The Second Annual

Undergraduate Research & Creative Achievement Day

1998

UMBC

AN HONORS UNIVERSITY IN MARYLAND

Table of Contents

SCHEDULE OF EVENTS

9:00 a.m. – 1:00 p.m. **Concurrent Sessions**

Oral Presentations, Room 767, Albin 0. Kuhn Library
Poster Sessions, 7th Floor, Albin 0. Kuhn Library
Musical Performances, 7th Floor, Albin 0. Kuhn Library
Visual Arts Exhibits, 7th Floor, Albin 0. Kuhn Library

1:00 p.m. **Faculty Speakers**

The Role of the Undergraduate in Research
and Creative Achievement
Room 767, Albin O. Kuhn Library
Dr. Tim Topoleski
Assistant Professor of Mechanical Engineering
Dr. Douglas Teti
Associate Professor of Psychology

2:00 p.m. **Reception**

7th Floor, Albin 0. Kuhn Library

April 30, 1998

Dear Participants and Visitors:

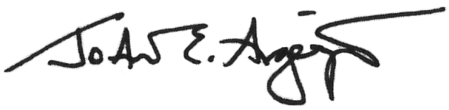
It is a distinct pleasure to welcome you to UMBC's Second Annual Undergraduate Research and Creative Achievement Day. This is a day when we celebrate the outstanding work of our undergraduates in all academic areas-the arts, the sciences, the humanities, the social sciences, and engineering. As our talented undergraduates share their research and creative projects with you, I know you will share our pride in their accomplishments and our excitement in this day.

UMBC has a strong tradition of supporting and encouraging the involvement of our undergraduates in the scholarly work of the university. In labs and classrooms across campus you will find undergraduates working with their faculty advisors on projects that expand the boundaries of knowledge. This is important and meaningful work for the students, the faculty, the university, and society. And it links the two fundamental functions of the university-to educate and to create new knowledge.

It was with this in mind that several years ago we established the Provost's Undergraduate Research Awards. These $1500 awards are given annually on a competitive basis to support students in their research efforts. The results have been some remarkably sophisticated and impressive projects, some of which you will see today.

Again I welcome you and hope you leave UMBC believing as strongly in the promise of the university and its students as we do.

Sincerely,



Jo Ann E. Argersinger
Provost

PRESENTERS

Presenters are listed in alphabetical order by type of presentation. Some students are involved in joint projects as described in the abstract section. The number refers to the page on which the abstract is found.

Oral and Musical Presentations

Poster Presentations

Artistic Exhibits

* 1998-99 Provost 's Undergraduate Research Award Winner

1999 PROVOST'S UNDERGRADUATE RESEARCH AND CREATIVE ACHIEVEMENT DAY COMMITTEE

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Zoe Warwick
Assistant Professor, Psychology

Victor Wexler
Associate Dean of Arts and Sciences
Associate Professor, History

ACKNOWLEDGEMENTS

The organizing committee would like to express its gratitude to the many people who helped make this day possible. First and foremost, we thank the student participants and faculty advisors whose talent and dedication inspire the entire event. We also express our appreciation to Provost Designate Art Johnson, whose support made this event possible and who has encouraged increasingly broad representation of disciplines in this year's event. We also thank Vice Provost Charles Woolston for his leadership on the Board of Governors of the National Conference on Undergraduate Research. Both Dr. Woolston and Dr. Johnson have afforded UMBC students financial support to participate in undergraduate research initiatives at the national level. A tremendous effort is made by members of the Undergraduate Research Awards Committee to screen applications and identify many of the talented students featured in each year's event. We thank the dedicated faculty committee for their efforts: Rebecca Boehling, Rebecca Brown, Mauricio Bustos, Raphael Falco, Doug Hamby, Ramachandra Hosmane, Preminda Jacob, Willie Lamouse-Smith, and Gust Mitchell. Appreciation to Larry Wilt and Linda Durkos continues for their efforts to facilitate our use of the Albin 0. Kuhn Library. Among the many individuals who have assisted us in the publicity are Jack Suess, Lisa Akchin, John Fritz, Jose Barata, Pat Larrabee, and Erin Senack. We would like to thank Kristen Campbell, Maura Walsh-Seaman, Sandra Dzija, and Zahra Safavian for the design and production of this program, invitations, and various displays. Elaine Elgamil, Christina Sabato, and Rose Tipitino of The Retriever have also been supportive of publicity efforts, and we appreciate the announcements of WMBC Radio Station. Oscar Berninger, Larry Schwartz, and the staff of Wood Food Service have worked to provide an enjoyable reception, and Brian Shipley and the Student Workforce staff support this and nearly all campus events. The acquisition of new poster units for this and future campus events was an ambitious initiative made possible by a number of individuals: Lasse Lindahl, Scott Bass, Chuck Sperandeo, Tim Powell, Leland Beitiel, Clolita Williams, and John Blecheisen. Provost's Office staff members Linda Hatmaker, Sue McMillian, Susan Mocko, and Denise Warren have provided administrative support to this event for many months, as have student ass istants Kim Wilhel m, Darlene Magsino-Milan, and Jessica Magsino. Doug Pear, Karen Wensch, Sue Bosley, and Kathy Raab always provide assi stance for major campus events and facilitate the participation of our most ardent guest, President Freeman Hrabowski. We thank all of these people and the many, many members of the faculty and staff who have given their support and encouragement.

Oral and Musical Presentations

Music

Cantata, Arion by Andre Campra (1660-1774)

Baroque Ensemble: Kassie Baldwin, soprano; Rebecca Metheny, flute; Hui Sean Tan, harpsichord

Advisor: Dr. Joseph Morin

Andre Campra's Arion is exemplary of vocal compositions from the first half of the 18th century representing the pinnacle of French secular cantata. Developed by Italian composers in the early 17th century, the cantata is a form of chamber music that presents a narrative text on lyric, dramatic or religious topics, although most often it concerns unrequited Jove. The sections of text that convey the story-line are cast in recitative – a half-sung, half-spoken form of song-while sections of text that depict emotional reaction to the story's action are sung as melodious arias. Featuring a voice supported by a small instrumental ensemble, performance was non-theatrical and generally intended for presentation in a chamber or salon before a small audience.

As with many French cantatas, Campra's draws on Greek myth: the fabled musician Arion, after attaining wealth and fame through his musical artistry, is threatened with robbery and death by sailors returning him to his home.

Text:

Aria: Agreeable enchantress, daughter of Love, kind mistress of the games, is it possible that you can be of no help at all? It is you heavenly harmony, whose sweet tyranny knows how to captivate mortals, and to disarm the fury of the most cruel monsters. These elements obey you, you appear to rule their hearts, even rocks most deaf listen to your sentiments.
Recit: Arion, who in the art of song has made himself an exceptional glory, who has appeared likewise from Apollo to have received some lessons, having made his science of wondrous song, riches and happiness in Corinth, returns to his place of birth.
Ariette: The waves and the winds serve his desires. The brisk north wind, the tyrant of the waves, with one retiring blast disturbs their rest.
Recit: But, in a calm and peaceful time, what of hearts in secret trouble! What a scheme! What terrible project. Tremble, young Arion, tremble.
Vivement: A monster full of injustice, fate of the dark abyss. The pale and somber Avarice blows a dangerous poison. On his feet march Envy and Cruelty follows her; the torch of a Fury is the star who guides her.
Recit: Already the sailors that Avarice inspires squander the treasures. And as it is not enough to fascinate them, they wish that Arion expires: "Ah well," he says, "I yield to your demands, but, at least, permit that by my voice and my lyre I may soothe my sorrows with my last harmonies."
Air: The waves feel the power of Arian's harmonious sounds. The most furious winds now blows without violence. Even the cold heart of Neried is warmed by his songs. The god of the watery empire listens to his expressions. The just sovereign who presides over the seas abandons the concert of the most tender Siren.
Recit: But these inexorable mortals believe that pity does not disarm their hearts. Arion goes to die ... the formidable waves proceed to complete their heinous crime, his life and his sorrows. No, Arion hopes ... wonders, the gods take care of your fate. A dolphin attracted by your voice and lyre, approaches, receives you, and this Jiving ship returns you to port.

Notes on Performance:
In order to hear this work as originally intended, the musicians use methods of vocal production and styles of instrumental technique that replicate practices of performance used in the 18th century. Part of the aesthetic challenge concerns the score itself, which records the notes to be sung and played. Baroque performance typical of Campra's Arion relies on a considerable body of "performance conventions," i.e. aspects of performance that are essentially unwritten and not part of the score, but part of a common set of musical performance practices. Thus, the typical score of Baroque music is merely a skeleton, transmitting only the "essential information" required to constitute a musical composition. Where 19th and 20th century musical compositions convey detailed information regarding the relative loudness or softness of a given musical passage or the kind of articulation to be given to notes, the Baroque score lacks such indications. While the absence of such critical information might seem detrimental, it is in fact an advantage. The application of these unwritten conventions allows the performers to add a creative aspect to the music itself that goes beyond simple interpretation and makes the performers co-creators.

English and Ancient Studies

Issues in Translation: Alexander Pope and the Convivial Tradition

Sharon A. Bostwick
Advisors: Dr. William Edinger and Dr. Walter Sherwin

Alexander Pope, a major Neoclassical British poet, was writing in a period steeped in classical forms, themes, and ideas. One of the major classical themes to which Pope attached himself was the tradition of convivial poetry. This tradition involves the central dichotomy of classical poetry, that is to say, the dichotomy between the public and private realms, between rhetorical and dialectical poetry. Callimachus, a Greek poet of the third century B.C.E., was writing in a time when many poets were still trying to imitate the great works of Homer. But Callimachus frequently made references to those poets as traveling down an overcrowded path. He, himself, on the other hand, avoided writing in the epic style in preference to shorter, more personal poems. In Epigram 58, he stated, "I hate the poems in the Epic Cycle, I don't like highways that are heavily traveled ... Everything public disgusts me." Epic is a public form as opposed to the private forms in the plain style, such as comedy, epistles, epigrams, and satires, the forms in which Pope himself chose to write.

In the dialogues of Socrates, as seen in the Symposia of both Plato and Xenophon, the subject matter is of the private realm. The dialogues consist of conversations between friends during banquets, which is also key to the convivial tradition. This is the poetry of friendship-friendship, which requires trust and equality. These are also the values, which the Roman rhetorician, Cicero, extolled in his treatise on the subject, be Amicitia. Horace, a Roman poet of the first century B.C.E., was well versed in the above mentioned Greek works, as well as the values with which they dealt.

Horace continued the tradition of convivial poetry in his satires and epistles. When advised by a friend that he should try writing epic, Horace responded in Satire 11,i, "Not everyone can paint ranks bristling with lances, or Gauls falling with spearheads shattered, or a wounded Parthian slipping from his horse" (11,i, 13-15). And indeed, Horace never did write any poetry in the epic style, but kept to the above mentioned shorter and more personal satires and epistles. And being that the plain style is more personal, the poet necessarily shares more information about himself with his audience. "So it happens that the old poet's whole life is open to view as if painted on a votive tablet" (Horace, Satires, 11,i, 32-

34).
These are the traditions, themes, and values with which Alexander Pope was so familiar. In the sixteenth and seventeenth centuries, the great controversy of British poetry was also between the realms of the public and private spheres, between epic and plain style. The Ciceronians felt that Cicero was the only classical writer worthy of imitation, but the anti-Ciceronians, who greatly influenced Ben Jonson, a predecessor of Pope, began to translate/imitate Sallust, Seneca, Terence, Plautus, etc. And the individual experience became a worthy adversary to public oratory. Ben Jonson wrote in the plain style, which is part of the controversy of rhetoric versus dialectic. The purpose of dialectic poetry is to discover and teach the truth, as opposed to the purpose of rhetoric which is to persuade. Jonson, often imitating the style of Horace, avoided high rhetorical or epic style and conventions in his writing in favor of more easily accessible, down-to-earth language. Alexander Pope, writing in the Neoclassical period of British literature, also continued the tradition of convivial poetry. Pope did some of the most prominent translations/ imitations of the poems of Horace, thus helping to bring the convivial tradition to British literature.

English

The Adolescence of Asian American Literature

Christine Chun
Advisors: Dr. James McKusick

The Provost's Undergraduate Research Award grant funded research that was conducted at the Asian American Studies department of the University of California, Los Angeles. This research has led to the completion of the thesis paper required of all members of the English Departmental Honors Program and the establishment of the Asian American Literature Discussion group on campus. In addition, the texts accumulated in this research will be donated to the A.O.K. Library for the use of this discussion group and the general UMBC campus.

The thesis paper is a close analysis of the prevalence of the Bildungsroman, or "growing-up novel," in Asian American literature. The Bildungsroman appears more often in Asian American literature than in any other ethnic literature in the United States. It is a result of the fact that this group has created a cultural movement and identity which, as of 1999, is in an adolescent stage as compared with other ethnic groups. The presence of the typical Asian American author, a relatively recent voice on the American literary scene, is only approximately 30 years old and reflects the adolescence of the culture.

The practical application of this research is manifested in the Asian American Literature Discussion Group, which is in its second year and will hopefully become a tradition reflecting the diversity of the UMBC campus. I am the founder of this group, I choose the works to be discussed, distribute them, and serve as the discussion facilitator. The group reads short works by Asian American authors and discusses them informally, linking to the literature the readers' understanding of Asian American issues and the formation of identity in the minority of the United States.

History

The Dreyfus Affair and the Divide in France

Erica Ernst
Advisor: Dr. Rebecca Boehling

The conflict between republican and monarchist forces in the Third Republic of France, which climaxed in the Dreyfus Affair from 1894-1906, was connected to anti-Semitism. The affair developed from the military court martial of Alfred Dreyfus, who was found guilty, of treason and the debate that followed was over the possible revision of the guilty verdict. Captain Dreyfus stood out on the French general staff as the first Jew, as a republican amidst otherwise monarchist officers, and because he was from Alsace, which since 1871 was part of Germany and an area considered rife with pro-German espionage. These factors combined to make Dreyfus suspect, although there was only minimal circumstantial evidence provided by prosecutors. Through an examination of secondary sources, I have argued that the Dreyfus Affair was the result of strong monarchist beliefs in a republican state. Throughout the nineteenth century, the French political system switched back and forth between empire, monarchy and republic. The upheaval in the governmental structure was evidence that monarchist support had not dissipated despite the creation of a republican form of government. Jews often supported the republic because, as a discriminated against minority, its more democratic and pluralistic character was advantageous for them. Monarchists utilized anti-Semitism as a nationalist and xenophobic tool against the Third Republic. The Dreyfus Affair and the ensuing debate was a continuation of the conflict between republican and monarchist forces that had occurred since the French Revolution. This time, however, the integration of Jewish citizens into French society was merged with the question of the national identity of France.

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Music

Church Cantata, *Ihr Vöiker, hört*, for tenor, flute, and continua by Georg Philipp Telemann (1681-1767)
Baroque Ensemble: Karen Froehly, harpsichord; Gregory Lazzaro, tenor; Rebecca Metheny, flute
Advisor: Dr. Joseph Morin

Georg Philipp Telemann's *Ihr Vöiker, hört* is one of the hundreds of church cantatas, a genre that became a prominent form of musical expression within German Lutheran worship during the 18th century. The church cantata was crafted around biblical texts that constitute the yearly cycle of feasts forming the core of the Lutheran liturgy. *Ihr Vöiker, hört*, composed for the Feast of the Three Kings, celebrates the Star of Bethlehem and its significance for the Christian world.

As a genre, the cantata was developed by Italian composers in the early 17th century as a form of chamber music that typically presents a narrative text on lyric, dramatic or religious topics, although most often it concerns unrequited love. The sections of text that convey the story-line are cast in recitative - a halfsung, half-spoken form of song-while sections of text that depict emotional reaction to the story's action are sung as melodious arias. Featuring a voice supported by a small instrumental ensemble, performance was non-theatrical.

As inherited from the Italians, the cantata lent itself well to the German language and musical style. Telemann's work is characterized by clearly etched melodies; driving, energetic rhythms; and by the German proclivity for counterpoint (really a feature of sacred music in general) which renders the voice and flute melodies more as an equal duet than as a vocal line with a flute accompaniment. As it stands, this work is representative of the most complex vocal chamber music characteristic of German Baroque composers.

Text:

Aria: 0 people, hear, as God speaks anew: There is light. The soul celebrates in holy rapture, God's splendor becomes visible to the world. For there radiates a star in Zion's circle, to glorify all morning stars, it joins with light and salvation itself.
Recit-Arioso: The gloom escapes, the darkness expires, master and creator of the sun brings us into the sunlight. He radiates pure salvation, he weaves pure grace. His bright appearance penetrates to the ascent and descent, his clarity occupies the midday and the midnight, for only look about [you]! What stirs there? What rustles on the sea? It is the people's abundance, it is the heathen's power; it pleases itself, that it also boils in the light; because there it, on the wrong path, hinders the army of heaven moreover altar and temple, their devotion wants reward with gold and incense now with splendor, which sparkles to Zion, to make ready the holy worship by sacrifices. From Saba comes everything, one beholds, one glorifies the light, the air resounds from the sound. Yet what silence! Is the cry of praise already past, is the tone of exultation already gone? Thus it is, how very much the first time these lights gave pleasure, thus the blessing is little recognized now, thus little incense is burned to it presently; in place of rejoicing hardly a murmur allow itself to be heard. No, No! I don't want ingratitude, I want to increase your praise, I want, oh Jacob's star, to be eternally grateful to you. Your fire shines down on me, thus shines my fervor to you also upwards in return.
Aria: Alleluia! I offer up your radiance, you star, which makes me like the star. My heart should cherish to your honor an everlasting fire. Be highly praised, be highly praised for so much brilliance and blessing, by which you brought me from fear and darkness to the inheritance of the benefit in the light.

Notes on the Performance:
The ensemble simply does not simply "play and sing" this piece of music, but recreates it using methods of vocal production and styles of instrumental technique that replicate practices of performance used in the 18th century. The music that comes down from the Baroque is in a sense incomplete, lacking important information found in more contemporary music that informs the performer about interpretation. In the Baroque period, musical aspects such as tempo, dynamics, phrasing, melodic ornamentation, and articulation were not notated in the music, but were part and parcel of a common set of musical performance practices. (Even the keyboardist did not have a complete arrangement of the accompaniment written out: for the keyboard player only has half of its part-the left-hand part-notated, the right-hand part is created in performance through "improvisation" guided by 'rules for harmony' - a process not unlike the way a jazz pianist improvises his part in a jazz ensemble.) Thus, a performance of Telemann's *Ihr Vöiker, hört* relies on a considerable body of unwritten "performance conventions" that are brought into play at the discretion of the performer's aesthetic sense and training. While the absence of such critical information might seem detrimental to the performance and performers, it is in fact an advantage. The application of these unwritten conventions allows the performer considerable creative license that goes beyond simple interpretation and requires the performers to become co-creators. As such, Baroque music is created anew with each performance. The music of the high Baroque represents a specialized repertoire with its own sets of performance and interpretational challenges.

Women's Studies and Interdisciplinary Studies

Just for the Sake of Not Being Called Queer:

Writing Lesbian Identity in Letters to The Ladder
Amy Hauer
Advisor: Dr. Carole McCann

As the first national lesbian magazine in the U.S. and as the publication of the Daughters of Bilitis, the first national lesbian organization in the U.S., The Ladder (published from 19S6-1972) is an excellent source for the study of lesbian discourses on identity. In my research I focused on the "Readers Respond" section of The Ladder, looking for both the general themes expressed in letters from readers and specific conversations about medical definitions of homosexuality. I read all the letters as well as every article and piece of fiction mentioned in those letters. After coding the letters so that 1 could identify their general themes, my research turned to secondary sources on gay and lesbian history, medical studies of homosexuality, and postwar sexuality, as well as articles on homosexuality, which appeared in the popular press and interviews with the living editors of the magazine.

My research has shown that readers of The Ladder were active participants in a struggle with medical discourse in a battle over lesbian identity during the 1950s, 60s, and 70s. While the magazine is frequently said to have occupied an accomadationist position in the homophile movement, it is clear that women who contributed to the magazine contested the dominant negative definitions of homosexuality. They neither accepted what they were told by the "experts" nor dismissed the scientists as wrong. Instead, these women engaged the experts and each other on the issues of medical research on homosexuality and the importance of medical experts to the homophile movement, while simultaneously struggling to articulate a discourse of lesbian identity that would win them acceptance in the straight world. During an era when psychoanalysis and psychology were used to explain many social phenomena it is not surprising such issues were frequent topics of discussion in the pages of The Ladder.

What is remarkable is that the women who read and wrote to the magazine were able to challenge this discourse to the extent they did.

Chemical and Biochemical Engineering

Detection of Venous Diseases in Legs Using Near Infrared Spectroscopy

Lino K. Korah, Frederick Scott, Melville Williams (Vascular Surgery Department, Johns Hopkins Hospital)
Advisor: Dr. Kyung A. Kang

The goal of this study is to utilize near Infrared (NIR) continuous wave spectroscopy (CWS) to detect venous diseases in the leg. The device (Micro Run-Man 96) utilizes NIR as a non-invasive, inexpensive method of monitoring blood volume changes. The probe contains two light sources and two detectors and is placed on the surface of the muscle group to be monitored. The detectors monitor the changes in the amount of deoxyhemoglobin and oxyhemoglobin by the use of light absorption at 760 and 8SO nm, respectively. Therefore, the sums of the amount of deoxyhemoglobin and oxyhemoglobin correspond to blood volume. All three changes (deoxy- and oxy-hemoglobin, and blood volume) are plotted over a time period in which the subject undergoes light exercises. The protocol of the test is designed to determine the blood volume capacity of the muscle tissue, the rate of filling and the efficiency of the muscle to promote one directional venous blood flow. Blood flow profiles of normal subjects and patients with venous diseases are compared. Large blood volume increase, a quick rate of filling, and an inability to reduce the blood volume during the contraction of the muscle characterize abnormal venous systems.

Mathematics

Isomorphisms of Circulant Graphs

Kimball Martin
Advisor: Dr. Thomas Armstrong

A development of the isomorphism problem for circulant graphs will be discussed, leading up to the speaker's research in The Isomorphism Problem for Circulant Graphs, pre-print.

The notions of (directed) graphs, circulant graphs and isomorphisms will be covered. Graphs are a central part of mathematics and have applications to chemistry, engineering and nearly all branches of computer science. The isomorphism problem is a (NP-) hard problem and one of the most famous problems in graph theory and computer science. The speaker will highlight possible connections between the isomorphism problem for circulant graphs and a famous problem in the theory of error-correcting codes.

A (directed) graph G=(V,E) is a set V of vertices together with a set E of (directed) edges where each edge is of the form (u,v) for vertices u,v in V. Each edge may be thought of as an arrow from vertex u to vertex v and the vertices may be thought of as points in space.

Take the case where V is the set of integers 1, 2, 3, ... , n and place the n vertices in order in equally spaced locations around the circle. Draw an arrow from vertex u to vertex v whenever (u,v) is an edge of E. Now rotate the graph around the origin of the circle so that vertex 1 goes where vertex 2 was, vertex

2 goes where vertex 3 was, vertex 3 goes where vertex 4 was, and so on up to vertex n-1 going where vertex n was and vertex n going where vertex 1 was. If the rotated graph is identical (except for the labeling of vertices) to the original graph (i.e ., the arrows are all oriented the same), then we say the graph is circulant. So intuitively a graph on n vertices is circulant if every time you rotate it 360/n degrees, it looks the same. We will study isomorphisms (ways to rearrange the vertices so that the resulting graph looks the same, e.g. this rotation by 360/n degrees of a circulant graph is one such isomorphism) of such graphs. In particular we wish to know when are two circulant graphs isomorphic (i.e. can you rearrange the vertices of the one graph to make it look like the other?).

Psychology

Distress Levels in Language Minority Children During Cancer Treatments

Kristine D. McKenna
Advisor: Dr. Lynda M. Dahlquist

This study investigated differences in distress levels between Hispanic and Asian children who speak a language other than English during invasive cancer treatments and their solely English-speaking counterparts. Both verbal and physical signs of anxiety were observed in an effort to see if language minority children differ in how they express their discomfort or have higher levels of distress than those patients who speak only one language during treatment sessions.

Examination of the studies involving language barriers, physician-patient interactions, and child distress during painful medical procedures reveals a gap among these three fields [1,2,3]. Despite increased attention to the child's role during treatment sessions, little regard has been given to the cultural factors unique to these young patients [4]. Though research has highlighted the differences of certain cultures in their perceptions of family roles, it has not been related to how these factors may affect behaviors in a hospital setting [1]. Similarly, language barriers are known to cause problems in conveying information, namely symptoms and pain, but little work has been done to find ways of alleviating this stressful obstacle to successful communication [5]. These factors are compounded when dealing with a young patient whose level of coping and understanding may be limited due to his or her young age [6]. Thus, in devising ways to lower distress levels in children during medical treatments, it is important to assess not only the limits their age may have on their behavior management abilities, but also their unique cultural and linguistic background. Language barriers could prevent a young patient from receiving the vital support provided by the nurse or doctor, even if the child is cognitively able to understand and employ the coping strategies given by the medical staff. This may lead to frustration on both sides and heightened anxiety in the examination room.

The objectives of this study were as follows: 1) Do language minority children show higher overall levels of distress than their English-speaking counterparts of the same ethnicity? 2) Do language minority children have elevated distress levels in general in comparison to their English-speaking Caucasian and African American counterparts? 3) Are there differences in verbal and physical distress levels exhibited by language minority children and their English-speaking counterparts from the same culture? 4) Are verbal and physical distress levels of non-English speaking children different from Caucasian and African American English-speaking patients?

The participants for this research were part of a larger group recruited for a study by Dahlquist in 1991 from the Texas Children's Hospital Center Cancer Clinic in Houston to investigate the effectiveness of different techniques in reducing child distress during cancer treatment. Selected on the basis of age,

ethnicity, and linguistic ability, these participants were put into one of six categories. The three main groups were participants who speak a foreign language, those who are Hispanic or Asian but only speak English, and white or African American children who only speak English. Non-English speaking ability was based on the occurrence of minority language dialogue during baseline procedures.

The Observation Scale of Behavioral Distress (OSBD) [7] was used to measure the levels of physical and verbal distress in the children. Coding was done in fifteen-second intervals, with different weights given each behavior, according to relative intensity of distress. There were thirteen different operationally defined behaviors: Information Seeking, Verbal Resistance, Verbal Pain, Verbal Fear, Requests for Emotional Support, Crying, Screaming, Groan, Rigidity, Refusal Position, Restrain, Flailing, and Nervous Behavior. Statistical measures (such as analyses of variance) were then used with these scores to determine significant differences between the groups and the respective characteristics of these disparities, such as direction and strength.

To date, initial data analyses indicate a significantly higher level of verbal anticipatory distress in Hispanic male patients compared to their English-speaking counterparts of the same ethnicity. There is also a trend for the younger Spanish-speaking males to show higher levels of distress than older patients. Further analyses needs to be done to determine which other children show significant elevation in their anxiety levels. The incidence of higher anxiety levels in the language minority children will be used to support the request for translators to be available for the families and medical staff in order to facilitate communication and lower distress for both parties.

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Mechanical Engineering

Effect of Rht Dwarfing Gene on the Dynamic Frequency Response of Wheat

Helen Meyer
Advisor: Dr. Tony Farquhar

Vibration techniques were used to determine the effect of the reduced height dwarfing gene (Rht) on the dynamic frequency response of living wheat stems. The Rht gene is widely used in modern wheats to increase grain yield and standing ability (ref. 1). The standing ability of wheat plants is a major factor limiting grain production world-wide. Understanding how Rht affects the dynamic frequency response and related structural and material properties will help wheat breeders to develop new varieties that are better able to tolerate windy conditions.

Structural resonance due to forced vibration occurs when the frequency of the driving force matches that structure's natural frequency. The resonant frequency (wr) can be determined by plotting the amplitude of structural displacement versus the frequency of excitation as shown in Figure 1. Structure damping can also be calculated from this data using the half power points to determine the damping factor. Video photography was used to record and measure the displacement of living wheat stems undergoing forced harmonic vibration (Figure 2) at frequencies spanning from .5 to 4 Hz. The resonant frequency and damping factor were determined for three pairs of nearly identical or isogenic wheat lines, each containing Rht and rht, respectively. In other experiments, the grain bearing tip of the plant was replaced with a concentrated mass and the resulting shift in resonant frequency was recorded. The shift in natural frequency was then used to estimate the flexural stiffness of the stem using a power law relationship.

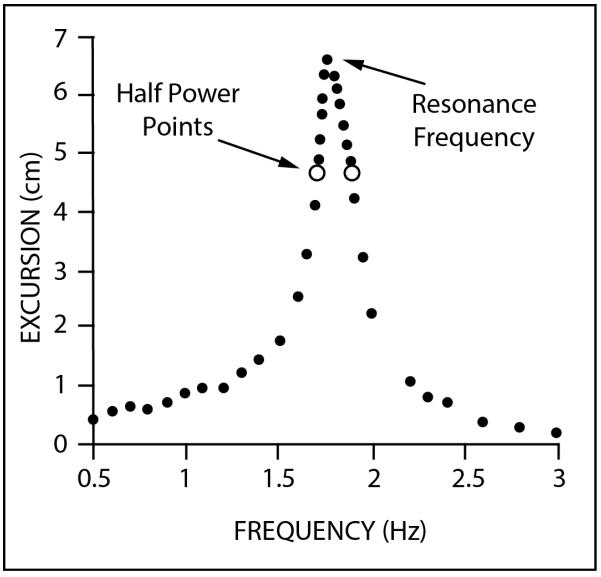

Figure 1: Excursion vs. Frequency

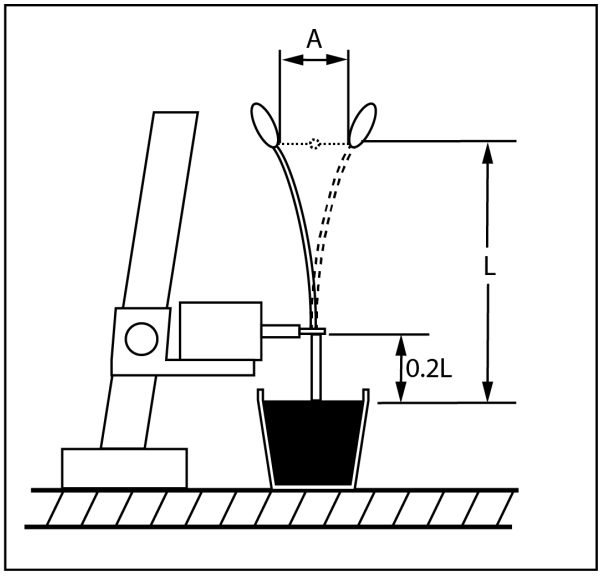

Figure 2: Vibration Apparatus

For the three pairs of isogenic wheat plants, the resonant frequency of Rht plants was 51 % higher than rht plants (Figure 3). The damping factor did not vary much amongst the six varieties except for the tall Kauz whose damping factor was 18% higher than its semi-dwarf sibling as well as the other four varieties (Figure 4).

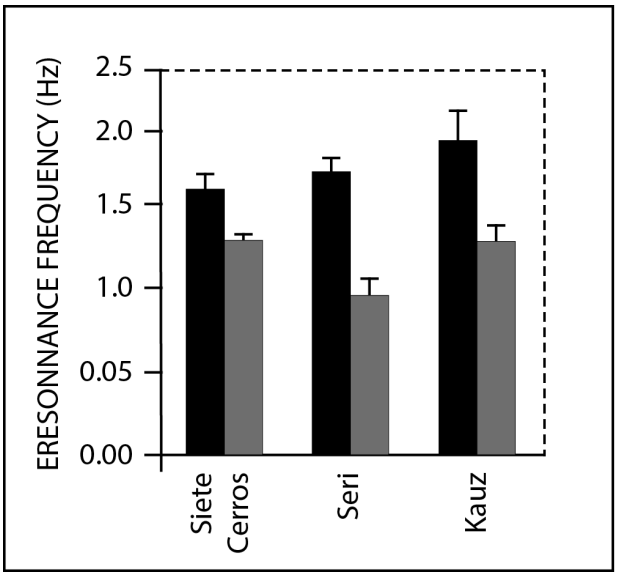

Figure 3: Effect of Rht on Natural Frequency

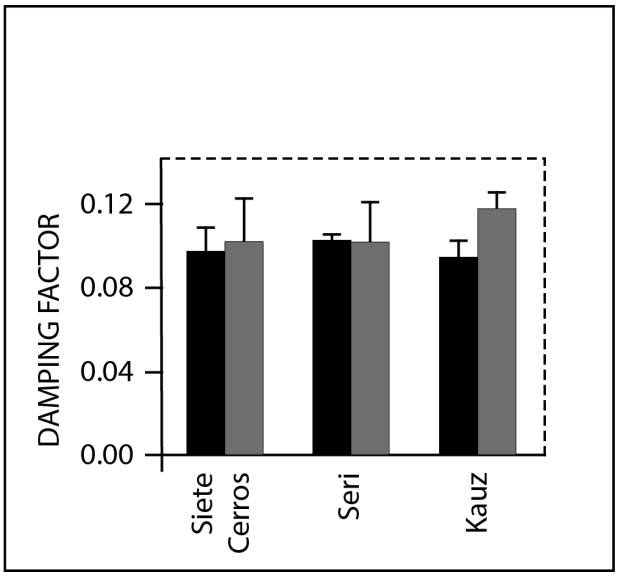

Figure 4: Effect of Rht on Damping

A power law of the form wr =A mB was used to relate resonant frequency to the tip mass for the two isolines shown below. The coefficient (A) is proportional to the square root of effective flexural stiffness and has units of [N/m] Yz . Note that A was 67 % larger for the Rht variety as compared to the rht variety, within the Kauz isoline. The exponent (B) was a measure of the dependence of resonant frequency on tip mass (m). In a linear system, this exponent would be -1a, and the deviation from this value provided a measure of the nonlinearity of the observed response. The value of B departed from the expected more in tall varieties, and more in the Seri isoline.

Seri semi-dwarf:	$\omega_\gamma = 12.6\ m^{-0.71}$
Seri tall:	$\omega_\gamma = 11.7\ m^{-0.83}$
Kauz semi-dwarf:	$\omega_\gamma = 18.0\ m^{-0.55}$
Kauz tall:	$\omega_\gamma = 10.8\ m^{-0.63}$

This experiment studied the effects of Rht on the dynamic frequency response of six varieties of wheat. We found that the Rht gene increased the natural frequency of stems up to 63% but had minimal effect on damping. A power law described the relationship between stiffness and mass and the resonant frequency. Analysis of the data showed that the vibration response departed from that of a linear system to varying degrees.

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Biochemistry and Molecular Biology

Dimerization of RNA Molecules Derived from the HIV-1 IP-RNA Recognition Site

Kristi E. Pullen, Philip E. Johnson, Zheng Rong Wu, and Michael F. Summers
Advisor: Dr. Michael F. Summers

The type-1 human immunodeficiency virus (HIV-I) contains two identical positive-strand molecules of genomic RNA. The conservation of this diploid RNA genome has been shown to be critical for the HIV viral life cycle. The site of initial dimerization of these two strands has been found to occur at the 5' end in a region where four stem loops are predicted to exist (SLI to SL4). The primary dimer linkage site (DLS) is located in SLI, but our research indicates that there may be another site where dimerization occurs. The goal of our research has been to investigate this dimerization using different RNA constructs (SL23, SL234, and SL34) derived from the IP-site. Dimerization of these RNA molecules as a function of NaCl and MgC1 2 concentration was monitored through the use of native polyacrylamide gel electrophoresis. Both SL23 and SL234 were shown to form dimers, and the site of dimerization is thought to occur in the region between SLZ and SL3 . This proposal is supported by the fact that mutagenesis within the region between the two stem-loops of SL23 severely reduced dimer formation, and no dimerization was observed in SL34. Further studies are being carried out using antisense oligonucleotides to confirm whether dimerization occurs at this proposed site in the context of the entire IP-site.

Interdisciplinary Studies

Interrelationship Between Literature and the Visual Arts

Jennifer Silate
Advisor: Dr. Preminda Jacob

The purpose of this project is to examine the interrelationship between literature and the visual arts. There is a long history of writers and visual artists incorporating other art forms into their works. This trend has become much more wide spread in the 20th century. I will be examining the relations between the works of authors to the works of painters, as well as comparing the roles of author and painter in the Postmodern era. This project incorporates the ideas and theories of W.J.T. Mitchell and Meyer Schapiro, among others, to analyze the relationship between text and image as well as artist and writer.

Currently, research is being conducted surrounding the present situation in the realms of literature and the visual arts. Questions I have raised regarding the nature of this interdisciplinary exchange include: What is the motivation for the artist or writer to embark on this commingling of disciplines? What is the nature of this developing relationship between the arts? How has the work of visual artists affected the works of writers? There are no simple answers to these questions. This project will serve to address these questions as well as demonstrate, with the use of slides, several specific instances where the visual arts and literature converge. Furthermore, I will be outlining direct correlations between artist and writer as revealed in the relationships between the works of Gertrude Stein and Pablo Picasso and Kurt Vonnegut and Rene Magritte.

Music

We MS M21.M.185 (case): Research, Analysis and Performance; With the Focus on the Works by Francis Forcer.

Hui Sean Tan
Advisor: Dr. Joseph Morin

The Manuscript M21.M.185 (case) currently located in the Library of Congress is a little studied early 18th century English keyboard manuscript. This manuscript contains late 17th century keyboard repertoire from Italy, England and Germany. The present study focused on English composer, Francis Forcer (c. 1650-1750), whose works occupy a major portion of the manuscript. This manuscript proves to be not only the largest source of Francis Forcer's keyboard works, but also reflects the development of English keyboard music, especially the suite. The purpose of this study is to place Forcer's works in the context of the development of the keyboard suite in England and to understand foreign influence in Forcer's keyboard music, through comparison of Forcer's suites with contemporary continental suites.

This project involves transcribing and producing a critical edition of Forcer's keyboard suites, analyzing and performing the repertoire. Through concordances and comparison of the printed sources, and also the analysis of the musical style, the genre of the untitled movements in Forcer's suites are identified. The transcriptions of Forcer's suites are completed in order to illustrate the difference between Baroque notational practice and modern practice.

While many keyboard suites by Forcer's contemporaries demonstrate French influence, Forcer's suites display a combination of styles, not only those native to English music but also those of French and Italian music. This reveals further the fascination the English had with Italian music at that time, despite the efforts of King Charles II in encouraging French culture in England.

This research has already led to a performance of Forcer's Suite in c-minor as part of the UMBC Collegium Musicum's recital in early March. My presentation for the Undergraduate Research and Creative Achievement Day will consist of a performance of Forcer's Suite in ct-minor.

History

A Developing Two Party Maryland: Republican Growth (1960-Present)

Mark Andrew Tyler
Advisor : Dr. John Jeffries

The return of a Republican majority to Congress in 1994 broke fifty years of Democratic federal legislative dominance. Republicans have since then retained control of Congress, retained control of a majority of governorships, as well as state assemblies. I think an important question that needs examining is whether the electoral results of 1994 reflect a wider political trend in America that has either been occurring or is just beginning? Upon careful examination of Maryland, a traditionally Democratic state, some possible answers emerge. Maryland, a state that was once composed of a Democratic/Republican registrant ratio of 3 to 1, has seen that ratio dwindle to 2 to 1 over the past thirty years. A regional analysis of the entire state will demonstrate the specific areas where the GOP has witnessed the most growth. Further evidence of Maryland's political transformation may also be the 1994 Gubernatorial election results . Ellen Sauerbrey became the first Republican in over twenty years

to pose a serious challenge to the Democratic candidate. She came within 5,000 votes of winning the governorship of the state.

The natural question that emerges is what has caused this change in partisan identification, even in a traditionally Democratic state like Maryland? Historians Earl and Merle Black discussed the transition of the South from a solid Democratic electorate to a post-1960s Republican stronghold in their recent research. They explored whether the Republicans have, in fact, been becoming the new majority party based upon the Party's platform of issues, which have been attractive for conservative southern Democrats? Maryland, therefore, the most northern southern state could be caught in this regional realignment of voters. The GOP growth may also be associated with specific political issues like civil rights or taxation, which have been identified by historian Thomas Edsall as the cause of a lot of Republican growth after the 1960s, when the country's electorate was increasingly frustrated with the excesses of liberalism. The examination of the areas in Maryland that are experiencing the most Republican growth might highlight the specific factors contributing to the Party's increase in size and proportion to the Democratic establishment.

In examining Maryland's Republican growth, a larger historiographical issue will be tackled, the appropriateness of using the traditional party systems model to analyze contemporary political behavior. The party systems model, long used to classify the nature of characteristics of certain elections, several of which could be critically pivotal to changing voter coalitions, is becoming the subject of increasing criticism from scholars. Political scientist Everett Carl Ladd has proposed an alternative paradigm applicable to contemporary politics known as "dealignment". Ladd's paradigm is characterized by the long-standing presence of divided government between the two parties, growing numbers of independent voters, but an overall general shift in the electorate to the right. Ladd's model seems to not only accurately classify and describe the politics of the post-1960's, but indicate another possibility as to how the GOP has been able to grow in Maryland . In a "dealigned" electorate that is less tied to party loyalty, some Republicans are more likely to receive the support of crucial Independent voters, making a statewide Republican victory even more possible than before. The increasingly present characteristics of "dealignment" in the Maryland electorate will be analyzed to determine whether such an influence has contributed to Republican growth .

Based on both the available electoral data and historical accounts of Maryland political history between 1960 and 1998, the dealignment model seems to accurately identify and classify recent political forces and their impact on the Maryland electorate. Therefore, in a dealigned electorate, and one that increasingly shifting to the right, the future prospects for Republican candidates looks bright. Much, however, will depend on the individual strengths of the candidate to determine whether a Republican, still coming from the state's minority Party, can win a statewide contest.

Poster Presentations

Mechanical Engineering

Energy Absorption Characteristics of Composite Tube Structures Under High Velocity Impact

Edgar Abalahin
Advisor: Dr. Severino L. Koh

Since the early 1960s, there has been an ever increasing demand for materials with increased strength and decreased weight in such diverse fields as space, aeronautics, civil construction, sporting goods, etc. The demands for materials to have a better overall performance are so great and diverse that no one material is able to satisfy them. This has led to the concept of integrating different materials into a composite system that satisfies the user's requirements. The most popular utilization of these composite materials is in the form of layers (laminae), each layer composed of a matrix reinforced with unidirectional fibers. The layers are then bonded together in stacks with the number of laminae and orientation of fiber reinforcements according to the designed use of the laminate.

There is a considerable body of research that focuses on the ability of laminated composite materials to absorb energy due to impact or crash related events. The specific application envisioned here will enhance the performance of aircraft, aerospace vehicles, cars and other engineering structures rendering these objects more resistant to impact. The present work investigates the composite tube structure for its ability to absorb impact energy from a load that is applied parallel to the axis of the tube. The amount of energy absorbed by this tubular structure is dependent upon the progressive collapse that takes place during the impact event. The nature of progressive collapse, such as transverse shearing, lamina bending, or local buckling, are dependent on the complex interaction of materials used, reinforcing fiber orientation, tube dimension, and other phenomena. This study primarily focuses on the energy absorption characteristics of composite tubes due to a variety of impact velocities.

In order to examine the energy absorption characteristics of composite tubes under various impact velocities, a modified drop weight testing apparatus was designed and built. The main distinction of this apparatus to previous drop weight systems is that high velocity impact can be generated due to a spring loaded firing mechanism. A comparison of the energy absorption capacity of composite tube test specimens loaded at various impact velocities is made by utilizing a Force versus Displacement analysis.

Biological Sciences and Philosophy

Pointing the Finger: An Interdisciplinary Examination of Genetic Determinism

Jason Baker
Advisors: Dr. Jessica Pfeifer and Dr. Phillip Sokolove

The purpose of this investigation is to examine the classic views of genetic determinism and to evaluate those views from a philosophical perspective in light of modern biological theories of inheritance.

The objectives of this research can be divided into two groups of questions. The first group addresses the classic views of genetic determinism:

1. What biological theories of inheritance does genetic determinism propose?
2. How does genetic determinism explain phenotypic variation within species?
3. What philosophical paradigms of causation does genetic determinism assume?

The second group of questions addresses the synthesis of an alternative model that better explains current biological data and is more philosophically sound:

4. How do the biological theories of inheritance proposed by this new model fit current data in model organisms, such as in the nematode, Caenorhabditis elegans?
5. How does this new model explain phenotypic variation in C. elegans?
6. How does this new model address the failed philosophical paradigms of genetic determinism?

To answer these questions, a retrospective investigation of past academic publications was conducted. Publications were selected based on the following criteria: (1) they contained relevant data to at least one of the research questions, (2) they were primary sources, and (3) they were published in peer-reviewed journals or, in the case of books, by university-sponsored presses.

Currently, the majority of all data has been collected. However, it is anticipated that only part of that research will be compiled and analyzed by the presentation date. The display, therefore, would present a work in progress and would include a complete treatment of the first group of questions only.

The results of this investigation have implications in both biology and philosophy. Because theories of inheritance and genetics are central to the biological sciences, misguided paradigms of thinking about these particular areas have great impact. This is especially relevant in the social sciences, such as psychology, sociobiology, and anthropology, which often deal with the causes of human behavior. Likewise, theories of genetic determinism have impact on the way philosophical issues, such as the nature of causation and explanation, are treated.

Biochemistry and Molecular Biology

Protein C Biosensor Sensitivity Study with Change in Blocking Buffers and the Amount of Human Serum Albumin

Heath Balcer and James 0. Spiker (Biological Sciences)
Advisor: Dr. Kyung A. Kang

Protein C (PC) is a protein in blood plasma and PC deficiency leads to serious blood clotting disorders. The project goal is to develop a real-time biosensor that can detect PC deficiencies in approximately 15 minutes compared to currently used assays, which require several hours. This will allow patients to get treatment sooner. Present research has focused on simulating samples closer to human plasma. This has been achieved by adding human serum albumin (HSA). Also, the signal to noise ratio was improved by reducing the nonspecific binding of the probe, by using blocking buffers.

The PC optical sensor uses an antibody-antigen reaction on an optical fiber (Figure 1). A primary antibody against PC is immobilized to the fiber, the PC sample is injected into the system, and then the secondary antibody against PC is injected into the system and binds to the PC. Attached to the secondary antibody is a fluorophore, a chemical tag that gives off light when a laser beam is passed through the fiber. The intensity of the light can then be measured by the detector to determine PC% concentration.

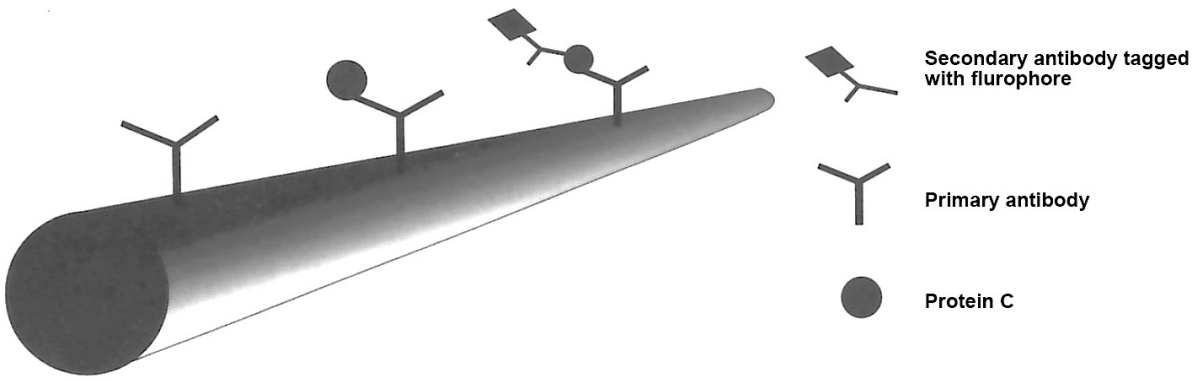

Figure 1. Immuno-Optical PC Biosensor: The primary antibody is immobilized onto the fiber prior to the beginning of the experiment. The PC then binds to the primary antibody. The secondary antibody then binds to the PC. After this, a laser beam is passed through the fiber and the signal is measured.

In the previous studies, when using the biosensor, PC has been assayed using pure, buffered solutions. To determine the effect that other proteins in the blood plasma had on the PC biosensor, HSA at concentrations of 50 µg/ml, 1 mg/ml, and 5 mg/ml was added to PC samples to simulate human plasma. The results showed decreases in signal intensity of approximately 10%, 20%, and 45% respectively. These results suggest a non-specific effect inhibiting the binding of PC to the fiber.

Several different buffers including, 1 mg/mL and 2 mg/mL of bovine serum albumin (BSA), ethanolamine at various concentrations were tested for blocking the optical fiber. The buffers showed a decrease in noise of approximately 10%, 15%, and 73%-98% compared to an unblocked fiber. The 0.1M

ethanolamine solution was chosen as the blocking buffer of choice.

Increasing concentrations of other proteins, such as HSA, may further inhibit the signal output of the system. However, the results also indicate that the system's ability to discriminate PC concentrations is still present. Furthermore, the experimental results showed that the sensor is capable of maintaining and restoring system sensitivity. Consequently, it is concluded that the PC biosensor will be a viable alternative to present assay methods in the future.

Sociology

Attitudes Toward Affirmative Action Programs: Effects of Program Knowledge and Group Self Interest

Marilyn Cover
Advisor: Dr. Fred Pincus

This presentation explores University of Maryland, Baltimore County students' attitudes toward affirmative action programs. The data I will be presenting have been collected using a systematic random sample of 1,000 UMBC undergraduates. The sample was selected from a list of all UMBC undergraduates that was provided by the registrar. Questionnaires were mailed to the students' addresses on file with the registrar. Two follow-up mailings were sent to those students who did not respond to previous mailings. Data from the 267 returned questionnaires have been analyzed using SPSS. The data collected will be used to explore the relationship between affirmative action program knowledge and attitude toward affirmative action programs, a relationship that has not been explored in past research. The effect of group self-interest will be presented as well.

Previous research has shown that group self-interest leads European Americans to have negative attitudes toward affirmative action programs while leading African Americans to have positive attitudes toward the same programs. Research has also shown that women have more positive attitudes toward affirmative action then men (Tuch and Hughes, 1996; Kravitz, 1995; Nosworthy, Lea and Lindsay, 1995; Kravitz and Platania, 1993; Kluegal and Smith, 1986). Racial group self-interest appears to be a factor in this study as well. Among African American respondents, 84.3% (N=32) are against ending affirmative action programs in university admission policy while 67.6% of European American (N=182) respondents are for ending such programs. However, the findings for sex group self-interest differ from the findings of previous research. While 62.3% of men (N=l09) are for ending affirmative action programs in university admission policy, 56.7% of women (N=l57) are for ending such programs.

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Biochemistry

Chemical Shift Assignments of the HIV-I Capsid-Nucleocapsid Fusion Protein

Zaya Fansler and Philip E. Johnson and Michael F. Summers
Advisor: Dr. Michael F. Summers

The goal of this research is to determine the structure of a portion of the human immunodeficiency virus type-1 gag polypeptide bound to genomic RNA. As an initial basis for this study, the chemical shift assignments of the unbound protein are being determined.

Human immunodeficiency virus (HIV) contains the gag, pol and env polyproteins typical of a retrovirus. An essential step in the replication of the HIV virus occurs when the nucleocapsid region of gag recognizes and binds its genomic RNA in an infected cell. The gag polyprotein then assembles at the cell membrane and buds and matures into a virus capable of infecting other cells. During this maturation process, the gag polyprotein is cleaved to form the matrix, capsid, and nucleocapsid proteins.

The portion of the gag polyprotein being studied encompasses the C-terminal or dimerization domain of the capsid protein, the nucleocapsid protein, and the P2 domain that links these two proteins. The protein being studied therefore resembles a portion of the gag polyprotein that binds RNA in the cell prior to viral maturation and proteolytic cleavage.

As a basis for structural studies of this protein, an isotopically Be and lSN labeled protein sample has been expressed and purified. This has enabled the collection of triple-resonance nuclear magnetic resonance (NMR) experiments that will be used to assign the backbone of this protein. The NMR experiments that have been collected are the HNCA, HNCOCA and the CBCACONH.

Preliminary results of the chemical-shift assignment process will be presented with a comparison to the isolated capsid and the isolated nucleocapsid protein.

Psychology

Legal Tickle

Karen Gibbs
Advisor: Dr. Robert Provine

Ongoing research by Robert Provine indicates that tickle is an important means of touch communication between family members, friends, relatives, and lovers. The tickler and the ticklee are usually of different sex and almost never strangers. The power of tickle is suggested by the strict unspoken rules about who may tickle whom and when. The present investigation used the Lexus legal database to search for civil and criminal cases in which these rules have been violated.

The Lexus search engine detected 359 Federal and Appellate cases that referred to tickle. Tickle was not always the behavior that prompted legal action, but was a part of a broader pattern of actions associated with the cases, such as child abuse, sexual harassment, or rape. Legal sanctions are brought against males 71 % (N =256) more often than against females 4% (N=13). Civil proceedings that did not involve sanctions being brought against a person occurred in 25% (N=42) of the cases (e .g. child custody, workman's compensation). In 86% of the cases, males tickled females (N=307) more often than

females tickled males (N=50), z2(2)=449.521, p<.000 . Tickle occurred most often in cases where the defendant and the plaintiff knew each other, a pattern that was found in our study of normal tickle. In 44% of the cases, the tickler and the ticklee were related (N=155); 30% were blood relatives (N =107) , and 14% were non-blood relatives (N=48) . Non-related acquaintances accounted for 48% (N=167) of the tickle cases, whereas a complete stranger was involved in only 8% (N=28) of the cases. In 93% of the cases adults (N=332) were charged with tickling children (N=298) z2(1)= 259. 123, p< .000

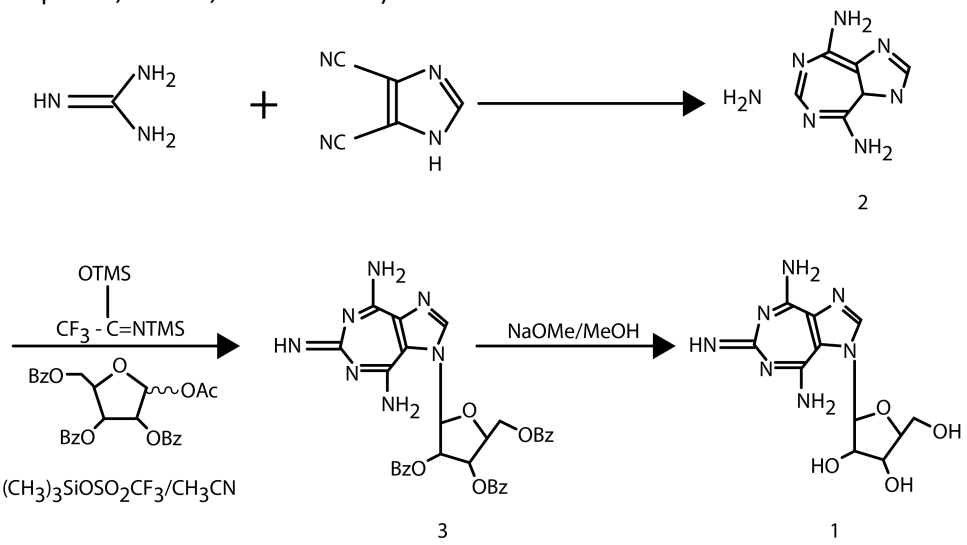
This study addresses the proposition that there are strict social rules in regard to tickle behavior. The legal findings are consistent with findings of normative tickle behavior found by Provine, tickle appears to be a heterosexual behavior, with men being the predominant ticklers, the tickler is typically older then the ticklee, and tickle almost always occurs between people with close social bonds.

Chemistry

Potent Anti-Hepatitis B Viral and Anti-Cancer Activities of a Ring-Expanded Nucleoside Analogue Containing the Imidazo[4,5-e][l,3]Diazepine Ring System

Juliana Gill, Lijuan Wang, Maria Bretner, and Ramachandra S. Hosmane
Advisor: Dr. Ramachandra S. Hosmane

Ring-expanded nucleosides and nucleotides are potentially useful probes for nucleic acid metabolism, structure, and function. With their structural resemblance to natural purines, they are a rich source of substrates or inhibitors of enzymes of purine metabolism as well as of those requiring energy cofactors such as ATP or GTP. As ring-expansion is anticipated to significantly affect the base-ribose spatial geometry, sugar pucker, and syn/anti conformational array, they are excellent tools for investigations of steric and conformational constraints of nucleic acid double-helices. From a medicinal standpoint, they have potential applications in viral and cancer chemotherapy. We report herein the synthesis and potent in vitro antiviral and anticancer activities of a ring-expanded nucleoside analogue (1) containing the title heterocyclic ring system. The 5'-triphosphate derivative of 1 has also recently been shown to inhibit the bacteriophage T7 RNA polymerase in vitro (see Bretner, M., D. Beckett, and R.S. Hosmane, Abstr. XIII Internat. Round Table on Nucleosides, Nucleotides, and Their Biological Applications, Sept. 5-10, 1998, Montpellier, France, Abstr. No. 88).



Visual Arts and Art History

Explicating Sherrie Levine's Rhetoric

Laura Hammel
Advisor: Dr. Preminda Jacob

The purpose of this research project is to unravel Sherrie Levine's Postmodern feminist rhetoric, as presented though her appropriations of pivotal, male, Modern artists. Levine's artwork has been the subject of much controversy. This is primarily because she meticulously "re-presents" quintessential Modern male artists. This craft-like activity of reproduction can be greatly appreciated on an aesthetic level. Yet, Levine's meaning lies beyond this superficial level. Not only does she question originality and creativity, but she also questions society's endorsement of these Modern, male, master artists. Her struggle to exist as a female artist in a post-modern society, which is over-shadowed by Modernism, seems to be a driving force in her artwork. To further understand Levine's feminist rhetoric and the significance of her appropriations, one must be aware of the historical context of Modernism and its relationship to women. Sherrie Levine's appropriations are mechanisms for challenging the ideals of Modernism. Through appropriating, Levine distances herself from Modernism, yet at the same time boldly confronts it by directly partaking in its reproduction. Ironically, by her questioning these iconic men of Modernism, Levine herself becomes an iconic of Postmodernism.

I will explore Levine's rhetoric by summarizing the ideals of Modernism and by presenting quintessential examples of Modernist artists. This is necessary to know in order to understand how Levine refutes Modernism through her work.

I will then discuss how Sherrie Levine's work relates to various popular theories of the twentieth century. Levine refers to Jean Baudrillard's theory of hyper-reality in terms of how she pre-processes images which have been over processed by commercialism. I will also explore how this method of processing images mocks t he work she appropriates. Levine also makes references to Fredric Jameson's ideas of pastiche, in her attempt to destroy the value of the artwork by reproducing it; this will be further explored. Sherrie Levine also makes reference to Walter Benjamin's fundamental article "A Work of Art in the Age of Mechanical Reproduction." The key point Benjamin discusses is the loss of aura. Levine capitalizes on this concept through her appropriations.

An excerpt from Levine's Five Comments will then be dissected in order to explain her motivation for her appropriations. She discusses plagiarism and originality in terms of how in the post-modern era there is no room left for artistic invention.

Finally, I will use examples of Levine's work as quintessential mechanisms to explicate Sherrie Levine's rhetoric. I will compare some examples of her artwork to the original pieces she appropriates. Specifically, I will explore Fountain (After Duchamp: 1), After Walker Evans #7, and After Leger. Through her work, it can be seen that Levine seemingly accomplishes her goals, but by mocking the icon Modern masters she becomes an icon of Postmodernism in the process. I will explore if she truly does accomplish her goals or if she only raises questions through her work, leaving them unresolved.

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Psychology

The Relationship of Referral Source and Relationship Adjustment with Domestic Abuse Therapy Attendance

Michael L. Keaser
Advisor: Dr. Christopher Murphy

Researchers had found a correlation between male batterer session attendance/attrition and referral source. (Faulkner et al., 1991; Hamberger & Hastings, 1989; Pirog-Good & Stets, 1986; Rosenbaum et al., in press) However, other researchers found no such relationship (Edleson & Gruzinski, 1988; Gruzinski & Carillo, 1988; Saunders & Parker, 1989).

Cadsky et al. (1996) had found that session attendance/attrition correlated with scores on the Dyadic Adjustment Scale (DAS) such that male batterers who completed treatment reported experiencing a more discordant relationship than clients who dropped-out.

The purpose of this study was to replicate Cadsky et al. (1996) findings and investigate the combined effect of referral source and relationship quality on session attendance/attrition. It was hypothesized that male batterers who reported lower DAS scores (more discordant relationships) would attend more treatment sessions than male batterers who reported higher DAS scores (less discordant relationships). Furthermore, an interaction between referral source and relationship quality was predicted such that effects for low DAS participants would be stronger for self-referred and case pending clients than for court-referred clients.

Participants included 104 males attending group treatment for domestically abusive behavior at the Domestic Violence Center of Howard County, Maryland between 1994 and 1996. The cognitive behavioral therapy program entailed 16 weekly two-hour sessions. All participants at least completed a two-hour intake session. Sixty-four of the clients fit into a low DAS category (scores below 100 indicating a discordant relationship) and forty clients placed in the high DAS category (scores of 100 and above). Sixty-six clients were court-ordered, 29 clients were self-referred, and 9 clients had cases pending.

Results indicated a significant relationship between reported scores on the DAS and session attendance, $F(1, 103)=4.591$, $p<0.05$. Male batterers who scored low on the DAS (M=ll.19) attended more sessions than male batterers who scored high on the DAS (M=8 .80). The effect of DAS scores on session attendance was independent of referral source, $F(1, 103)=0.005$, $p>0.05$. The effect for low DAS scores was not significantly stronger for clients who were self-referred (M=9.26) and had cases pending

(M=l3.00) than court-referred clients involved in more discordant relationships (M=l l.85).

Findings indicate that partner abusive men attended treatment more if they were in a relationship that was discordant, but would attend treatment less otherwise.

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Psychology

A Potential Measure of Expected Racial Discrimination Between African American and Caucasian Job Candidates

Paul f. Knox
Advisor: Dr. Stanley Feldstein

The purpose of this study is to determine whether racial discrimination is expected when an interviewer is left to decide between a Caucasian job candidate and an African American job candidate. A library search failed to find research pertaining to discrimination expectancy. However, research focused on discrimination, suggested that Inter-group relations (Ellmers, 1997) and stereotypes (Devine, 1991) play roles in decision-making. It has also been suggested (Kacmar, 1994) that although more employers are acknowledging minority qualifications they are still not willing to hire minority workers.

With this research in mind it is hypothesized that: (a) a Caucasian participant rates an African American interviewer as more likely to choose an African American candidate; (b) an African American participant rates a Caucasian interviewer as more likely to choose a Caucasian candidate; and (c) African American participants more often feel discriminated against than do Caucasian participants.

Participants consisted of 100 students from UMBC. The sample included 4S African Americans and 55 Caucasians. Each participant was asked to read one of two vignettes, such that every other African American and Caucasian participant read the vignette with the African American interviewer. The other half read the vignette with the Caucasian interviewer. After reading the vignettes the participants were

asked to rate, on a scale of 1 to S (S being "highly likely" and 1 being "not at all likely"), the likelihood of an African American candidate being hired as well as the likelihood of a Caucasian candidate being hired. Participants were also asked to provide their age, gender and race.

A 2 x 2 x 2 split plot analysis was conducted. The results yielded a significant main effect for participants, suggesting the race of the participant influences the results.

The results also have yielded a significant interaction between interviewer race and candidate race, suggesting that the race of the interviewer influences the choice of candidate, such that a Caucasian interviewer is expected to choose a Caucasian candidate more often than an African American candidate whereas the African American interviewer is expected to choose an African American candidate more often.

The results yielded a significant interaction between participant race and candidate race as well, suggesting that race of the participant influences the score that the candidate receives, such that a Caucasian participant is more likely to give an African American candidate a higher likelihood score (when the candidate chosen is African American), than a Caucasian candidate (when the candidate chosen is Caucasian).

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Computer Science

Internet Access for Mobile Users

Vladimir Korolev
Advisor: Dr. Anupam Joshi

Desktop personal computers and workstations are getting more and more powerful these days. This drives the Internet content providers to use their capabilities for enhancing the websites with things like video and audio and interactive content in the form of Java applets and ActiveX control. However, mobile computers and personal digital assistants, such as 3Com's Palm Pilot, are far behind in terms of processing power and overall multimedia capabilities. As such, in order to allow mobile users to access Internet pages, the content of these pages has to be modified to match limited capabilities of mobile computers and PDAs. Presently some organizations maintain separate plain text sites for regular and mobile users, while other organizations just ignore the needs of mobile users.

Fortunately recent developments in the Internet technologies such as Extensible Markup Language (XML) and Extensible Style Sheet Language (XSL) can be used to solve this problem by separating content (actual information on the web site) from presentation (the way of displaying the information on the screen). Thus only one site and several sets of rules for different types of users is needed.

In my project, I investigate the fitness of this particular technology to solve the problem of mobile Internet access. I am doing the project under the guidance of Dr. Anupam Joshi, assistant professor in the UMBC Department of Computer Science and Electrical Engineering.

Recently we implemented a transcoding proxy and light client for 3Com's Palm Pilot PDA. The proxy and the client allow the user to access the weather information provided by the National Weather Service.

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Biochemistry

Overexpression and Characterization of Glutamine Synthetase from the Hyperthermophilic Archaeon Archaeoglobus fulgidus.

Lynn-Marie Lenhart
Advisor: Dr. Hamid Schreier

All organisms require nitrogen for growth. Absorption of nitrogen from the environment is affected in some cases in the form of ammonia. Glutamine synthetase (GS), an enzyme that catalyzes the energydependent amidation of glutamate to produce glutamine, has been characterized in several bacterial and eukaryal systems. Transcriptional, post-translational, and enzymatic control occurs in many of these systems . Very little is known about GS and nitrogen metabolism in the diverse group of micro-organisms that are members of the Archaea. This study focuses on GS from the hypothermophilic archaeon, Archaeoglobus fulgidus. Members of the Archaeoglobus genus are sulfate-reducers, a unique characteristic shared only with some members of the Bacteria. The complete DNA sequence of A. fulgidus has been determined; this provides the necessary data to analyze the biochemistry, molecular biology and physiology of this interesting organism.

The structural gene for the A. fulgidus GS, glnA, was amplified from A. fulgidus chromosomal DNA by the polymerase chain reaction. The gene was then cloned into the pETl ld expression vector. The vector was transformed into the bacterium Escherichia coli. After induction, production of the heterologous protein was detected by SDS-polyacrylamide gel electrophoresis. The molecular weight of the produced peptide was approximately 57,000, which corresponded to the deduced glnA sequence. GS was purified to near heterogeneity by a series of steps: heat treatments, gel filtration, and ion-exchange chromatographies. The presence of glutamate stabilized GS activity during heat treatment, possibly by forcing the heterologously produced protein to attain the native conformation. The molecular weight was determined by gel filtration to be approximately 650,000, which is consistent with the dodecameric structure characteristic of bacterial GS's.

The optimum temperature range for activity was found between 60 and 65 °C. The enzyme had a half-life of approximately 4 hours at 95 °C in the presence of glycerol. Optimal enzymatic activity was

obtained in the presence of 0.2M potassium chloride and manganese; no other divalent cations supported biosynthetic activity. Kinetics for glutamate were hyperbolic with an apparent KM of 3 mM; non-hyperbolic kinetics were obtained with hydroxylamine, with the KM ranging from 0.2 to 10 mM. Hyperbolic kinetics were also obtained with ATP and GTP, both of which demonstrating an apparent KM of 0 .56 mM. ADP, CTP, or UTP would not replace ATP or GTP in the forward reaction. Sensitivity to the transition state analogue methionine sulfoximine was observed with an Jo.s of approximately 10 uM. Enzyme activity was found to be unaffected by all end-products of glutarnine metabolism that were tested. When A. fulgidus was grown in the presence of different nitrogen sources, GS levels were found to vary approximately 10-fold suggesting that transcriptional control appears to be one likely mechanism for regulating enzyme activity, although post-translational modification cannot presently be ruled out.

Biological Sciences

Is Heavy Metal Resistance Increased in Plants that are Genetically Engineered for Heat Stress Tolerance?

J. Jeesin Lui
Advisor: Dr. J. Lynn Zimmerman

The goal of this project is to determine whether the expression of the heat shock gene Hsp 17.7 in carrot cells plays a role in the plant's stress response to the heavy metal cadmium. Heavy metal contamination of soils by cadmium is a large problem in the U.S., especially in agricultural regions that fertilize with contaminated sewage sludge from populated industrial cities (Davies, 1995). Cadmium has been shown to inhibit metabolism in plants and thus reduce growth (Huang, Bazzaz, & Vanderhoef, 1974), indicating a potential problem for crop production if levels of cadmium continue to rise with increasing pollution. Heat shock genes, found across the spectrum of species tested, are conserved genes that are selectively transcribed and translated to produce heat shock proteins (HSPs) when the organism is under thermal stress. These proteins are thought to protect cellular components from damage, thereby increasing thermotolerance (Viswanathan & Khanna-Chopra, 1996). Previous research in plants has discovered that HSP transcription can also be induced by environmental stresses other than heat, including heavy metal stress by cadmium (Czarnecka, Edelman, Schoff!, & Key, 1984; Edelman, Czarnecka, & Key, 1988), suggesting a possible correlation between HSPs and cadmium resistance in plants.

In this study, I am investigating the effects of cadmium on the growth of transgenic carrot cells, which have been genetically engineered by modification of the Hsp 17.7 gene to have altered thermotolerance. To explore how the reduction of HSP 17. 7 may change cadmium tolerance and to determine if constitutive expression of Hsp 17.7 confers any resistance to cadmium, three different transgenic lines are being utilized. The "sense" line contains a plasmid with the gene sequence for Hsp 17.7 under the control of the constitutive CaMV 35S promoter. The "antisense" line possesses the gene sequence in a reversed orientation in order to reduce translation of Hsp 17.7 mRNA. The third line lacks the gene sequence in the plasmid and thus acts as a vector control. The carrot cells are grown in liquid media and subcultured every seven to ten days. In the experimental design, equal amounts of cells are placed into three flasks. The cells in the first flask are collected to determine initial inoculation mass. In the experimental flask, cadmium is added and incubated with the cells for two weeks, at which time the cells are collected, dried, and weighed. Relative growth for all lines is determined by comparing cell weight in the experimental flask relative to cell weight in the control flask lacking cadmium. Preliminary data suggest that reduction of HSP 17. 7 results in decreased cell growth in cadmium, while constitutive

expression of Hsp 17. 7 may slightly enhance tolerance to cadmium. These studies have been expanded to further investigate these initial findings and the latest results will be presented.

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Psychology

Layers of Identity: The Influence of Multiple Psychological Senses of Community Within A Community Setting

Christine Marx and Marilyn Cover
Advisor: Dr. Anne Brodsky

Using McMillan and Chavis' (1986) operationalization of psychological sense of community (PSOC), this study explores the existence and operation of multiple senses of community within a single physical community-in this case, an education and job training program serving urban women. This poster will present qualitative data collected as part of a larger, mixed method, process evaluation of a holistic educational and job training program for welfare and underemployed urban women. The goal of the program is to prepare and support women in the acquisition and retention of living wage jobs. The purpose of the larger ongoing study is to understand the multi-level risk and protective factors that promote successful transitions from underemployment to living wage jobs.

Qualitative interview data was collected from five focus groups conducted with 45 center students, and eight individual interviews conducted with staff members. All interviews focused on identifying and understanding the individual, familial, program, neighborhood and community-level factors which promote longer and more successful tenures and outcomes in the center, as well as those which lead to premature program exit. Data was audio recorded, transcribed and rechecked for accuracy. A data based, iterative coding framework was created and applied by a consensus-based team approach (Richie et al., 1997). Codes and themes related to PSOC emerged from the data. Previously, PSOC has been dichotomized into whether or not a sense of community exists for a setting. In these interviews, however, spontaneous discussion of PSOC suggested that not one, but multiple psychological 'senses' of community operate in this single setting. This finding led to closer examination of the operation of PSOC, which will be presented in this poster.

In this setting, multiple PSOC is evident through the four components of PSOC, as described by McMillan and Chavis (1986). In this poster, examples and operation of multiple PSOC will be demonstrated

through exploration of all four components of PSOC-membership, mutual influence, fulfillment of needs, and shared emotional connection. The membership component provides just one example of the operation of multiple PSOC. While the physical setting itself provides one definition of community membership, program participants and staff spoke of multiple subcommunities with differing PSOC.

Previous research has suggested that PSOC is not a global concept but is setting specific (Hill, 1996). However, this study's finding of multiple PSOC suggests that, even within one setting, PSOC may not be evenly distributed. By exploring the operation of multiple PSOC in a specific physical setting, this study looks at how individuals and subgroups define community for themselves. Findings suggest that participants recognize a qualitative difference between PSOC in the relational sub-communities and the PSOC of the larger, physical community. This qualitative difference has implications for understanding the complex balance of subgroup and setting PSOC in multicultural contexts. Furthermore, future program design and policy may benefit by taking into account the development of positive PSOC, not only in the physical community, but also in the nested sub-communities of identity.

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Psychology

Infant Temperament and Infant Gender and Their Effect on Marital Harmony

Brian Morrison and Brian Raatz
Advisor: Dr. Stanley Feldstein

The purpose of this study is to determine the effects of infant temperament and infant gender on marital harmony. There has been a limited amount of previous research assessing the relation of these variables. However, several studies (Carey & McDevitt, 1978; Martin, Wisenbaker, Baker, & Huttenen, 1997; Moss, 1978) have found significant gender differences in certain temperamental categories, such as males illustrating higher levels of irritability, vocalization, and activity and lower levels of adaptability. Moreover, child temperament has been shown to influence social relationships (Kronstadt, Oberklaid, Ferb, & Swartz, 1979; Mercer, 1986; Pridham, Chang, & Chiu, 1994) and parent-child relationships (Belsky, 1981; Campbell, 1979; Hagekull & Bohlin, 1986; Milliones, 1978).

It is hypothesized that a child's gender and temperament affect the parents' marital harmony. More specifically, (a) male infants have parents with lower Dyadic Adjustment scores than female infants, and (b) non-easy infants have parents with lower Dyadic Adjustment scores than parents of easy infants.

The participants are mothers with 4-month old infants recruited through advertisements in local newspapers/magazines, campus postings, and a local maternity center. After participating in two observed procedures, the mothers are asked to complete questionnaires, including the Revised Infant Temperament Questionnaire (RITQ) and the Dyadic Adjustment Scale (DAS). The RITQ assesses infant

temperament by classifying infants into 3 categories: easy, slow-to-warm-up, and difficult. The DAS assesses the mother's perception of the quality of her marriage, with a higher score on the DAS indicating higher marital satisfaction.

Data are continually being collected and analysis of the data will be completed by the presentation date. Following data collection, a two-way factorial ANOVA will be run to test the hypothesis.

If analysis confirms the hypothesis that infant gender and infant temperament affect marital harmony, the results would relate to past research, as well as provide the stepping stone for future research.

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Structural and Molecular Biology

Subcloning, Overexpression and Purification of Rous Sarcoma Virus Capsid Protein for NMR Structure Determination

Yasmine Ndassa, Ramon Campos-Olivas, and Michael F. Summers
Advisor : Dr. Michael F. Summers.

The purpose of this project is to resolve the three-dimensional structure of the capsid protein of Rous Sarcoma Virus (RSV). RSV, discovered in 1911, constituted the first example of a tumor-inducing virus. RSV is a retrovirus and is the representative of one the seven different types of retroviral morphologies. Retroviruses are membranous structures containing a protein core, which encapsulates the RNA genetic material. The main protein building up the retroviral core structure is the Capsid protein. This protein is not only essential for the structural integrity and morphology of the infectious virus but also plays a fundamental role in its assembly and disassembly. In connection with the work carried out recently in our lab, and with the aim to establish common aspects and differences between retroviral Capsid protein structures we have set to study the solution structure of the Capsid protein of RSV (CA_{RSV}) by Nuclear Magnetic Resonance Spectroscopy. In addition, knowledge of the three-dimensional structure

of the Capsid protein is a first step towards the rational pharmacological intervention in the relevant processes of the viral lifecycle in order to fight retroviral infection.

In this work, the gene coding for CA_{RSV} was amplified from a complete-genome cDNA library of RSV by t he polymerase chain reaction. The resulting product was inserted between restriction sites *Nde* 1 and *Bam*H 1 in plasmid pET-16b and the resulting construct was transformed into HMS174(DE3)pLysS *E. coli*. These cells were grown in M9 minimal medium up to an OD600 of -0.6, the expression of the engineered CA_{RSV} gene was induced with lmM IPTG, and the cells harvested after 3--4 hours. The overexpressed protein product contains, in addition to the 240 residues of the native protein, an N-terminal extension of 23 residues including a tag of 10 histidines, resulting in a molecular mass of 29kDa. The protein was purified by Ni affinity chromatography in a single step but a further fractionation consisting of a cation exchange chromatography was also applied to achieve maximum purity for the NMR studies. NMR samples of - 1mM protein in water were obtained by concentrating the chromatographic fractions and exchanging the buffer by ultrafiltration. Using this procedure, a variety of isotopically labeled samples were prepared aimed at obtaining the spectral assignment of the protein. Four different selectively labeled samples were prepared providing ^{15}N-asparagine, ^{15}N-valine, ^{15}N -aspartic acid and ^{15}N-isoleucine to a defined growth media. Three uniformly labeled samples (U -^{15}N; U-^{13}C, U-^{15}N; and U-^{15}H, U-^{15}C, U-^{15}N) have been used to acquire through-bond triple resonance experiments and NOESY 3D and 4D spectra. Details of the above procedure will be presented and the results of recorded NMR experiments discussed.

Biochemistry

A Hückel Molecular Orbital Theory Analysis of the Nucleotide Bases and Their Isoelectronic Analogs

Quan Nhu
Advisor: Dr. Joel Liebman

The structures and energies of the five common nucleotide bases-Cytosine, Guanine, Adenine, Thymine, and Uracil-and numerous selected isoelectronic analogs were analyzed for stability, using the Hückel Molecular Orbital (HMO) theory and HMO computer program on a UMBC UNIX system. This was part of an effort to elucidate whether RNA or DNA evolved first.

Currently, the exact conditions of the "primordial soup" from which primitive life forms might have originated are not clear. Therefore, it is plausible to view the organic compounds of interest as isolated systems, free of any external interference, and then test out possibilities through consideration of the possible chemical environments. In this project, using the HMO computational method, the Hückel energies of pyrimidines, purines, and selected isoelectronic analogs are determined and analyzed for chemical stability.

It has been found that DNA bases are more energetically favorable than RNA bases. We concluded that DNA came to existence before RNA. The finding of the higher energetic stability in the five common nucleotide bases, compared to the selected isoelectronic analogs, further reinforces nature's desire for energy minimization.

Table 1. Cytosine & Analogs	
# of heteroatoms altered	Hückel Energy (β)
0	15.87
1	14.62-14.85
2	13.37- 13.68
3	12.21-12.44
4	11.19

Table 2. Uracil & Analogs	
# of heteroatoms altered	Hückel Energy (β)
0	16.40
1	15 .13-15.24
2	13.88-13.98
3	12.71-12.81
4	11 .55

Table 3. Thymine & Analogs	
# of heteroatoms altered	Hückel Energy (β)
0	17. 15
1	15.89-16.00
2	14.65-14.76
3	13.48-13.59
4	12.33

Table 4. Guanine & Analogs	
# of heteroatoms altered	Hückel Energy (β)
0	22.63
1	21.36-21.61
2	20.10 - 20.57
3	18.85-19.42
4	17 .70-18.17
5	16.67-16.91
6	15.65

Table 5. Adenine & Analogs	
# of heteroatoms altered	Hückel Energy (β)
0	19.04
1	17.78-18.02
2	16.07-16.99
3	15.50-15.96
4	14.47-14.71
5	13.45

Figure 1-5. Higher β values indicate higher stability. As illustrated here, the common nucleotide bases are most stable. lsoelectronic analogs with the most number of altered heteroatoms are least stable.

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See, for example,
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Biological Sciences

Distribution of Cone Photoreceptor Pigments in the Striped Bass (*Morone saxatilis*) Retina

Valeriya Potyagaylo
Advisor: Dr. Terry Viancour

The primary purpose of the present study is to identify subclasses of the light-sensitive cone photoreceptor cells and to determine their pattern of distribution in the striped bass (Marone saxatilis) retina. In similar studies with other teleost fish (goldfish and zebra fish), researchers have determined a one-to-one ratio of a cone photoreceptor cell to the photopigment it contains. Thus, I expect to observe different subsets of photoreceptor cells in striped bass retinas containing distinct photopigments. The expression of short-, mid-, and long-wavelength sensitive photopigments is examined using in situ

hybridization. Digoxigenin-labeled antisense complimentary RNA probes are used to label endogenous cone opsin messenger RNAs. The hybridization of goldfish a-tubulin antisense probe is used as a positive control.

Chemical Engineering

Identification of Amino Acid Residues Critical for ARF1 and ARF6 Localization

Natasha Powell
Advisor: Julie G. Donaldson ('88 Biological Sciences; Laboratory of Cell Biology, NIH)

ADP-ribosylation factor (ARF) proteins are a family of highly conserved small GTP binding proteins that regulate various membrane trafficking events. This study set out to identify regions that are critical for cellular localization in the two best investigated members, ARF1 and ARF6. ARF1 cycles between the Golgi complex in its GTP-state and the cytosol in its GDP-state, and functions to maintain the structure of and membrane traffic through the Golgi complex. ARF6 on the other hand, appears to remain membrane-bound as it cycles between the plasma membrane (PM) in its GTP-state and a novel tubular endosomal compartment in its GDP-state, and functions to regulate a membrane recycling pathway between the two sites. Additionally, ARF6 causes actin-rich protrusions to form at the PM when activated. We used pharmacologic reagents to distinguish ARFl and ARF6 localization and function in cells. Aluminum fluoride (AlF) treatment of cells results in net activation of both ARF1 and ARF6, by keeping them in the GTP -state. In contrast, brefeldin A (BFA) inhibits activation of ARFI, shifting its distribution to the cytosol, but has no effect on ARF6 . Additionally, cytochalasin D (CD) treatment affects only ARF6, shifting its distribution to the tubular endosomal compartment, and blocking its recycling to the PM. In order to identify domains in ARFI and ARF6 that are responsible for their different localizations, we created chimeras of the two proteins using a two-step PCR procedure in which the amino- and carboxylterminal halves were exchanged. These chimeras were subcloned into the mammalian expression vector pXS. HeLa cells were transfected with the plasmids and subjected to pharmacologic treatments. The cells were fixed and the chimeras were localized by immunofluorescence microscopy. We found that the C-terminal halves of ARF1 and ARF6, in addition to a four amino acid domain at the N-terminal half of ARF6, are responsible for the proper localization of these proteins.

Biochemistry and Molecular Biology

Purification of Protein C using Mini-Monoclonal Antibodies as a Specific Adsorber in Affinity Chromatography

Dennis Pradhan and Peter Tsai (Chemical and Biochemical Engineering)
Advisor: Dr. Kyung A. Kang

The goal of this project is to develop an immuno-affinity purification protocol for Protein C (PC), using mini monoclonal antibodies as a specific ligand. This protocol will be aimed at large scale PC purification compatible with the standards for pharmacological use.

Protein C is a vitamin K dependent glycoprotein produced in the liver with MW of 62,000 Da. It is present in human plasma at concentrations of about 4 µmg/ml. PC is one of many factors involved in hemostasis. Hemostasis is a concerted action of plasma proteins to maintain normal blood flow within

blood vessels. Hemostasis consists of two branches: one that acts to prevent blood coagulation, the other that acts to dissolve formed blood clots. Proteins involved in the prevention of blood clot formation are called anticoagulants, and proteins that are involved in the breakdown of formed blood clots are called antithrombotics. Protein C belongs to both of these categories, it can act as an anticoagulant and as an antithrombotic (see Fig 1).
PC

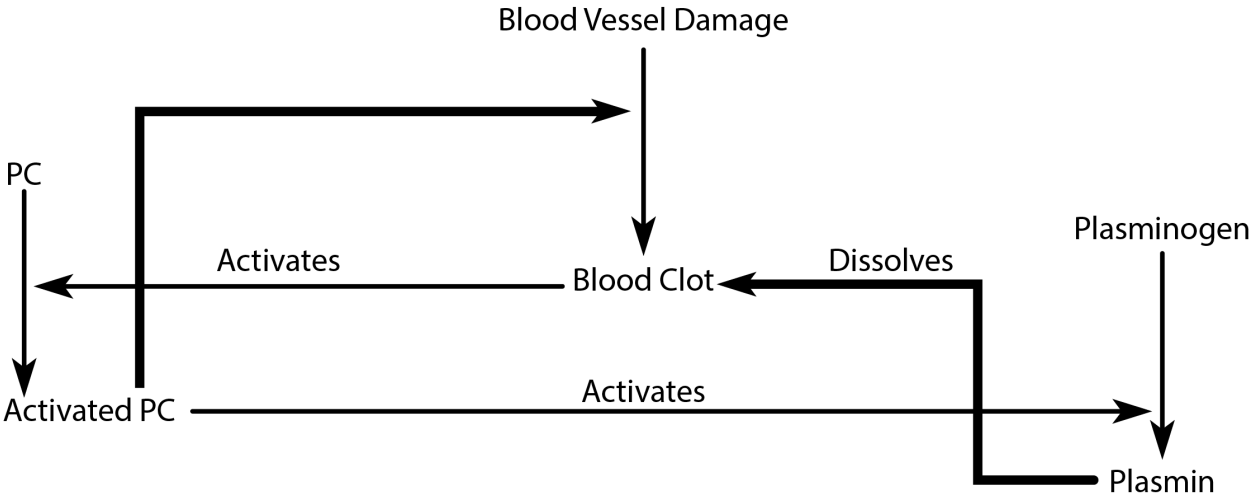

Figure 1. Physiological Functions of Protein C Inside a Blood Vessel

1. Prevents formation of blood clots-anticoagulant
2. Dissolves formed blood clots-antithrombotic

There are three major sources of PC: human plasma, animal cell culture, and transgenic animal milk. At this time there are various Protein C purification techniques in existence. Current purification strategies rely on the specificity of immuno-affinity chromatographic methods utilizing PC monoclonal antibodies. This is an extremely effective method for obtaining highly pure product from sources of low PC concentration. There is however a drawback with such methods which mainly is the high cost of monoclonal antibody production. This is reflected in the current price of $5,000 for each gram of Protein C.

Our group is in the process of developing an acceptable technique that will allow Protein C mass production at a fraction of the current cost. This can be possible by replacing monoclonal antibodies with only that portion of an antibody molecule, which is responsible for its specificity. This is called an antibody single chain variable domain (ScFv), which mainly consists of the light variable chain region linked to a heavy variable chain region by a disulfide bond. These mini-antibodies can be produced in *E. coli* cells using a viral vector.

Dr. Sierks isolated those ScFv's specific to Protein C, which are also able to discriminate it from other homologous plasma proteins (factors IX and X). Dr. Sierks kindly provided us with thirteen clones expressing different Protein C specific ScFv's isolated from an antibody binding domain library. We are currently determining the binding properties of ScFv fragments from different clones. We are currently (1) screening those clones for production of ScFv and their specificity to Protein C, (2) determining their selectivity to PC among its homologues, (3) selecting PC mini-monoclonal antibodies having optimal affinities, and (4) developing a feasible PC purification protocol.

Mechanical Engineering

Unconventional Robotic Manipulators

Darian Robbins, Adam Stolzberg, and Byron Miguel Stancil
Advisor: Dr. Tony Farquhar

The goal of this project is to design and build an unconventional robotic arm that mimics the structure and function of an animal that makes use of the muscular hydrostat principle. Presently, robots are used to explore and retrieve information and/or items from hazardous areas such as outer space, underwater, volcanic areas, and/or nuclear waste sites. However, robots have their limitations. Most robotic manipulators are built from mechanical components that are limited to a finite number of degrees of freedom. Since conventional means of actuation are limited, it may be necessary to wander into "unconventional realms." Utilizing robots in such areas aid humanity by helping to further our knowledge without endangering our lives.

Most conventional robot arms use hinged skeletons like the appendages of humans; they have hand-like grippers, wrists, elbows, and shoulders. However, many living organisms have appendages that do not have an internal skeleton. Examples of appendages that utilize the hydrostat principle are an elephant's trunk, octopus tentacles, and the human tongue. Potential advantages include collapsibility, variable compliance, reduced weight, design efficiency, and enhanced functionality and navigation.

The first stage of the research process consisted of purchasing and constructing a kit-based robotic arm and hexapod. Once the two robots were assembled independently, they were combined into one robot. Professor Doug Hamby, of the UMBC Dance department, made observations on the movement capabilities of the robot and coordinated a dance presentation around them. His input provided the group with valuable insight about the techniques, skills, and equipment necessary to build and operate a robot. Once the robot was operational, Professor Hamby composed a dance routine that was integrated into a full -featured performance.

Following the performances, more background research was conducted to obtain a better understanding of the hydrostat principle. With the background information, designs for a prototype were drafted and materials were bought for assembly. Certain tests were performed on the prototype. A fluid medium (i.e., air, water, etc.) was pumped through the system to see which tubing produced a maximum deflection of the arm. Under an applied pressure, our group wanted to see if a relationship existed between tubing that produced a maximum deflection and tubing that lifted a maximum weight. Once optimal deflection and lifting was produced in one direction, modifications and further testing will be done to optimize the traits in other degrees of freedom (if time permits).

Biochemistry

Structural Biology of HIV

Brian G. Turner and Michael F. Summers
Advisor: Dr. Michael F. Summers

The human immunodeficiency virus (HIV) genome encodes a total of three structural proteins, two envelope proteins, three enzymes, and six accessory proteins. Studies over the past ten years have provided high resolution three-dimensional structural information for all of the viral enzymes, structural

proteins, and envelope proteins, as well as for three of the accessory proteins. In some cases it has been possible to solve the structures of the intact, native proteins, but in most cases structural data were obtained for isolated protein domains, peptidic fragments, or mutants. Peptide complexes with two regulatory RNA fragments and a protein complex with an RNA recognition/encapsidation element have also been structurally characterized. This article summarizes the high-resolutions structural information that is currently available for HIV proteins and reviews current structure-function and structure-biological relationships.

Developmental Biology

Designing a System to Rapidly Assay Expression of T-Box Genes

Shetarra Walker
Advisor: Dr. Charles Bieberich

A new family of genes known as the T-box gene family has recently been described. These genes have been experimentally shown to be linked to developmental processes including pattern formation and organogenesis in several species including mouse (*mus musculus*) and human. These genes encode transcription factors all having a common DNA binding domain known as the T-box. The differential expression of these genes is believed to play a causal role in the development of different morphologies between similar structures. For example, differential expression of T-box genes distinguishes forelimbs from hind-limbs.

We have designed a system based on degenerate Polymerase Chain Reaction to rapidly assay expression of the eight known members of this gene family. The T-box regions were aligned based on sequence similarity and several highly conserved regions were identified. Degenerate oligonucleotide primers capable of annealing to all eight genes were designed. The ability of these degenerate oligonucleotides to successfully amplify known T-box genes was assessed. This system may be useful to determine whether T-box genes are involved in patterning structures other than limbs during embryogenesis.

Biological Sciences

Investigating the Interaction between a Heat Shock Protein and the Cytoskeletal Protein, Actin, in Plants

Amber York
Advisor: Dr. J. Lynn Zimmerman

The goal of this study is to determine what effect the small heat shock protein, Hsp 17.7, has on the polymerization of actin, an essential cytoskeletal protein. The source of the Hsp 17.7 gene and the model system used in this experiment is the carrot. Heat shock occurs when an organism is exposed to abnormally high but sub-lethal temperatures (heat stress). The heat shock response is characterized by that organism's production of a class of proteins called Heat Shock Proteins (Hsps), which are believed to protect the cell from heat damage to its proteins and membranes. It has been shown that under extreme heat stress, a cell's cytoskeletal structure collapses. In animal systems, small Hsps play a vital role in the polymerization of actin, the key component of the cytoskeleton, and thus help to maintain the cell's structure. The experiments in this study investigate whether an analogous response occurs in plant systems.

To carry out the analysis of Hsp 17.7, it was necessary to produce this protein in large quantities and to purify it. This was done by genetically engineering a strain of E. coli bacteria to express the gene that codes for the protein. The protein was produced as a fusion between the Hsp 17.7 protein and another protein, the Maltose Binding Protein (MBP), that facilitates purification of the protein from cell extracts. The process of affinity chromatography was used to extract and purify Hsp 17.7. Once the protein was purified, it could be used in experiments and for the production of antibodies, which are also useful for further analysis.

The actin polymerization assay developed was based on previous studies involving actin and small heat shock proteins. The assay quantifies the relative extent of actin polymerization in various samples based on Poly Acrylamide Gel Electrophoresis. Experiments are underway to analyze the polymerization of actin with and without the addition of the Hsp 17.7 protein. Current results will be presented.

The Hsp 17.7 fusion protein was also used to raise antibodies that can recognize it *in vivo* and in solution. Such antibodies will be very useful in visualizing where the Hsp 17. 7 protein is inside of cells and can identify it in mixed protein extracts. Antibodies have been successfully raised in rabbits and are currently being characterized.

These experiments will contribute toward our understanding of how heat shock proteins protect cells from severe damage during heat stress in plants.

Artistic Exhibits

Imaging and Digital Arts

Multiple Personalities/Identities (MP /I)

Nidhi Adya
Advisor: Dr. Preminda Jacob

Multiple Personalities/Identities (MP/I) was made as a part of the intermediate computer art class. The software "Director" was used to explore the various identities and personalities that a person assumes as his or her own in order to adjust to different environments that they encounter as a part of life. The topic was of interest to me, one due to the various experiences that were making me question my own identity in a new country, as well as an interest in the cases we read about in introductory psychology class, on multiple personalities. With this project I wanted to make people question human nature to buttonhole and label people.

The sound component of the piece is also meant to increase the ambiguity of the identities, as one might mistake it for the music of the traditional Indian instrument sitar, yet it has been mixed and composites from the portfolio available on the software "Soundedit." MP/I requires interaction from the audience. First the viewer comes to the computer and then at various points they need to click the mouse on the image displayed on the monitor to continue the flow of the story.

Photography

Feminine/Masculine

Carol Hudrlik
Advisor: Professor David Yager

My photographic series titled Feminine/Masculine is a visual response to the social definitions of masculinity and femininity. These photos depict body parts of female bodybuilders layered with text. The words are fragments from definitions of words related to gender differences.

These are actually a sub-series from a larger body of work relating to femininity and masculinity. The other two sections of the work are a series of male body builder photos with text relating to femininity, and a group of extreme close-ups of muscle sections, wherein the viewer does not know the gender depicted. Feminine/Masculine, produced second in the process, directly addresses the notion that females are considered to be the "weaker sex." Frequently, muscle is equated with masculinity. I used images of female bodybuilders to subvert traditional gender distinctions.

The text was taken from research I conducted about definitions surrounding words related to masculinity and femininity. I fragmented the text in order to allude to the process of deconstructing old definitions in order to create new ones. The segmented definitions are placed on a small grid, referencing body measurement.

It is my hopeful intention that this work will elicit questions in the viewers' minds concerning commonly held assumptions regarding gender differences.

Art History

Moving Beyond Simulacrum: A Reassertion of the Visual Image

Jason Mahanes
Advisor: Dr. Preminda Jacob

Postmodern art practices, unable any longer to recycle the failed tenets of modernism and unwilling to abandon them, have become cannibalistic. Photographers, occupying the role of pinnacle art producers after the collapse of modernist painting, are conscious that limits exist in postmodern aesthetics and that those limits are looming. This realization, coupled with the oppressive environment unique to late capitalist societies, has shifted the focus away a future-oriented art practice into a present-based, stagnating practice. The ultimately destructive end to this practice finds its roots in the basic definition and education of photography. Therefore, in order to understand where we are now and how to escape from this position, the history of photography must undergo a critical inspection, and its most basic tenets have to be reevaluated.

The result of such an examination is that camera-based realism, a previously unquestioned element of photography's practice founded on the concept that what is depicted is or indeed has been, has become tainted by the ability of digital technologies to demonstrate that what is may not indeed be or necessarily have been, resulting in an inherent distrust or disinterest in the camera-based image that cripples the photography's aura. The crisis of representation is twofold: art no longer has the ability to expand its audience's understanding of the beautiful, and the practice of art has undermined its avant-

garde voice leaving it without the desire or ability to undo the confusing and disruptive "anything goes" aesthetic in which it is caught. The remedy to this crisis lies in the reestablishment of an avant-garde movement in photography that revolutionizes the way an audience interacts with the photographic image and asserts revised theories of the path to ultimate beauty. One path to this end lies in a revised understanding of the relation of art to natural, chaotic and organic forms as experienced through a cameraless image that is no longer subject to the criticisms of traditional imaging. Such a radical break is sufficient to reestablish the experimental voice in art and is sufficiently generative to affect enduring change.

NOTES