

at

The University of Texas at Arlington



*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 university research and teaching. Since its inception on campus, the McNair program has encouraged and assisted over two hun-

dred students in various majors with their preparation for graduate study.

Currently the McNair Scholars Program at UT Arlington works with a minimum of twenty-eight 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 before 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.

HAND ANTHROPOMETRY COMPARISON OF MEXICANS VS. BRITISH AND VIETNAMESE

Martha Contreras

Mentor: Dr. Sheik Imrhan, Department of Industrial and Manufacturing Systems Engineering



The United States is characterized by a wide variety of ethnic groups. However, Hispanics are the fastest growing population segment in the U.S. and, as a result, they also make up a high percentage of the total national workforce. Therefore, improving measures regarding the workplace and tool design to fit this population's physical characteristics should be implemented. Otherwise, an improper working environment and poorly designed tools for the human operator may result in musculo-skeletal problems.

The purpose of this paper is to report the various representative hand dimensions for 50 Mexican subjects, 25 women and 25 men. The results of this study have the potential for improving the design of hand tools for industrial work in places where the Mexican population is significant in the labor force. It also presents the differences between Mexicans' hands and those of other nations, such as Vietnam and Great Britain. This analysis will be of great importance since there is no published data for the civilian population of Mexico.

From a convenience sample of participants (from the border cities of Nuevo Laredo, Mexico, and Laredo, Texas), with no abnormalities in their hands, 23 dimensions were collected from both hands. These dimensions are important in designing manual tasks and equipment. The definitions of the dimensions can be found in various ergonomics publications, such as Imrhan (1993). A vernier caliper, a measuring tape, and a weight-measuring scale were used for measuring the

hands, arms and weight of the subjects. A software package, the Statistical Analysis System (SAS), was used to perform the data analysis.

The subjects' ages ranged from 20 to 50 years old, for both men and women. Men's heights ranged from 156.50 cm to 183.70 cm, with a mean of 169.80 cm and standard deviation of 11.60 cm. Their weights ranged from 62.00 kg to 130.00 kg, with a mean of 79.32 kg and a standard deviation of 15.88 kg. Women's values for height were 147.60 cm to 180.00 cm with a mean of 160.44 cm and standard deviation of 7.79 cm; their weights were between 45.00 and 103.00 kg, and the mean and standard deviation were 64.18 kg and 14.63 kg, respectively.

A comparison of the left and right hands of males was performed using a t-test, with a 5% level of significance. The results showed that all 23 measurements were not significantly different ($p > 0.05$) between the right and the left hands. In general, the right hand was larger, with thicker and

broader fingers. In the females, there was no difference between the females' left and right hand dimensions ($p>0.05$).

The male versus female comparison showed that only five hand dimensions (right hand's first joint to root digit V, right and left hands' second joint to root digit V, and right and left hands' breadth at tip digit III) were not significant ($p>0.05$). The right arm's fingertip to elbow measurement was not significant either.

Twenty-three measurements for three different ethnic groups—Mexicans, British (Davies, 1980) and Vietnamese (Imrhan, 1993)—were evaluated. All 23 measurements showed no significant difference ($p>0.05$) in the

Mexican versus British comparison at the 5% level of significance. Overall, Mexicans had larger, thicker, broader hands, with longer fingers. In the Mexican versus Vietnamese comparison, only six values were significantly different ($p<0.05$): the depth at second joint of digit 5 (36.84% difference), the maximum depth of the hand (2.29% difference), the fingertip to elbow (9.71% difference), the wrist circumference (187.4% difference), the height (3.16% difference), and the weight (34.44% difference). In general, Mexicans had longer (4.80%), thicker (5.24%), and broader (2.29%) hands with longer fingers than Vietnamese. Mexicans

also had thicker wrists (187.4%) and they were taller and heavier. Mexican males had bigger, thicker and deeper hands than both British and Vietnamese.

These results may be useful to designers of hand tools, apparel and other equipment for these populations. It is recommended to conduct further surveys and anthropometric analyses in different regional areas in Mexico to build up a broader data set that will be useful for the design of hand tools used by Mexicans in those countries where Mexicans make up a large percentage of the overall workforce.

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AIR FLOW DISTRIBUTION IN HEAT SINKS

Juan F. Ibarra

Mentor: Dr. Dereje Agonafer, Department of Mechanical and Aerospace Engineering



Heat sinks together with air moving devices, more specifically tube axial fans, were tested and analyzed. The concept for this experiment is based on U.S. Patent No. 5,704,419 [1] by Agonafer et al. The main purpose for the patent was to make a good match between the airflow and temperature distributions in heat sinks. One of the objectives of this study was to analyze the effect of the heat sink's geometry on the distribution of airflow throughout the heat sink. The area of interest on the heat sink was the center underneath the hub of the fan. This particular area is where most of the heat concentrates and where conventional fans provide little or no

air. Spot cooling techniques were employed to eliminate the spreading resistances by lateral heat conduction through the heat sink base away from the center towards the edges of the base.

Four different heat sink configurations were tested with the objective of finding the optimum geometry or set of geometries. All four configurations were identical with the exception of the fin geometries. A 15X15X1 mm chip was placed under the base to act as a constant heat source. In the first case, a regular parallel plate heat sink was tested to analyze the typical thermal and flow behavior for heat sinks with impinging flow. For the following cases volume was removed from the fins to provide better air movement in the center. Exhausts were also blocked to redirect exiting air away from the edges and towards

the area underneath the fan hub. For this study simultaneous conduction and convection conjugate heat transfers were the most significant challenges. Heat transfer due to radiation was not taken into consideration and interface resistance between the chip and the heat sink base was also neglected. FLOTHERM, a computational fluid dynamics (CFD) code, was used to model the conjugate heat transfer problem. FLOTHERM uses the finite control volume approach in which the entire solution domain is split into non-overlapping finite volumes. The discrete equations are then solved using an iterative method. To provide a better view of the flow behavior a visual plane was created with FLOTHERM near the base. The following table is a brief summary of the results for this experiment:

	CASE 1	CASE 2	CASE 3	CASE 4
Center vel, m/s	.472	1.19	1.13	.99
Total pressure drop, Pa	9.26	2.58	16.93	17.96
Chip Temp, °C	82.14	85.18	82.56	78.87

Table 1. Summary of results

For cases 1 and 2 the airflow distributions did not match the temperature distributions. As a result, the chip's temperature was high and there was a small pressure drop throughout the heat sink. For the last two cases, there was a good airflow and temperature match. However, the chip's tem-

perature was lower for case 4. The temperature difference is due to the fact that too much air was blocked in case 3. For this reason special considerations have to be given to the amount of air being blocked at the exhausts to make sure that hot air is not circulated back into the heat sink

causing poor convective heat transfer. From this study, it is concluded that a heat sink's efficiency can be improved with spot cooling techniques by reducing the resistance caused by spreading of the heat flux.

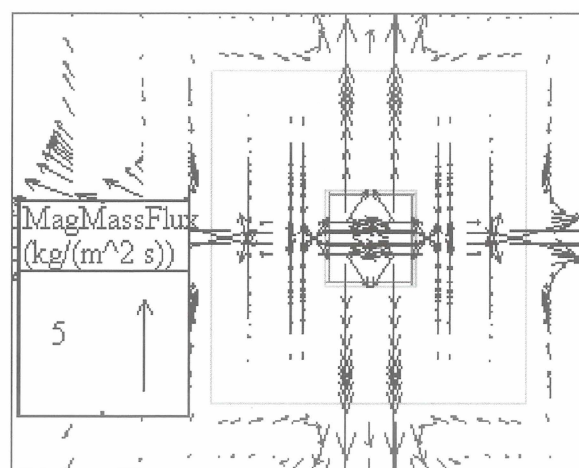
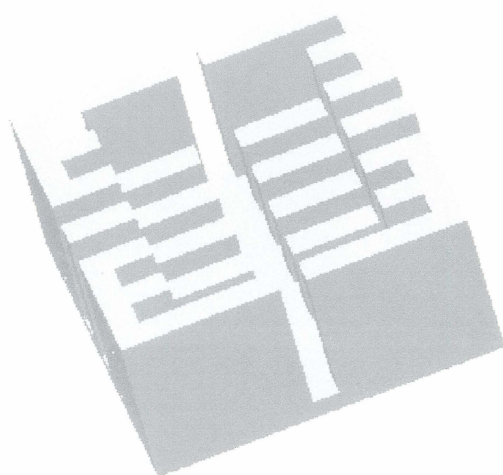


Figure 1. Optimum fin configuration with matching airflow distribution.

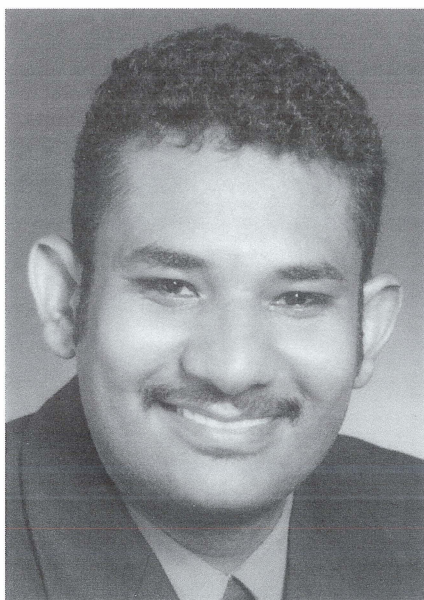
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A MODEL FOR SELECTING SOFTWARE ENGINEERING TOOL CHAINS

Sami Musa

Mentor: Dr. Arthur Reyes, Department of Computer Science and Engineering



Software can be developed in several ways. The software development process can be thought of as a “tool chain”, i.e., a path that leads from a high-level computer-assisted software engineering (CASE) modeling tool or programming language integrated development environment (IDE) to the computer on which the software must run (i.e., target hardware). Powerful CASE tools such as I-Logix Rhapsody in C and IDEs such as Metrowerks CodeWarrior tend to be expensive to acquire, learn, and maintain, but inexpensive to apply on a frequent basis. Conversely, simple tools and manual processes tend to be inexpensive to acquire, learn, and maintain,

but expensive to apply on a frequent basis. Since many paths/tool chains are possible, how can engineers determine the most suitable tool chain for their needs?

We present a model by which engineers can design optimal tool chains. In this model, tools and manual activities are represented as nodes. Potential data flows between tools are represented as arcs. The collection of potential tools and their potential data flows is a directed acyclic graph (DAG). The software engineering process potentially starts at a node that has no arcs entering it (i.e., a CASE tool or IDE), and potentially ends at a node that has no arcs exiting it (i.e., representing the target hardware). If any branches exist between the chosen leaf and root, then every chain between the chosen leaf and root must be analyzed separately.

Each node is a quadruple: (IDnode, COSTacq, COSTrenew, COSTuse).

Each arc is a pair: (NODEsrc, NODEdest).

Each chain is a sequence of arcs.

Figure 1 is an example tool graph and reflects our intention for the UTA College of Engineering Autonomous Vehicles Laboratory (COE AVL). The acquisition and yearly renewal costs for each node are based on the prices UTA was able to negotiate for each tool. The per-use cost of each tool is a time estimate based on experience with the tool and assuming the work is done by a UTA graduate student making the equivalent of \$6.44/hour.

Figure 2 shows cumulative costs per day of use for all leaf-to-root chains through Figure 1 over a period of 729 days (just less than two years). This period is chosen to see the effect of yearly renewal costs. We assume that each chain is exercised exactly once each workday (i.e., a “daily build” process is modeled).

For the given DAG, the per day number of hours are 4, 6, 7 and 8 for Rhapsody in C, ANSI C, Small C, and ISO MAX respectively. Figure 2 indicates that an engineer’s decision about which tool chain is most appropriate is a function of the period dur-

$$COSTchain_c = \left(\sum_i^{nodesalongchain} COSTacq_i, \sum_i^{nodesalongchain} COSTrenew_i, \sum_i^{nodesalongchain} COSTuse_i \right)$$

ing which the chosen chain is used. CASE tools and IDEs reduce the number of hours per day needed to complete a particular application. On the other hand, manual activities re-

quire a higher number of hours per day. For instance, in the Rhapsody chain, the cost starts high due to the initial acquisition cost, but the increase in per day cost is far less than

for other chains. This analysis allows the engineer to choose the tool chain that will be the least expensive for the engineer's expected time frame of use.

Figure 1

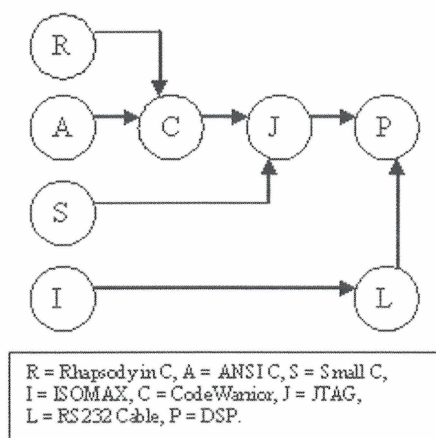
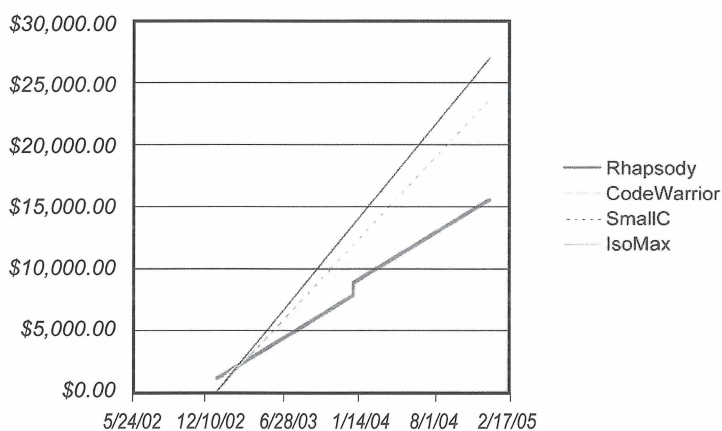


Figure 2



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DEVELOPMENT OF 2-D SCAPULAR X-RAY IMAGING INDEX TO IMPROVE THE PROTOCOL OF REHABILITATING SHOULDER IMPINGEMENT SYNDROME

Violeta Tayeh

Mentor: Dr. T.C. Yih, Department of Mechanical and Aerospace Engineering



The shoulder joint complex includes three bones (humerus, scapula, clavicle), three joints (sternoclavicular, acromioclavicular, glenohumeral) and the scapulothoracic articulation. Shoulder motion is, therefore, a summation of synchronous movement of all these components in which one component does not move without movement from the others, allowing for great mobility in various planes while still maintaining stability [1-3].

However, due to the nature of the anatomy and movements in the shoulder, it is highly susceptible to injury. For instance, in impingement syn-

drome, the stresses of repetitive overhead activity cause disruption in the stability and mobility of ligamentous and muscular structures. This disruption leads to a chain reaction of asynchronous firings of the rotator cuff and scapular stabilizing muscles. With continued, repeated abduction and external rotation of the arm, anterior subluxation of the humeral head and impingement of the rotator cuff against the coracoacromial arch occurs [4]. Impingement syndrome is a common finding among athletes engaged in repetitive overhead motions (e.g., swimmers, baseball pitchers, tennis players) and individuals involved with work-related injuries. This disabling condition can result in significant amount of time lost from athletic competition as well as from work. Little is known about the mechanics (i.e., kinematics and kinetics) associated with impingement syndrome. From a kinematics perspective, there is little information describing normal scapular motion and even less information describing abnormal scapular motion. The goal of this study is to

develop an objective imaging approach to accurately quantify scapular movement. The kinematic index will be quantified and used to help improve the protocol of rehabilitating individuals suffering from impingement syndrome and to prevent the condition from developing.

In this study, plain (2-D) radiographic (X-ray) imaging was used to analyze the kinematics of scapular positioning under static conditions in non-impaired individuals. The experimental data was provided by a physician and a radiology technician from the American Orthopedic & Neurological Rehabilitation Center. For each imaging study, the analysis of normal scapula position was in relation to the position of two rigid body segments, the humerus and the thorax. Each body segment (the scapula, the humerus and the thorax) was marked with 3 plastic, spherical, hollow skin (surface) markers, 2 cm in diameter. In order for the surface markers to be visible on plain radiographic images, each marker was covered with reflective tape and then properly placed on

appropriate landmarks by the physician. There were 3 surface markers each on the humerus, the scapula and the thorax. There are a total of 6 range of motion (ROM) positions tested for each subject, arm abduction (0° , 90° , 180°) and 45° arm flexion (0° , 90° , 180°) in the scapular plane. After all radiographic images were obtained, a radiologist plotted the bone markers that correspond to each one of the surface markers on each of the body segments. Once all the markers were plotted, the two methods used for examining all the information were centroidal analysis and center of rotation analysis. For centroidal analysis,

each set of skin markers and bone markers forms a triangle, which enables the quantification of a set of indices for normal scapular motions with respect to the centroidal movements of the two triangles. For center of rotation analysis, one surface/bone marker is shown in three positions when corresponding radiographic images are overlapped. Therefore, a second set of indices was determined by kinematic three-position synthesis with respect to the center of rotation of surface vs. bone marker.

The results show a correlation between the skin and the bone during both normal arm abduction and 45°

arm flexion. However, the indices indicate that there is a normal range for ordinary arm movement, not just a particular number. This suggests that for abnormal shoulder movement, the indices will not fall in the normal range. As a result, the placement of the surface markers is crucial for a physician to determine which areas of the shoulder should be targeted for therapy. Further research needs to be conducted to develop a normal range by considering more subjects and dividing the subjects by similar weight, height, build, etc., to minimize error, therefore developing an accurate range.

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FROM THE BAD PLACE: ALCOHOLISM AND RECOVERY IN THE LIVES AND WORKS OF JEAN STAFFORD AND MARIAN KEYES

Amy Durham

Mentor: Dr. Vicki Sapp, Department of English



The alcoholic writer is a familiar figure in literary legend, but as an alcoholic experiences a narrowing of her focus onto her addiction, how does this distorted vision affect her writing? The present study considers two women writers who have suffered from alcoholism and, more notably, contrasts them in light of the benefits of recovery. The artistic merit of each author's work will not be at issue, but the themes and purposes of the work will illustrate the comparative worldviews of each woman in a different phase of addiction.

Alcoholism creates a truth contrary to reality. "Driven by a hundred forms of fear, self-delusion, self-seeking, and self-pity," the addict moves towards insanity (*AA* 62). Gradually, the alcoholic loses her freedom, her personal integrity, and her spirit to the inevitable progress of her disease. Linda Schierse Leonard sees the addictive state as a constrictive one which "leads to monomania – a narrowing of life and vision, reducing the addict to the status of an object defined by its craving [. . .]" (11). While such an individual may yet produce works of quality and insight, her creative vision is inherently limited by her personal vision. According to Dr. William D. Silkworth: "[U]nless this person can experience an entire psychic change there is very little hope of [her] recovery" (*AA* xxix).

The recovering addict must have help to break through her denial and face head-on the agony and darkness within herself. As the spirit strengthens, self-awareness and clarity of mind return, and the alcoholic artist's abil-

ity to accurately observe, interpret, and record, expands with the broadening of her reality. In such a complete transformation, the individual is reborn.

This study examines works that reflect each author's style and tone, while conveying aspects of alcoholism and recovery. Analysis of the fiction of Stafford and Keyes will result in the revelation of general characteristics of each author's thematic focus and creative vision.

Jean Stafford's chronic alcoholism influenced her thematic choices and character representations in selected pieces from *The Collected Stories of Jean Stafford* and in her novel, *The Mountain Lion*. "The Children's Game" illustrates the vast difference between the addict's world of monomania and reality. The female character's enchantment with the sensation of gambling, her "melancholy" at the loss of the sensation, and her struggle to leave "her cocoonlike trance" afterwards, all echo the behavioral traits of an alcoholic, demonstrating the isolation and

illness at the core of Stafford's creative vision. (CS 32). The author uses duality in "The Echo and the Nemesis" to explore psychosis, denial, and obsessive behavior, all indications of addiction. *The Mountain Lion* traces the fate of a girl alienated from the world around her by the world she has created within her mind. Molly gradually descends further into bitterness and isolation, and in the end, Stafford fulfills a death wish patterned on her own.

Marian Keyes's addiction and recovery are both evident in her novel, *Lucy Sullivan Is Getting Married*. Lucy's father is the alcoholic, and she must

come to terms with his disease and the effects it has had on her sense of self. After much anger and confusion over the breakdown of her fierce denial, she glimpses freedom, for "with the unfamiliar anger, another strange emotion had surfaced. This new one was called Self-Preservation" (LS 543). *Rachel's Holiday* is a fictionalized version of the author's experience in a rehabilitation center for alcoholism. Rachel initially denies her addiction until she is confronted with the harsh reality of her selfish and hurtful behavior. Over the course of Rachel's treatment, Keyes slowly reveals the addict's wounded spirituality and follows her rebirth

through socialization, self-examination, and hope.

Jean Stafford's reality was based upon her increasing monomania and her inescapable denial of herself as a whole entity. Keyes writes of life from the standpoint of a person reborn, and her fiction clearly illustrates both poles of human existence, good and bad, light and dark. By the same consequence that Jean Stafford's creative vision was bound by her psychological and spiritual limitations, so Marian Keyes's vision is freed by her furthering transformation and movement towards wholeness.

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THE POLITICAL INTRIGUES OF PASCUAL OROZCO, 1910 – 1912

Thomas Gonzales

Mentor: Dr. Douglas Richmond, Department of History



The purpose of this research was to investigate the political intrigues of Pascual Orozco from the beginning of the Mexican Revolution until his revolt in March 1912. There were, of course, many factors involved in Orozco's revolt. Orozco was an ambitious man who wanted to rise above his class, but who was thwarted by Francisco Madero, who also aspired to political power. Orozco originally joined Chihuahua's revolution to overthrow the Terrazas-Creel oligarchy. Ironically, the local oligarchy would later flatter Orozco and incite him to revolt, but the blame for Orozco's re-

volt lies primarily with Madero. Francisco Madero promised to change Mexican society, but, in fact, did nothing. Former President Porfirio Diaz' bureaucracy remained intact, except for the presidency and the vice-presidency. Many other Mexicans besides Orozco believed that the end of the Porfirian system would allow all social classes an opportunity to advance, but they would be disappointed. Madero would leave their hopes to drown in a sea of discontent. The lack of agrarian reform was a major reason for their dashed hopes.

The intent of this study was to research an individual who was an integral part of the early phase of the Mexican Revolution, but whose personality is often obscured in Mexican history. Orozco has been branded as a tool of reactionary interests, and is still considered a traitor by many, but his revolt was partially the result of failed Madero policies. It certainly did not help his reputation for Orozco to utilize the funds of the Chihuahuan oligarchy and also to succumb to their flattery. Therefore, the primary pur-

pose of this paper was to provide newer insights on a historical figure who has fallen into obscurity.

The study of Orozco and the world in which he lived is based upon many primary, as well as secondary sources, acquired from various libraries around the country through the Interlibrary Loan System. Many of the books used for this research work were, of course, in Spanish. Many sources were available only in the form of microfilm. Microfilm records were used to explore Orozco's career.

Insights gained into Orozco's character as a result of this research explain why he revolted in 1912. Orozco had ambitions which went unfulfilled. He became disillusioned by Madero's inaction on many of the policies he had set forward in his initial call for rebellion in late 1910 (Plan de San Luis). Orozco's disenchantment, coupled with the former regime's flattery, made the conditions ripe for insurrection, but Orozco was not the only individual disappointed by Madero. Many former revolutionaries had also become alienated by what they per-

ceived to be Madero's failures to help the common folk. The study of Orozco and the political intrigues that led him to revolt have also opened up further areas that can be studied to gain additional knowledge of this time period in Mexican history.

Over the course of this investigation, many other areas of research have been opened up for possible exploration. Orozco had many dealings with the United States during his rebellion and many of these contacts pertained

to the Orozquistas' attempts to circumvent the arms embargo. The Taft Administration imposed an arms embargo in March 1912, which greatly hindered the success of Orozco's revolt, but this investigation also brought forth much more than Orozco's problems with the United States. This research also allowed an opportunity to gain insight into other revolutionaries, on whom little has been written. Men such as Braulio Hernández, Jose Inés Salazar, and

Emilio Campa could also be studied as future research projects. The revolt of these men, who initially joined the Vasquista rebellion, would originally serve as a precursor to the Orozquista revolt. Later they would serve Orozco as officers in his own movement. Orozco's political intrigues with the United States and the actions of these men can be investigated through the use of selected references, which are noted below.

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LAW, RELIGION AND NON-WHITES IN COLONIAL LOUISIANA

Holly Heatley

Mentor: Dr. Steven Reinhardt, Department of History



The purpose of this paper is to examine the legal implications of the transfer of Louisiana from France to Spain for non-whites living in Louisiana prior to the United States' purchase of the Louisiana Territory in 1803. Because religion heavily influences the prevalent system of belief for a society, it has a significant effect on the formulation of its laws. While both France and Spain were Catholic countries with a Roman legal heritage, the Catholic Church was less dominant in France than in Spain and so French laws were less influenced by Catholicism than were Spanish laws. The United States of America, being primarily Protestant and with laws

derived from the English Common Law system, diverged markedly from both the French and Spanish legal systems and tended to be more severe in the treatment of non-whites. Although the condition of non-whites in Louisiana had improved with the transfer of power from the French to the Spanish, their position in society actually deteriorated upon the purchase of the colony by the United States.

The written law, originating from the parent countries, did not always translate into reality for the non-whites living in colonial Louisiana, where the inhabitants were physically and socially distanced from Europe. Likewise, the transplanted religious bureaucracy, much smaller in Louisiana than in Europe, was less capable of instilling the established European system of belief. Therefore, it can be argued that the divergence between the written law code and actual practice can be attributed, in large part, to the lack of religious influence in the colonists' lives.

The Roman influence is noticeable in French as well as Spanish law in relation to slavery. The French, how-

ever, adopted aspects of Roman law that prohibited the participation of slaves as full citizens. French law, for example, excluded the right of a slave to be a litigant in a civil or criminal case. While slaves could complain of mistreatment under the French, these complaints were often ignored, and the slaves, denied the right to initiate a court case, could pursue the matter no further. In contrast, the Spanish borrowed from Roman law provisions for the judicial seizure and sale of abused slaves. The practice of self-purchase was incorporated into the law codes for both countries, although the French impeded the process by applying a number of conditions. The Spanish, however, encouraged self-purchase and significantly increased the number of free blacks in Louisiana during the Spanish Period.

Other major factors influencing the laws governing the treatment of slaves was the colonizing country's type of religion and degree of practice, according to the Tannenbaum-Elkins argument. Because Catholicism teaches the moral equivalence of all humans, Catholic countries tended to have laws encouraging manumission and the

treatment of slaves as humans. Because the Protestant (especially Calvinist) doctrine of predestination holds that humans are in the social stations in which they deserve to be and that those in higher social stations are more favored by God, Protestants tended to treat those below them as they wished. Protestantism is also highly associated with capitalism and its insistence on the preeminence of private property rights. As a result, according to Protestant thinking, slaves (private property) were to be treated as the owner wished.

The Catholic Church's influence on Louisiana colonists was weak. Throughout the French period the Church suffered from insufficient personnel and a lack of accommodations. At the time of the transfer to the Span-

ish Church, attendance at Sunday Mass was less than twenty-five percent of the populace. Although the Spanish worked to revitalize the religious life of the colony, the lack of clerics remained a problem. This primary institution's inability to reinforce the established European system of belief served to undermine the principles written into the law codes. This failure caused a divergence between the written code and actual practice. So while the Catholic monarchs intended that the slaves on their soil receive a minimum standard of humane treatment, the colonists tended to enforce the law codes that were practically or economically expedient. As the Catholic Church in Louisiana gained power, the correspondence between legal theory and actual practice in re-

lation to slaves tended to increase.

The sale of Louisiana to the United States of America in 1803 brought another change in the condition of slaves. A new black code was enacted in 1806 that was the harshest yet for the region. Among other changes, the slaves of Louisiana were thenceforth prohibited from owning property or money, effectively outlawing self-purchase and depriving them of the right to complain of mistreatment. For the first time, free blacks were required by law to treat all whites with respect. At least in colonial Louisiana, the influence of Roman law and Roman Catholicism in French and Spanish law had provided better conditions for non-whites than they would experience as part of the primarily Protestant United States.

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MOCHE “REVOLT OF THE OBJECTS” ICONOGRAPHY: MYTH OR METAPHOR?

Jennifer Lucas

Mentor: Dr. Joseph Bastien, Department of Sociology and Anthropology



The Moche were a pre-Columbian theocratic people who inhabited the north coast of Peru from roughly A.D. 0 – 750. They developed a unique art style, based on a strict set of artistic canons. The new symbology essentially constituted a form of writing and was used to create their narrative iconography. The narratives depict a limited number of themes, including the Revolt of the Objects, the Presentation (or Sacrifice Ceremony), the Raft (or Tule Boat) and the Burial Themes. These individual scenes are believed to combine in some way to form a larger narrative sequence. In the Revolt of the Objects iconography inanimate objects, primarily mili-

tary regalia, come to life and attack humans.

Previous researchers have identified the imagery as representations of apocalyptic myths described in the Mayan *Popul Vuh* and the Andean *Huarochiri Manuscript* as a period of inversion in the natural order: predator becomes prey, inanimate objects have life, and that which once served man now destroys him.

The iconographic narratives were once believed to depict Moche myths and cosmogony, but recent archaeological evidence suggests that there were historical components present as well. My analysis of the Revolt symbology, in light of ethnographic and ethnohistorical data and artifacts from Moche sites, revealed that it was very possibly a visual metaphor for one or more severe El Niño episodes of the late sixth century, and the ensuing environmental, economic and socio-political chaos of the Late Moche period.

After having enjoyed over four centuries of warmer than normal weather, coupled with higher than average precipitation, the Moche civilization had reached its zenith. They had expanded their territory to its fullest extent and

had exceeded the abnormally high carrying capacity of their lands to support their growing numbers. As the sixth century drew near, temperatures cooled, precipitation levels decreased, and periodic droughts occurred. The worst drought in Andean history struck between A.D. 563 – 594, causing famines, damaging the Moche economic infrastructure, and undermining the people's belief in their leaders to effectively mediate with the spiritual forces controlling their natural environment. In the middle of the devastating drought at least one severe El Niño event occurred. Torrential rains brought massive flooding and landslides, covering the barren fields with meters of clay and destroying vital irrigation canals. The final blow fell when sand dunes inundated Moche agricultural lands and they were forced to move.

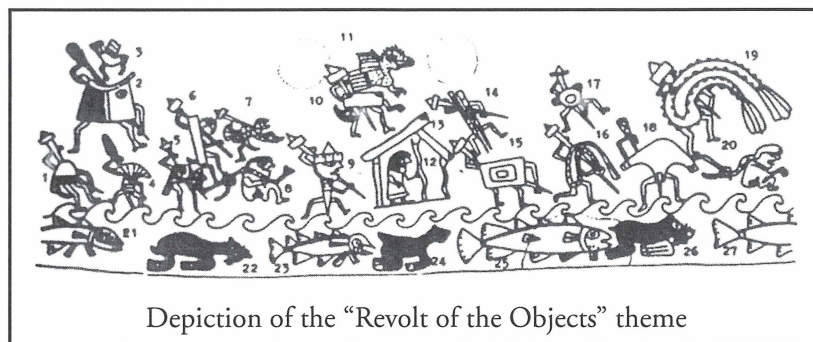
In their efforts to appease, and therefore control, the forces of nature the Moche relied upon the Andean practice of blood offerings. At the Moche site of Huaca de la Luna the remains of over seventy young males were found in thick layers of El Niño-related clay. Analysis of the remains

revealed that they were sacrificed in a manner consistent with that depicted in the iconography during periods of torrential rains caused by El Niño episodes. During these periods the natural order of the Moche world was truly inverted. The cool coastal current was replaced by warm waters; small fish, anchovy and sardines were replaced by large tropical and sub-

tropical species; and the arid desert was deluged with torrential rainstorms.

Circa A.D. 600 the Moche experienced a substantial societal disjunction, known as the Moche phase IV/V transition, between the Middle and Late periods. The Late Moche period is characterized by profound changes in demographic and settlement patterns, architecture, funerary activities,

art and iconography. There is also evidence of political restructuring, with new emphasis on the physical, rather than spiritual, control over vital natural resources. The new narrative iconography, possibly in the form of a



Depiction of the "Revolt of the Objects" theme

reinterpreted mythic sequence designed to legitimize and reinforce the authority of a new political regime, debuts at this time. The prevailing social order utilized narrative iconography to establish its members as protectors of the people, as well as to advertise its power and promote its importance by placing its symbols of power on portable, mass-produced, ceramic vessels.

I propose that the Late Moche mythic sequence began with the Revolt of the Objects Theme, representing the devastating El Niño event(s) and subsequent environmental and social chaos. It would be followed by the Tule Boat Theme, in which designated sacrificial victims were transported to the Moche ceremonial center. The Presentation Theme would follow, where

the prisoners would be sacrificed and their blood presented for consumption to Moche rulers, in a liminal state, as shamans mediating with the spirit world. Thus the actual historic component, El Niño, was represented symbolically in the Revolt of the Objects iconography, in an innovative vehicle for political propaganda developed by the new political hierarchy of the Late Moche Period.

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CHARLES DARWIN, LITERARY MASTERMIND: A DISCUSSION OF EVOLUTIONARY IDEAS IN DARWIN'S *JOURNAL OF RESEARCHES*

Grace Anne Wilhelm

Mentor: Dr. Richard Francaviglia, Department of History



When asked what he would say if he could have spoken with Charles Darwin, prominent modern biologist Richard Dawkins replied, "Why did you wait so long after you had this brilliantly simple yet powerful idea? Didn't it seem to you so fantastically simple yet so fantastically powerful that if you didn't write it down quickly, somebody else would?"¹ Why *did* Darwin wait twenty years before publishing his theory of natural selection?

Charles Darwin returned from his voyage on the surveying ship, the *Beagle*, in 1836. By the summer of

1839, he had published his *Journal of Researches*, a narrative of his journey. However, Darwin did not publish *On The Origin of Species*, which explained his theory of natural selection, until after he read Alfred Wallace's paper on the same topic twenty years later. Historians continue to debate why Darwin waited. Some suggest that Darwin waited because he wanted to be completely certain of the validity of the theory and have sufficient evidence before publishing it.² Others advocate the idea that Darwin spent the years in strengthening his reputation as a scientist.³

These ideas are very plausible, but this paper suggests yet another possibility—that Darwin needed time to *prepare* his readers to accept his theory. The *Journal of Researches* appears to be written with the *intent* of conditioning the reader to accept the theory of natural selection. Darwin may have primed his audience for the theory and then waited until it took effect. When Alfred Wallace sent him a theory identical to his own, Darwin knew the world was ready and was able to very

quickly prepare *On The Origin of Species*. In fact, Wallace read *Journal of Researches* before forming his own theory of natural selection.⁴

In order for his readers to accept this theory, Darwin had to acclimate them to certain ideas. They had to believe that the earth was older than the Biblically based model of nearly six thousand years. They also had to believe that the rate of change through time was relatively constant. The idea that was perhaps most crucial to Darwin's theory was that species are connected to each other. Darwin was asking his readers to shift their entire worldview.

To bring the reader to the conclusion that the earth must be older than was previously thought, Darwin used a poetic quotation to introduce the concept of nature teaching doubt. Then he described several scenes that led the reader to question the common Biblically based belief that the world was only about 6,000 years old. After each description, Darwin introduced commentary to direct the reader to the idea of an older world. By describing scenes which themselves

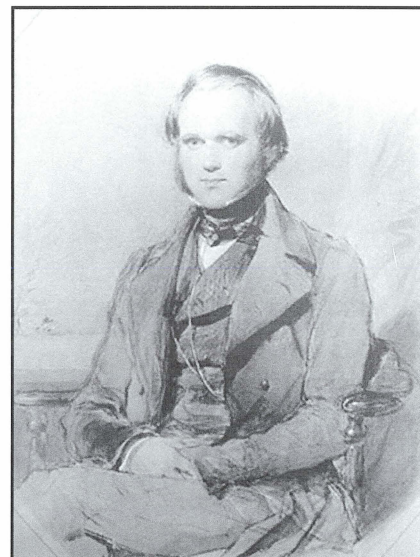
suggest incredible lengths of time, and then commenting on these scenes, Darwin effectively led his readers towards a belief in expanded time.

One way in which Darwin attempted to convert his readers to the idea that the Earth had been changing at a relatively constant rate was to explain by gradual causes events previously attributed to catastrophes. He also discussed the extinction of animal species by natural causes, rather than by divine intervention, as was commonly believed. This had the added effect of leading the reader away from supernatural beliefs towards rational, environmental causes of phenomena.

Darwin especially needed his readers to understand that species are con-

nected to each other and to their environment. Darwin showed that species are connected across continents and oceans and that the relationships between plants and animals are similar even on the other side of the world. He also showed that ancient and modern species are related. This allowed the readers to eventually be able to believe that all species have a common ancestry.

Darwin introduced the concept of natural selection by giving numerous examples of species' adaptation to their environment and variation in a species produced by environment. While discussing a tribe he encountered on Tierra del Fuego, Darwin commented, "Nature by making habitat omnipotent, and its effects heredi-



Charles Darwin, 1802-82

tary, has fitted the Fuegian to the climate and the productions of his miserable country."⁵ With descriptions, examples, and commentary designed to lead the reader to a certain conclusion, Darwin laid the foundation for his work, *On The Origin of Species*.

Endnotes:

¹ Richard Dawkins, interview in "Mechanisms of Evolution", *Biology*, ed. Neil Campbell, Jane Reece, and Lawrence Mitchell (Menlo Park, California: Benjamin Cummings, 1999), 413.

² Janet Browne, *Charles Darwin: The Power of Place* (New York: Alfred A. Knopf, 2002).

³ Ronald W. Clarke, *The Survival of Charles Darwin: A Biography of a Man and An Idea* (New York: Random House, 1984), 89.

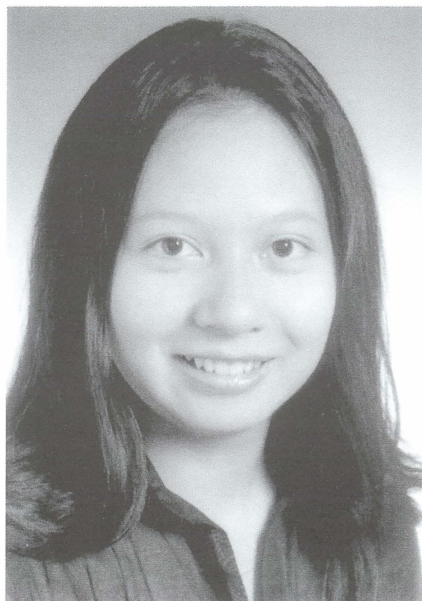
⁴ John Langdon Brooks, *Just Before The Origin: Alfred Russell Wallace's Theory of Evolution* (New York: Columbia University Press, 1984), 13.

⁵ Charles Darwin, *Journal of Researches: With Introduction and Notes*, ed. Charles Eliot (New York: P.F. Collier & Son Corporation, 1937), 220.

THE EFFECT OF ACIDIC pH ON MAST CELL ADHESION TO EXTRACELLULAR MATRIX PROTEINS

Marisol Chang

Mentor: Dr. Malgosia Wilk-Blaszczak, Department of Biology



Mast cells originate from hematopoietic precursors in bone marrow and circulate in the blood stream as undifferentiated cells until they reach their destination. Depending on the tissue to which they adhere, mast cells differentiate into three different types: connective tissue mast cells, mucosal mast cells, and brain mast cells (Theoharides, 1990). Once they have adhered, they secrete granule-stored mediators that have been associated with the symptoms characteristic of inflammation and hypersensitivity reactions. Previous studies have shown that tissues undergoing immune re-

sponses contain increased concentrations of mast cells as compared to normal tissues. Tissues experiencing injury also experience a change of extracellular pH towards acidity. While normal human tissue has a pH of about 7.4, a damaged tissue can experience a drop in extracellular pH to below 6.0. This drop in pH works as a signal informing the body about tissue injury. So far, two types of receptors have been found to respond to changes of pH: the family of acid-sensing ionic channels (ASIC) and the transient receptor potential vanilloid channels (TRPV), in particular a member of this family called a TRPV1.

MATERIALS AND METHODS:

We used the HMC-1 human mast cell line to study the adhesion of mast cells to extracellular matrix proteins, collagen and laminin in response to three different pHs. The mast cells were cultured in 100 mm plastic tissue culture dishes. 12-well plates were precoated with four different solutions (BSA, PBS, laminate, and collage) and

then washed with tissue culture media. The wells were then stimulated with pHs 7.4, 6.5, and 5.0. After incubation and extraction of the medium, six fields of vision were counted using an inverted microscope with 100X magnification.

RESULTS:

We found that HMC-1 cells adhered 33X more on collagen-coated dishes as compared to bovine serum albumin (BSA)-coated surfaces used as a control (Fig 1.). In laminin-coated

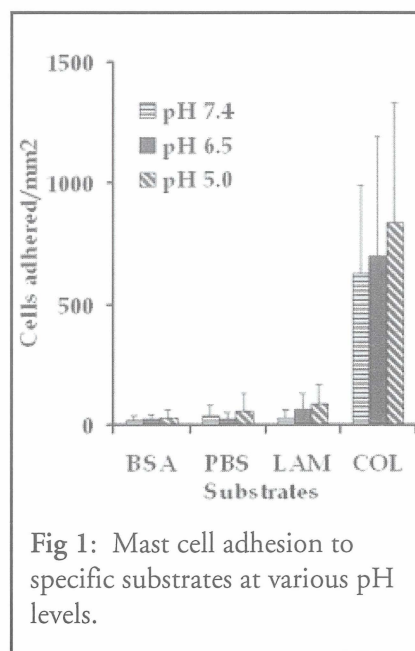


Fig 1: Mast cell adhesion to specific substrates at various pH levels.

dishes, we found that HMC-1 cells adhered 1.8X more as compared to

BSA (Fig.1.). The difference in adhesion among all four substrates was statistically significant ($p < 0.0001$). For all the substrates studied there was a slight trend of increased adhesion with an increase in acidity. In laminin-coated dishes, we found that HMC-1 cells adhered 2.5X more in pH 5.0 as compared to pH 7.4. In collagen-coated dishes cells adhered 1.3X more in pH 5.0 as compared to pH 7.4. In addition, we observed a change in mast cell morphology as acidity levels increased. We found that at pH 6.5 the diameter was 1.2X

greater as compared to pH 7.4, and at pH 5.0 the diameter was 1.5X greater as compared to pH 7.4. The difference in diameter according to pH levels was statistically significant ($p = 0.046$). Cells also displayed more ruffles and other membrane extensions as the acidity increased.

DISCUSSION:

This is the first study of the effect of acidic pH on mast cell adhesion. Our results indicate that mast cells preferably adhere to collagen over other substrates regardless of pH. This

might be due to interactions between mast cells and collagen that are pH independent. Also, our results show that HMC-1 cell adhesion to laminin increased with an increase in acidity, indicating the involvement of a pH sensing receptor. Furthermore, mast cell size and morphology changes as acidity level increases, which indicates that biological processes such as secretion and cytoskeletal remodeling are taking place in the cell in response to pH changes.

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THE EFFECTS OF GENDER AWARENESS ON PAIR BRAINSTORMING

Sharon Lynn

Mentor: Dr. Paul Paulus, Department of Psychology



Like yin and yang, and good and evil, male and female have existed in the world for as long as people can remember. They are each other's antithesis, but in most cases, still compatible with one another. Therefore, the male-female dyad is one of the most interesting subjects of study in science. Along with the obvious biological differences, each sex commonly acts in accordance with stereotypical behavioral norms. Research shows that these norms are very important in the way people behave in everyday situations. Participants report good feelings when acting in accordance with sex role norms and will identify

with same sex others who act accordingly (Wood, Christensen, Hebl, & Rothgerber, 1997). The primary purpose of this experiment was to identify the influence of sex role norms on participants during a brainstorming experiment. Another purpose was to identify how the perception of a partner's gender affects the behavior of participants. This can be evaluated by the number of ideas generated, the masculinity or femininity (gender quality) of the ideas, and the number of extraneous questions and comments posed to the partner.

I expected that males would generate more ideas than females on this brainstorming task (Wood 1987). The males will also have more ideas when working with another "male" than when paired with a "female" because the concept of comparing ideas with males is more threatening than with females (Orlofsky & Stake, 1981; Wood, 1987). Females will tend to be more concerned with the feelings of others, which may decrease the number of ideas generated because they do not want to make their partners feel inferior (Orlofsky & Stake,

1981; Wood, 1987). In terms of quality of the ideas, males will generate more masculine thoughts than females especially when working with another "male". Females will generate more feminine ideas especially when working with another "female".

Fifty-one male and female volunteer participants from the University of Texas at Arlington brainstormed on a computer in the experimental psychology lab which was networked with another computer in a different room. After filling out a survey on work group diversity, the experimenter read aloud the brainstorming instructions for electronic brainstorming. Participants were then given instructions on how to use MSN Instant Messenger and told that they would be working with Matthew or Jenny, another participant on a different floor with a different experimenter. Then they brainstormed on the topic of "What benefits and difficulties would arise if everyone born after 2003 had an extra thumb on each hand?" On the computer in the other room, an experimenter typed in 20 ideas from a script of previously brainstormed

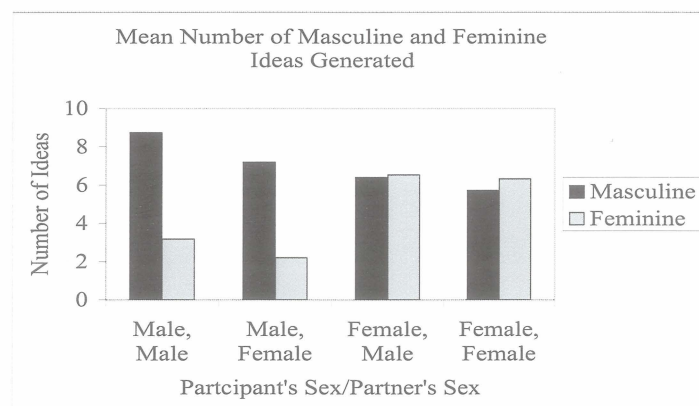
ideas (Dugosh 2001). After 20 minutes of brainstorming, the participant was asked to complete a post-brainstorming questionnaire. Participants were then debriefed and dismissed.

The results only supported two of my hypotheses concerning the brainstorming activity: men generated more masculine ideas and women generated more feminine ideas. This finding was true regardless of what gender the partner was. However, the manipulation check for the partner shows that participants believed that their partner was a male or female and assigned the appropriate gender quality to that person on the questionnaire. All of this suggests that men

and women behave similarly whether talking to a same-sex or an opposite-sex person. The only result that contradicts that assumption is the trend in the extraneous comments and questions measure. Each sex used more of these comments when talking to a same sex partner than when talking to an opposite-sex partner. Perhaps this finding indicates that participants were more comfortable communicating with same-sex partners and thus attempted to make more personal connections with that individual. The hypothesis that men would generate more ideas than women was not supported by my data, but this might be due to the small sample size of the two

male conditions.

Hollingshead and Fraidin (2003) also found no significant difference in the performance of men and women but instead a difference in the type of performance. Their results show that men and women recalled more words from same-sex typed categories than from neutral or opposite-sex typed categories; whereas, I found that men and women generate more gender appropriate ideas. Overall, this research shows that a partner's gender has little effect on the number and type of ideas generated by participants in a brainstorming activity.



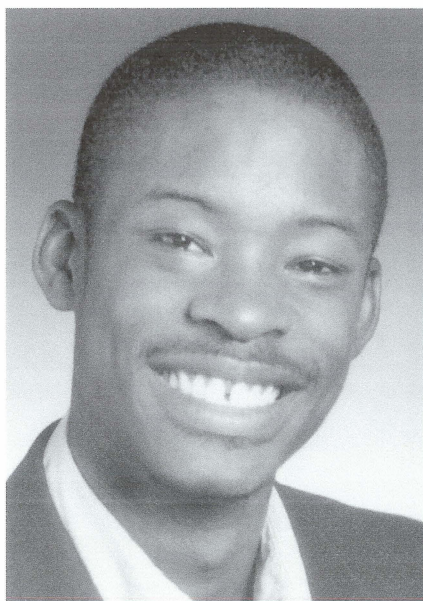
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SUPRAMOLECULAR NANOSYNTHESIS: CALIX-PEPTIDE POLYMERS

Stephen P. Stampp

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



In a technologically advancing world, there is need for the creation of new 'materials'. Today, the platforms or frontiers used in designing these materials are frequently based on molecular self-assembly and nanotechnology. This was not so in the past, as these are fairly new concepts.¹ Some of these frontiers are based on ideas such as: (i) chemical frameworks composed of many identical components arranged to serve as receptors for binding units, (ii) molecules designed to self-assemble into supramolecular structures, and (iii) new materials based on 'smart' assemblies that can be easily manipulated.² Designing materials with these specific

characteristics requires a clear understanding of the dynamics of intra/intermolecular interactions.

Polymers, since their discovery have been key molecules because of their multifunction capabilities.³ Many are the result of nanofabrication and are able to carry and store information.⁴ At the simplest level of reasoning, a polymer is a chain of *monomers* arranged in repeated units. The bonds between the monomeric units may be covalent or non-covalent such as hydrogen bonding, electrostatic attractions, and so forth. Some examples of active biological polymers exist as the storage polymers of deoxyribonucleic acid (DNA) and proteins. Also many plastics and building materials are polymeric in nature.

We are developing new materials based on the platforms mentioned above, where simple calixarenes are covalently bonded to peptide scaffolds forming monomeric units that self-assemble in solution due to hydrogen bonding. Calixarenes are molecules that have established popularity as building blocks in molecular recognition and gas sensing.⁵ Calixarenes offer cavities for binding various guests

and for our new polymers these molecules act as joints in the chain.

The experiments began with the synthesis of hexyl (A) and heptylphenyl (B) urea derivatives. We hypothesized that B would be more soluble in solution (apolar solvents) due to its long hydrocarbon tails. Preliminary results only showed a slight increase, and A was chosen to work with because it is somewhat easier to handle. The next steps involved covalent linking of short oligopeptides chains of lysine amino acids to the lower rim of the calixarene. Successful linking of one calixarene with an amino acid chain represents one monomer unit. There is great potential for polymerization forming longer chains through hydrogen bonding of the upper rim urea groups.

Commercially available *tert*-butyl calix[4]arene 1 in the presence of bromopropane and Ba(OH)₂·8H₂O and BaO were used to create tri-alkylated calixarene 2 in 78% yield. Further alkylation of 2 with BrCH₂COCH₂CH₃ and Na₂CO₃ gave compound 3. Nitration of 3 afforded compound 4-5, which was further reduced to 6 using Ra/Ni, H₂ in

ethanol. Tetra-amino calixarene, and octyl-isocyanate in chloroform gave 7 in 92% yield. Next, 7 was treated with NaOH in THF-H₂O and reacted with BOC-protected lysine, DCC and HOBt in DMF yielding compound 8 (see Figure 1).

Simultaneously, in-depth visual images of the polymer were created using Macromodel 7.0 molecular ar-

the polymer formation after hydrogen bonding (Figures 2 and 3, respectively).

The project was quite delicate. Calixarenes are fairly rigid structures, but calix-linked peptides are a new idea and the synthetic procedures were complex. The NMR spectroscopy and computer modeling experiments were key in characterizing the struc-

tures. At some point microscopic techniques or crystallization might be employed to 'see' points in

the molecule. The cavity of the calixarenes may allow the polymer to

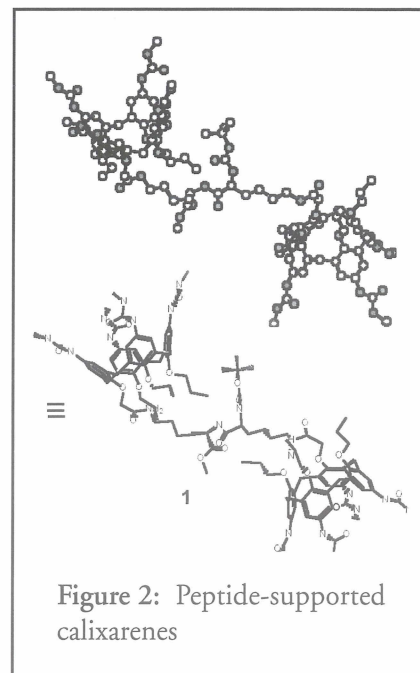


Figure 2: Peptide-supported calixarenes

carry small molecules or function as nanoscale building structures for drug delivery. Overall, we believe our polymers have tremendous promise and future application in practical use and represent an increase in the body of knowledge about such structures.

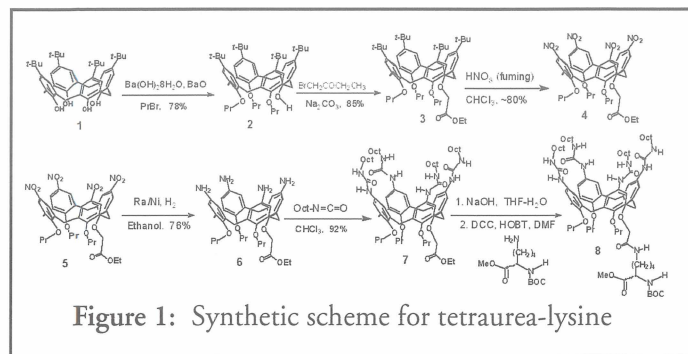


Figure 1: Synthetic scheme for tetraurea-lysine

chitecture software. The locations of all the atoms were entered into the program. Unfavorable energy interactions were calculated and minimized via the MMFS and MM2 energy reduction mechanisms. The program generated many possible conformations for monomeric structures. We also explored proposed structures for

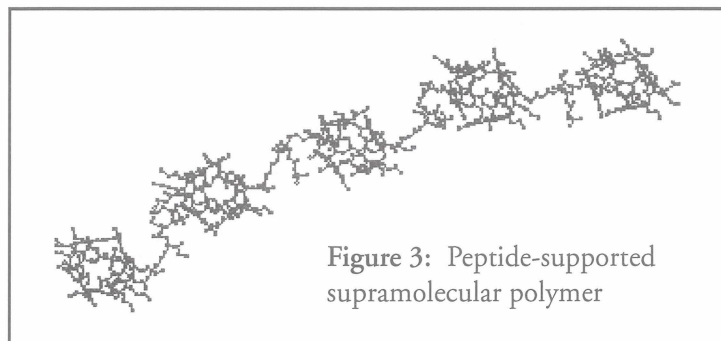


Figure 3: Peptide-supported supramolecular polymer

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ORBITAL STABILITIES OF TERRESTRIAL PLANETS IN GAMMA CEPHEID AND HR7272

Betty Vogds

Mentor: Dr. Zdzislaw Musielak, Department of Physics



W Within the last decade, the search for extra-solar planets has led to the discovery that 85% of all stars belong to multiple star systems, many of which are binary and triple star systems (Stuit 1995). These systems often contain one or more planets orbiting a primary star. Thus far only gas giant type planets (e.g. Jupiter and Saturn-like) have been discovered due to limitations of current detection techniques. The Doppler Technique, the main approach used to detect extra-solar planets, is sensitive only to massive planets leaving the existence of smaller terrestrial (earth-like) plan-

ets in these systems unknown. Even though it is still not technically feasible to detect terrestrial planets in other systems, other observational findings imply the strong possibility that they do exist (Noble, Musielak, & Cuntz 2002). These include: (1) the steep rise of the mass distribution of planets with decreasing mass which implies that more small planets form than giant ones, (2) the detection of protoplanetary disks (with masses between 10 and 100 times that of Jupiter) around more than half of all known young stars, and (3) evidence of rapid growth (within 0.1 Myr) of dust particles based on IR and millimeter wave observations (Marcy & Butler 2000).

Undoubtedly, the purpose of extra-solar planet research is to identify and target those systems where terrestrial planets can maintain certain conditions for sustaining life. The first and most important condition to investigate is whether short term orbital stability of earth-like planets in other systems is possible. Until recently studies have focused primarily on

single star systems. The high number of multiple star systems suggests that it is important to research these systems as well.

Through the use of computer simulations, this study investigates circular orbital stability of terrestrial planets in two known multiple star systems, binary system Gamma Cepheid and triple system HR7272, each of which contains a recently discovered giant planet orbiting a primary star. In each of these systems, the terrestrial planet will be positioned at different distances (measured in AU) from the primary star and the effects on the orbital motion will be examined. This will be done for both inner orbit cases (S-type orbits) and outer orbit cases (P-type orbits). In addition to investigating the known system Gamma Cepheid, this study will also examine a theoretical scenario, Gamma Cepheid2. In the case of HR7272, the terrestrial planet will be positioned and analyzed for orbital stability in various areas of the calculated Habitable Zone (HZ), that is, regions near host stars where the

physical conditions are favorable for liquid water to be available at the planets surface for a period of time long enough so that biological evolution can occur (Noble, Musielak, & Cuntz 2002). This study will allow us to draw general conclusions on what type of systems are ideal for directing the search for life.

Simulation of 25 orbital cases reveal four classes of resulting orbit stability: truly stable, stable, marginally stable, and unstable. A truly stable orbit, an orbit that only deviates within 5% of its initial orbital size and shape, is the primary focus of this study since it is the type of orbit needed to meet the necessary condi-

tions for sustaining life. A summary of stability results at different separation distances can be seen in Table 1. The results show that truly stable orbits of terrestrial planets exist in all three test systems. In the case of Gamma Cepheid, the changing position of the giant planet had very little effect on the regions of true stability for both inner and outer orbit cases. In the case of HR7272, results showed that all orbits in the HZ were truly stable. These results indicate that multiple systems similar to these can have terrestrial planets with truly stable orbits.

It is important to mention that these results are for circular orbit cases only.

Future research on this topic should be expanded to elliptical test cases for both stellar and planetary orbits. Another important aspect of future research would be to consider systems where an out-of-plane component existed. Our own solar system provides evidence that planes of planets can be expected to lie outside the plane of the stellar orbit. This could have a significant effect on the stability of a planetary orbit. While current studies provide the necessary insight into the fundamentals of planetary orbit stability, there is still much to be investigated (Stuit 1995).

Table 1
Orbit Cases Simulated For Each System

	Gamma Cepheid			Gamma Cepheid2			HR7272		
	rsep (AU)	t_yrs	stability	rsep (AU)	t_yrs	stability	rsep (AU)	t_yrs	stability
Inner Orbits	1	7.8	TS	1	7.8	TS	0.66	5.8	TS
	1.9	20.7	S	3.75	57.3	S	0.72	6.5	TS
	2	22.3	MS/U	3.8	58.4	MS/U	0.91	9.3	TS
	2.5	31.2	S	4.7	80.4	S	1.11	12.5	TS
	2.7	35	TS	5	88.2	TS	1.16	13.3	TS
	8	178	S	8	178	S			
	9	213	MS/U	9	213	MS/U			
Outer Orbits	Gamma Cepheid			Gamma Cepheid2			HR7272		
	rsep (AU)	t_yrs	stability	rsep (AU)	t_yrs	stability	No outer orbits		
	23	778	MS/U	23	778	MS/U			
	45	2130	S	43.5	2020	S			
	48.4	2380	4TS	47.9	2340	TS			

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SILVER SEEDS: THE ROLE OF EMOTIONS IN DEVELOPING READING MOTIVATION

Demetrial Wright

Mentor: Dr. Diana Wisell, College of Education



Educational research has been paying increasing attention to the role of emotions and motivation in relation to the development of reading skills. The ability to read is the traditional criterion of early school achievement and is basic to success in school (Chapman & Tunmer, 2003). A child who sees himself as a struggling reader often internalizes negative feelings, and assumes that he cannot learn to read. He may see reading as one overall process without realizing that while he is struggling to learn to read, he may actually have several relative strengths in one or more components

of reading. This view of reading as an 'all or nothing' process can cause him to see himself as a failure. This fear of failure may cause the child to have certain negative feelings such as anger or fear toward reading and can precipitate specific undesirable actions such as avoiding reading situations or expressing a dislike of reading. The consequences are that children who struggle with reading may be affected by both low achievement in school and have negative social or emotional impacts on their lives. Disagreeable emotions can be a primary, or casual, factor in some instances of reading problems in children. It seems reasonable, then, to propose that one form of learning disability is related to emotional blocking (Davis & Ekwall, 1976).

The current research project was implemented in conjunction with a summer reading program at the University of Texas at Arlington for children who have some type of reading difficulty. The children met with mentors for one-on-one instruction four days a week, one hour per day,

for three weeks, or a total of 12 instructional days. The purpose of this study was to investigate the connections between emotions and the motivation to read. Specifically, this research focused on how children felt during reading activities and how those emotions affected reading motivation.

Twenty-one ethnically diverse students were recruited for participation in this summer reading program using a variety of recruitment methods. In addition, 29 graduate students (27 female and two male) agreed to participate in the study as mentors as part of their educational course requirement. The investigator used four methods of data collection within the study. These methods included the Elementary Reading Attitude Survey (ERAS), the Wright Survey of Feelings Toward Reading, which was created by the investigator, the mentors' Reflective Logs, and the Observational Checklist, which was also created by the investigator.

The purpose of the ERAS is to evaluate students' attitudes toward

reading (recreational and academic). At the beginning of the summer reading program, slightly more than half of the children displayed a positive attitude toward recreational reading; in contrast, a little more than half had a somewhat indifferent or negative attitude toward academic reading. Overall, at the beginning of the program, more than half displayed a somewhat indifferent attitude or negative attitude for reading in general (both recreational and academic).

The Wright Survey of Feelings Toward Reading examines emotions toward individual reading activities, social reading activities, and activities related to specific books, subject areas, etc. The two strongest emotions reported for individual reading were happiness and anger; the strongest emotion reported for social reading was happiness; and the two strongest emotions reported for activities related to specific books, subject read, etc., were happiness and sadness.

In the Reflective Logs, the mentors wrote comments about the daily activities that were done with the students, such as, "Today Alice found a book she wanted to read and expressed her desire to read to us" (June 25—Kim) and "Risk taking was important to her because she was reluctant to read the book again because she said it was too hard." (June 24—Rhonda)

During the case study observations the four children were observed during an assessment, a shared reading, a familiar reading, and reader's theater. The emotions each child experienced for these activities were recorded. For example, during familiar reading, Alice read *If You Give a Mouse a Cookie* and showed frustration by saying that there were too many words on the page.

This research has shown that children display a wide variety of emotions during reading. Activities that promote positive emotions can facilitate higher motivation to read. Posi-

tive reading motivation has been associated with a number of desirable outcomes including higher reading achievement, deeper cognitive processing, greater conceptual understanding, and willingness to persevere when reading is difficult (Mazzoni, Gambrell, & Korkeamaki, 1999). Children who have a negative attitude toward reading at the beginning of an intervention program can improve their attitude toward reading with the use of interesting activities. These improvements can be traced in part to the students' emotional investment in the instructional activities used by their mentors and modeled within this program. Looking at emotions as a way of improving reading difficulties can be very useful.

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THE IMPACT OF SOCIAL WORK INTERVENTION ON STUDENTS COPING WITH GRIEF AND LOSS

Tiffany Powell

Mentor: Dr. Debra Woody, Department of Social Work



INTRODUCTION

Adolescents dealing with grief and loss may be at risk for serious emotional difficulties. Research studies indicate that the presence of consistent social support for children and adolescents, including professional intervention, can be effective in improving their overall emotional well-being and school performance (Richman, Rosenfeld, & et al, 1998). The purpose of this research study is to examine the effects of a school-based social work intervention program on helping students cope with

grief and loss. The following two questions will be addressed: Does participation in a school-based group intervention program help students increase their level of class attendance? Does participation in a school-based group intervention program help to decrease student levels of depression?

METHODOLOGY

The research design used for this project was *single system design*. (Bloom, Fischer, & Orme, 2003, p. 37). A sample of five subjects was evaluated. The data collected included the results of the WALMYR Generalized Contentment Scale (GCS) and school records on class attendance for each subject. *SINGWIN* statistical software was used to analyze the data. The group intervention involved educational, supportive, and cognitive techniques in which students were provided with information regarding the grief process and the various stages of grief (Kubler-Ross, 1969).

RESULTS AND DISCUSSION

Mean scores indicate that with the exception of one participant, levels of depression did decrease for each of the subjects. Depression scores from the one exception do, however, suggest that this participant's level of depression remained stable. For those participants whose depression levels decreased, t-test analyses indicate that these decreases were statistically significant in only one case.

In terms of school attendance, mean scores again indicate an increase in school attendance for each participant, except one. This participant experienced a slight decrease in school attendance. T-test results indicate that none of the changes observed in school attendance were statistically significant. Overall, some impact was made towards the improvement of student well-being and class attendance. This study informs social work practitioners that they should expect

to see gradual improvement when working with students who are coping with a difficult or traumatic experience. They should be aware that long term intervention and consistent social support are needed to make a significant impact.

CONCLUSION

In summation, many school-aged children and adolescents experience grief due to significant losses. The

occurrence of grief and loss can have a negative effect on childrens' and adolescents' well-being and school performance. Thus, schools are challenged to meet the needs of students beyond the basic provision of an academic education. There is a need for school-based social work services in order to help students cope with loss and other traumatic life experiences that can impede their success in

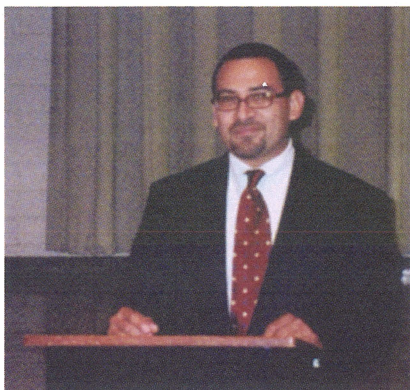
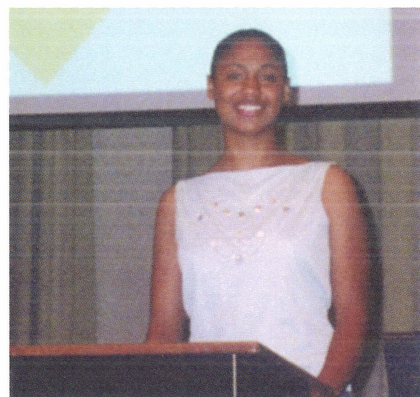
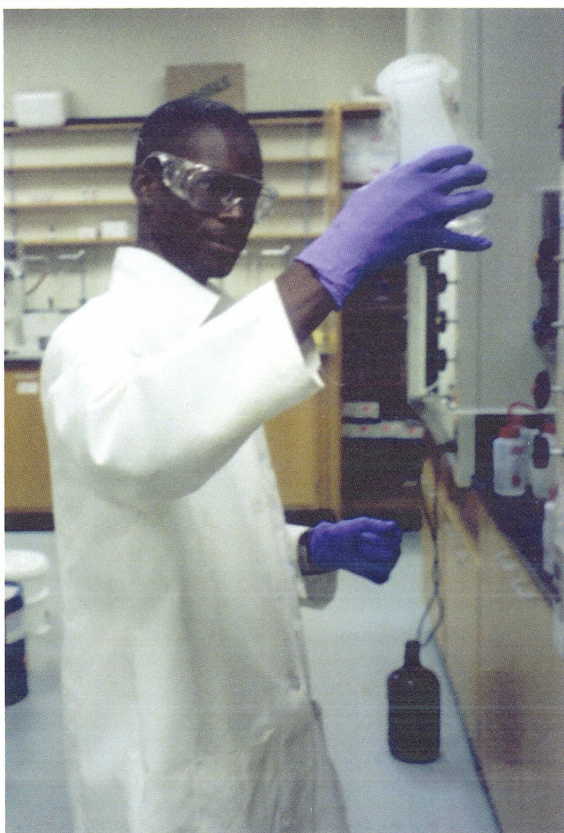
school. The results of this study suggest that the intervention provided to this group of students was somewhat effective in providing support. Although not statistically significant, group intervention did improve student levels of depression and student class attendance. At minimum, the group helped students maintain their level of functioning as they struggled to cope with the losses they experienced.

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Interns

in the lab and presenting their research findings



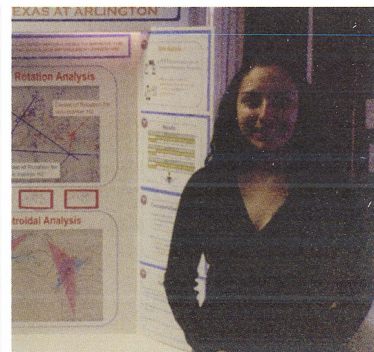
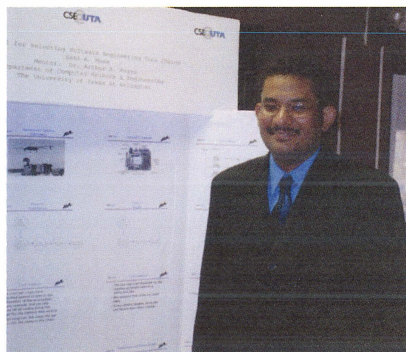
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