

THE FIRST ANNUAL

UNDERGRADUATE  
RESEARCH

&

CREATIVE  
ACHIEVEMENT  
DAY

1997

UMBC

A N H O N O R S  
U N I V E R S I T Y  
I N M A R Y L A N D

## **1997 PROVOST'S UNDERGRADUATE RESEARCH AND CREATIVE ACHIEVEMENT DAY COMMITTEE**

Dr. James Grubb	Department of History
Dr. Ramachandra Hosmane	Department of Chemistry and Biochemistry
Ms. Patricia Joseph	Provost's Office
Dr. Marjoleine Kars	Department of HISTORY
Professor Wendy Salkind	Theatre Department
Ms. Kathy Sutphin	Department of Biological Sciences
Dr. Timmie Topoleski	Department of Mechanical Engineering
Dr. Zoe Warwick	Department of Psychology
Dr. Victor Wexler	Department of History, Office of the Dean of Arts and Sciences

S p o n s o r e d   B y   t h e   P r o v o s t ' s   O f f i c e

April 30, 1997

Dear Participants and Visitors,

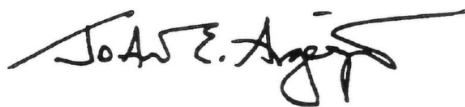
It is a distinct pleasure to welcome you to UMBC's First Annual Undergraduate Research and Creative Achievement Day. This is a day when we celebrate the outstanding work of our undergraduates in all academic areas--the arts, the sciences, the humanities, the social sciences, and engineering. As our talented 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 side by side 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 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,

A handwritten signature in black ink that reads "Jo Ann E. Argersinger". The signature is fluid and cursive, with a long horizontal stroke at the end.

Jo Ann E. Argersinger  
Provost

## SCHEDULE OF EVENTS

- 9:00 a.m. – 1:00 p.m.**      **Concurrent Sessions**  
Oral Presentations, Room 767, Albin O. Kuhn Library  
Poster Presentations, 7th Floor, Albin O. Kuhn Library  
Visual and Digital Arts Displays, 7th Floor, Albin O. Kuhn Library
- 1:00 p.m.**                      **Faculty Speakers**  
Topic: Research and Creativity for Undergraduates  
Room 767, Albin O. Kuhn Library  
Professor Wendy Salkind, Associate Professor of Theatre  
Chair of the Theatre Department  
Dr. Michael F. Summers, Professor of Chemistry  
Associate Investigator, Howard Hughes Medical Institute
- 2:00 p.m.**                      **Reception**  
7th Floor, Albin O. Kuhn Library & Gallery
- 7:15 p.m.**                      **Piano Performance**  
Room 508, Fine Arts Building
- 8:00 p.m.**                      **Student Laboratory Theatre Production**  
Room 318, Fine Arts Building

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## ORAL PRESENTATIONS

### **The Influence of Computer Knowledge on Attitudes of Children**

Jennifer Antonielli

IFSM

Advisor: Ms. Valerie Scott

The purpose of this research was to assess degree of both computer knowledge and attitude across a spectrum of school-aged children. The objectives of conducting this research was to determine if knowledge and attitude varied directly within age groups and to determine if knowledge and/ or attitude increased as a function of age. My hypothesis was that a positive attitude towards computers increases with knowledge, familiarity, and experience, regardless of age.

Descriptive research was done across ages using school children between the ages of 7 and 17 as subjects, by grade level and an age-appropriate survey/ questionnaire was formulated for each of the three groups. The survey/ questionnaire included questions of preference, amount of computer use, knowledge, understanding, and attitude; further, it included graphical representations of three computer interfaces.

Data analysis was done using ranges and means within groups and across the groups. Recognition of peripherals was classified by either positive, partial, or negative. Preference for multi-media was classified as high, medium, low, or impartial. The three interfaces were classified as to the subject's reaction (positive or negative) and level of understanding (correct interpretation vs. incorrect).

A table with data analysis results is used to show comparison of the three groups and the ratings in each of the classifications. Two charts are used as tools to graphically represent the analysis of the groups' differences towards the three interfaces. The first chart shows the differences .in comfort (attitude) level with the different interfaces and the second chart shows the differences in comprehension of the interface functions.

This research demonstrates the reaction of school-aged children to interfaces and their knowledge of computers. More importantly, this research suggests that the introduction and use of computers at early ages and throughout school should be encouraged and, additionally, that knowledge of computers leads to a more positive attitude towards them.



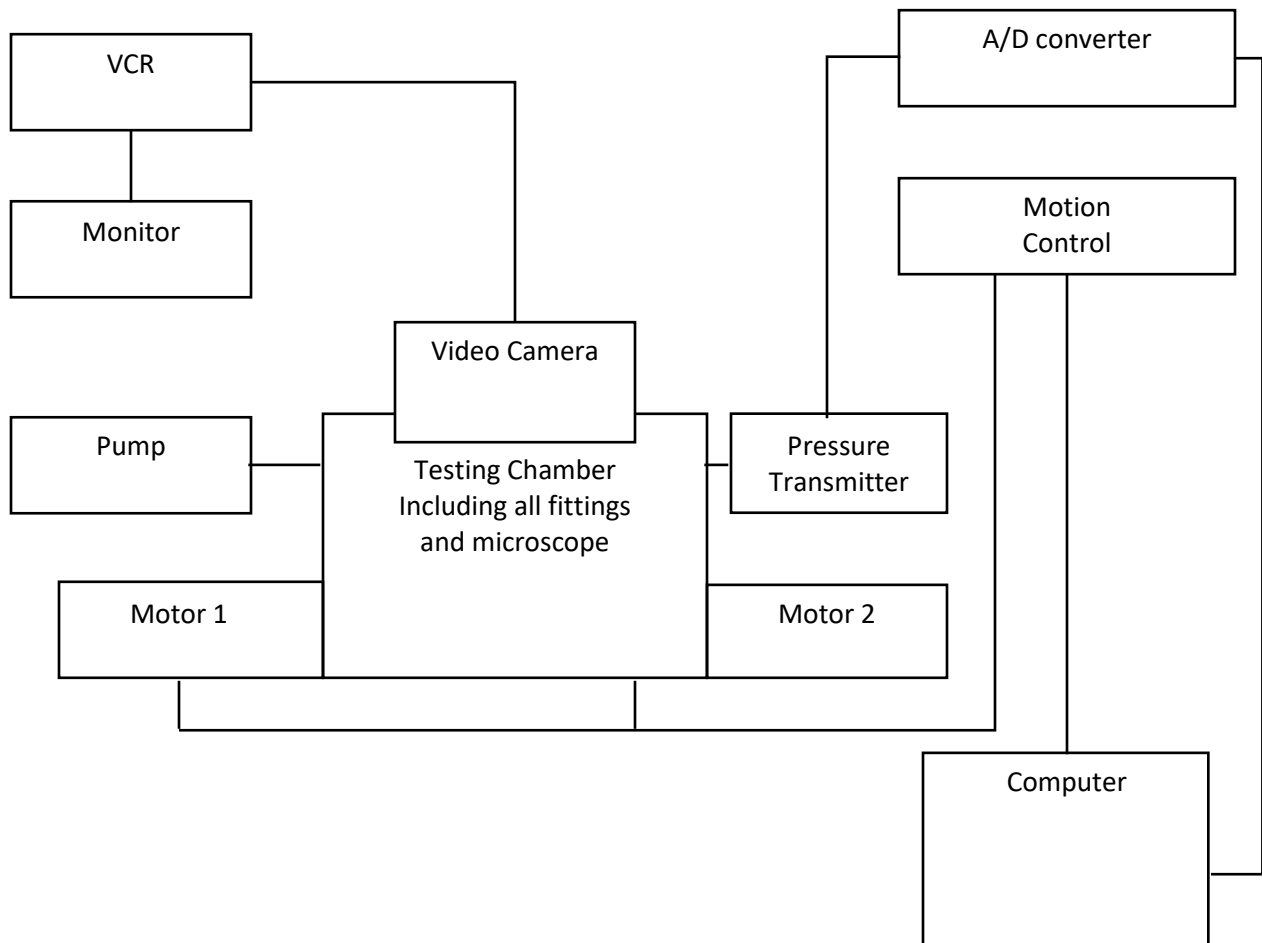
# Stress Strain Relations in the Embryonic Heart

Jerome Ball

Mechanical Engineering

Dr. Jay Humphrey

The objective of this research project is to characterize the stress strain properties of embryonic hearts. To determine the stress strain relation  $\sigma$  I have been designing a testing apparatus specifically for testing embryonic hearts (Figure 1). The device is micromanipulator controlled to vary the length and diameter of the hearts. It uses non-contact, on-line video strain analysis via a video camera mounted on the microscope. The micromanipulation is accomplished by the use of specially designed fittings attached to XYZ stages, which uses micrometers to obtain perfect alignment of the heart. These are mounted on micro-stepping motors controlled by computer. The diameter is controlled by the use of a nano-liter injector (pump) and a pressure transmitter controlled by computer. The testing device is nearly completed. a force transducer must still be incorporated into the device and a protocol for testing established.



# **British Economic Controls During the Great War**

Stephen Henry Cromwell

History

Dr. Daniel Ritschel and Dr. Victor Wexler

In examining the First World War, historian Avner Offer asks the question of whether we should look at war as a problem of management or an examination of rational planning. It is with this question that I am preparing my honors thesis in history. The First World War was unlike any war previously fought. It involved the complete mobilization of each country involved and brought warfare into the modern age of total war. This presented an interesting dilemma for the countries that were involved in the war. Each belligerent power had to provide for their armies on the battlefield while carefully husbanding precious resources on the home front. Tradition has praised Britain for its ability to do just this in the face of great odds. It is generally accepted in popular history and among historians that David Lloyd George performed these feats by first reorganizing munitions production after the shell scandal as the British Minister of Munitions and then leading Britain to victory through a total war policy after succeeding Herbert Asquith as Prime Minister.

Recently, the triumph of the Lloyd George coalition has been under attack by revisionist historians. While the degree of their attacks on the traditional and official history are varied, their message is clear. More emphasis is now placed on the previous liberal government under Herbert Asquith and less emphasis on the accomplishments of the Lloyd George government. My aim in researching this topic is simple. In examining the historiography of British economic controls during the First World War, I am attempting to judge which version of the historiography is more believable and why. Questions such as what various conclusions have historians draw on the subject. Why have their views changed over the past ninety years and ultimately how has this more specialized research affected the overall history of the First World War will be answered. The subject is well covered and my research efforts are focusing on about twenty-two key monographs and ten subject-oriented articles concerning British economic controls during the First World War. The final paper is will be about 75 pages.

## **Exhibit on the History of Cowdensville**

Jean Flanagan, April Franklin, Matthew Mowczko, Zahra Safavian  
American Studies, Visual Arts  
Edward Orser, Frank Nunoo-Quarcoo

The four student presenters have collaborated with faculty members in American Studies and Visual Arts to produce the exhibit, "Cowdensville: African American Heritage on Baltimore County's West Side," on display in the Rotunda area of the UMBC Library from April 13 to May 12. Its opening on April 13 is in conjunction with a public program on the history of Cowdensville.

Jean Flanagan, American Studies, and April Franklin, English, served as undergraduate researchers for the exhibit during the fall semester 1996 under the direction of Dr. Edward Orser, and Jean has continued in that capacity during the spring semester 1997. Building on the work of two earlier student researchers (Evie Gardiner, History; Christina Cieslak, American Studies), each conducted background research on the exhibit themes. Their investigation included oral history interviews, collection of visual evidence, surveying manuscript census records, and tracing property deeds. They also met with community members to discuss their findings and to test their interpretation. The research resulted in the text and illustrations for a series of thematic panels on the history of families and community institutions.

Zahra Safavian and Matthew Mowczko, Visual Arts, agreed to serve as the exhibit designers for the project under the supervision of Frank Nunoo-Quarcoo, faculty member in Visual Arts. Based upon the material prepared by the researchers, they have developed conceptual plans for the exhibit and are responsible for the production of the exhibit. Their activities have included preliminary design proposals, developing the production process and schedule, and implementing the actual construction of the exhibit.

In an oral presentation, the four students will discuss the collaborative process involved in the research and production of the exhibit. The exhibit will be on display at that time in the Library, but the students will use visuals to illustrate special considerations and issues in the collaboration.

## **Art Smart**

Susan Monkman Fritz

Interdisciplinary Studies

Mary S. Rivkin and Diana Thayer

The purpose of this project is to demonstrate how an integrated curriculum based on the arts can help teachers to use creative processes to reach students with different learning styles, unlock hidden talents and interests, and help children learn more effectively.

I will present one creative activity that will involve audience participation, "The Hokey Pokey." During my discussion time, I will link this song, dance, and children's game to the history and heritage of African-American people.

I will discuss using children's interests and emotions in teaching, and in fostering critical thinking. I plan to display art activities, dramatic stories, and movement games I have created to help children learn concepts about environmental issues, static electricity, and probability.

# **A Study of Gps Based Attitude Indicators and Instrument Update Rates**

Rahman Henderson

Professor R. John Hansman, Department of Aeronautics & Astronautics, MIT

In the event of failure of the attitude indicator in GA aircraft, pilots are left to fly without a primary indication of attitude. This requires the use of the remaining instruments ("needle, ball, airspeed") to estimate roll and pitch attitudes. Currently at the Aeronautical Systems Laboratory (ASL), efforts are underway to synthesize attitude information (pitch and roll) using a single antenna GPS system and analytical redundancy techniques. These efforts are striving to create a low cost, stand-alone attitude indicator for the GA aircraft. In this experiment, some of the issues when using GPS as an attitude sensor are addressed: (1) In contrast to a conventional gyro based attitude indicator which provides continuous attitude information, current GPS systems output only at low frequencies (1 - 10 Hz). A higher update rate is associated with higher equipment costs. There, the minimum update rate sufficient for pilots to safely fly the aircraft must be determined. (2) The use of GPS introduces the capability of displaying non-traditional attitude information for pilots, such as flight path angle (FP A) or a combination display of pitch, roll and FPA. However, it is not known if these non-traditional displays will allow for adequate pilot performance and aircraft controllability.

Nine GA instrument rated pilots each completed similar tasks using nine different displays of attitude on the ASL Cessna 182 flight simulator. The displays tested were (1) full panel; (2) needle, ball, airspeed; (3) - (6) GPS based pitch and roll at 6 Hz, 3 Hz, 2 Hz, and 1 Hz; (7) GPS based FP A at 6 Hz; (8) a combination of GPS based pitch, roll and FP A at 6 Hz; (9) GPS based pitch at 6Hz with receiver noise and Kalman filtering. The six tasks (all completed in turbulence) were to (1) maintain altitude during straight and level flight; (2) maintain heading during straight and level flight; (3) maintain altitude during a 360 degree turn; (4) maintain the specified bank angle during a 360 degree turn; (5) & (6) track the localizer and glideslope during an ILS approach to decision height. For each task and display, the root mean square deviation for selected variables was used to quantify pilot performance. Cooper/Harper data was also collected to assess the pilots' preference for each display.

Pilot performance while maintaining altitude during straight and level flight was significantly (95%) better than needle, ball, airspeed when GPS pitch at 6Hz and 3 Hz was used. GPS pitch at 6 Hz and 3 Hz also resulted in significantly (95%) better performance than needle, ball, airspeed when pilots had to maintain heading during straight and level flight. GPS FPA and the GPS combination display yielded better performance at the 99% significance level for this same task. For the task to maintain altitude during the 360-degree turn, GPS pitch at 6 Hz produced significantly (95%) better performance than GPS at 1 Hz. In maintaining bank angle during the 360-degree turn, GPS pitch at 6Hz and 3Hz yielded better performance at the 99% significance level, while pitch at 2 Hz resulted in better performance at the 95% significance level. While tracking the glideslope for the ILS approach, GPS pitch at 6Hz and 2 Hz yielded significantly (95%) better performance than GPS pitch at 1 Hz; and the GPS combination display resulted in performance that was significantly (95%) better than needle, ball, airspeed. Finally, tracking the localizer, GPS pitch at 6 Hz, GPS FPA, and the GPS combination display all yielded significantly (95%) better performance than needle, ball, airspeed. Cooper/Harper data revealed a positive correlation between pilot preference and performance for each display. All of these results suggest that GPS based attitude information can be a safe, reliable alternative to the traditional use of needle, ball, airspeed during a failure of the attitude indicator in GA aircraft.

# Ion Channels Formed from Rat Connexin 32 Peptides Reconstituted into Lipid Bilayers

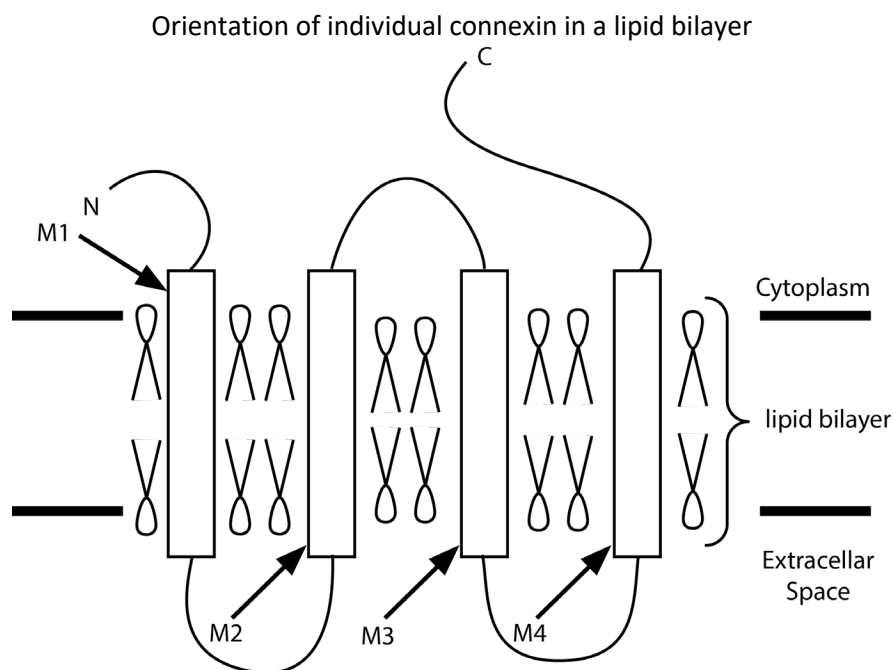
Sean Y. Kassim

Department of Chemistry and Biochemistry, UMBC  
Aristotle G. Kalivretenos

Gap junctions are made up of non-selective ion channels that regulate intercellular processes and can be found in almost all tissue in mammals, in particular, cardiac and liver tissue as well as the central nervous system (CNS). The ion channels are formed by the coupling of hemichannels (connexons) from neighboring cells. The connexons are composed of six membrane bound protein subunits designated connexins. The figure attached provides a stylized representation of an individual connexin in the lipid bilayer. The goal of this work was to determine the transmembrane domain of the connexin involved in channel formation.

The rat connexin 32 has been shown to have four domains, which pass through the lipid bilayer. Sequence analysis and hydrophobicity plots support the M3 domain as the ion channel region. To confirm this, synthetic peptides corresponding to two of the transmembrane domains (M3 and M1) of the rat liver connexin 32 have been prepared. The M3 transmembrane peptide has been studied for its ability to form active ion channels in lipid bilayers. Preliminary data suggests that active ion channels are formed by random aggregation of the M3 peptide in lipid bilayers. Further studies of the peptides are focused on better defining the M3's conductance properties as well as analyzing the prepared M1 peptide's performance in lipid bilayers. Ultimately, the M2 and M4 transmembrane domains of the rat connexin 32 protein will also be studied.

The synthesis, purification, structural characterization, and subsequent conductance studies of these peptides will be the focus of the presentation.



## The Synthesis of a Novel "Fat" Nucleoside-5'-Triphosphate Containing A 5:7 Fused Heterocycle Ring System

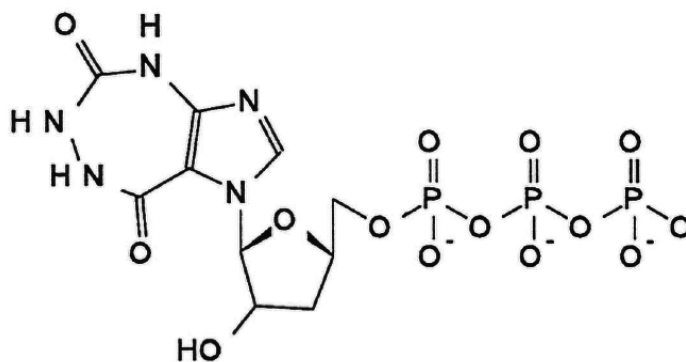
Donna Person

Ramachandra S. Hosmane

Laboratory for Drug Design and Synthesis, Department of Chemistry & Biochemistry  
University of Maryland Baltimore County

The purines are composed of a 5:6 fused ring system. It is these bases that, along with a sugar molecule and a triphosphate, form ATP and GTP. It has been proposed that an analog of ATP or GTP could actually "trick" the body and inhibit some DNA synthesis functions. However, it is very important that any analogs of ATP or GTP not be toxic to the body. The formation of a 5:7 fused ring system, vs. the 5:6 fused ring system should create a non-toxic analog of ATP and GTP.

The synthesis of the pictured molecule, a "fat" nucleotide, is being studied. This synthesis is being attempted by first synthesizing a heterocyclic base, then reacting it with a sugar to form a "fat" nucleoside. The "fat" nucleoside-5'-triphosphate is then synthesized from the fat nucleoside. This molecule is being studied as an inhibitor of enzymes that use ATP and/or GTP as the energy cofactor, as an inhibitor of HIV reverse transcriptase, and as an inhibitor of other polymerases involved in replication.



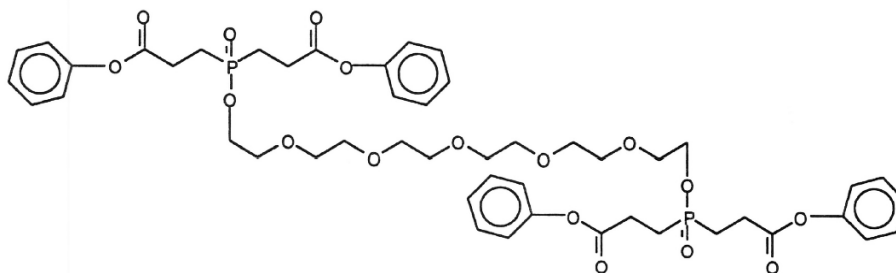
## Vsb-57 as a Possible Cross-Linking Reagent for the Preparation of Hemoglobin-Based Blood Substitutes

Jennifer Rabenhorst and Karla Somerville

Ramachandra S. Hosmane

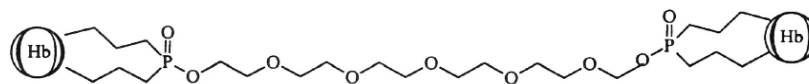
Department of Chemistry and Biochemistry, University of Maryland Baltimore County

Hemoglobin, the blood molecule responsible for transporting oxygen, can be used in blood substitutes if the hemoglobin structure and its oxygen affinity characteristics can be maintained, as proposed with VSB-57, a molecule that could preserve hemoglobin's tetrameric structure.



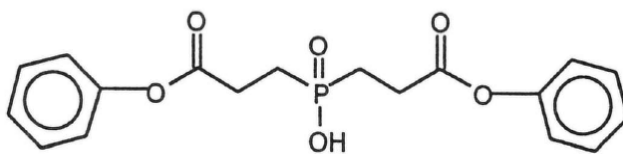
**VSB-57**

Blood replacements today occur chiefly through the use of donated blood, which is often in limited supply, has a short shelf life, and requires screening for viruses and matching blood types. As an alternative, using just the hemoglobin molecule would not require screening or matching and has the potential for longer storage and larger supplies. However, hemoglobin decays into two dimers and will not be retained in the human body without a molecule that can hold it together. VSB-57 is a molecule that can bind to specific sites on each of the dimers (at the  $\beta$  subunit), linking them together and preserving the hemoglobin. This cross-linking reagent has a structure, size and polarity that allows it to react successfully with the  $\beta$  sites in a tetrafunctional manner that makes the binding even more secure.



**VSB-57 linking Hemoglobin (Hb)**

VSB-57 can be synthetically made from readily available materials and easily synthesized compounds. First, the part of VSB-57 that actually binds to the hemoglobin, a reagent called VSB-35, is synthesized from hypophosphorus acid ( $\text{H}_3\text{PO}_2$ ) and phenyl  $\beta$ -chloropropionate.



**VSB-35: bis(phenoxycarbonylethyl)phosphonic acid**

This compound is then reacted with hexaethylene glycol, which makes up the long body of VSB-57 that bridges the two hemoglobin subunits.

With this compound, synthetically modified hemoglobin may be retained in the body and used as a convenient blood substitute that can alleviate volumetric shock and eventually transport oxygen. To date, I have synthesized the crude product VSB-57, verified by NMR.



## Women as Healers in the Ancient Greek World

Juliana K. Sander

Ancient Studies Department

Dr. Carolyn Koehler

By devoting themselves to the healing of the body and the mind, women, as physicians, friends, and mothers, rendered themselves invaluable members of the Hellenistic medical community. The contributions of ancient Greek women to their society are almost never revealed by a single source or even by a single type of source. In fact, it can be stated with some certainty that no aspect of the ancient world can be completely understood without the use of many different 'texts'. In order to discover the roles that women played in the healing community during the Hellenistic period (ca. 323-31 B.C.E.), it is necessary to examine medical and literary texts, grave reliefs, inscriptions and archaeological artifacts. Such evidence reveals that Hellenistic women, ignoring the theoretical arguments of the Alexandrian physicians, addressed and treated their patients as individuals, attending to both their physical and spiritual welfare. Instead of doubting the words of their female patients, as the male physicians (iatroi) were wont to do, the female physicians (iatreousai) heard and advised the ailing women, never abandoning the comfort of healing cults or the magic of touch. Ancient women demonstrated their appreciation of such attention by commemorating female physicians on grave stelai, summoning midwives during their illnesses, and employing nurses for themselves and their children. Female physicians were specifically taught to respect the psychological state of their patients. Male physicians, from the late Classical era to the Imperial Roman period, understood that a patient's mental health determined his or her physical health. Thus, they often recommended treatment for both. Women, first as sisters caring for their siblings, then as mothers nurturing their children, and finally as friends comforting their peers, cared for the psychological welfare of their society long before physicians wrote of its necessity. At times they sought such psychological treatment from healing cults such as the one devoted to Asklepios. Evidence in the form of inscriptions and terracotta offerings from the sanctuaries of Epidaurus, Athens and Corinth indicates that women more often than men sought relief from the healing god for themselves and their families. Through women's sometimes overlooked or underrated efforts, many ill men, women, and children of the ancient world found relief for their ailments. Even if female healers with official titles were rare in the ancient world, unrecognized healers in the guise of mothers, wives and friends who naturally cared for their loved ones' needs were plentiful. It is the objective of my research to finally recognize these anonymous healers.

# Implementation of Internet Protocol over ATM Networks

Charles P. Shelton

Computer Science and Electrical Engineering Department

Advisor: Dr. Fow-Sen Chea

The Global Internet is comprised of thousands of separate local area and wide area networks linked via a complex routing structure and standardized by a series of specifications known as the Internet Protocol (IP) and Transport Control Protocol (TCP). TCP/IP provides a homogeneous method for communication between computers across various types of networks. This connectionless-oriented approach works well when implemented over local area networks such as Ethernet, but complex software must be developed to implement IP over a connection-oriented technology such as Asynchronous Transfer Mode (ATM) networks.

With the exponential growth of the Internet, traffic on local area networks has become significantly larger and current networks will not be able to meet future bandwidth and throughput needs. ATM networks offer higher throughput and are more easily scaled to larger user and data traffic requirements. However, there are major difficulties in implementing IP over ATM. Ipsilon Networks has developed a new switching technology that can dynamically perform IP routing functions as well as ATM switching, eliminating the need for additional software layers to convert between ATM and IP.

With the development of the IP Switch, ATM networks will become the implementation of choice for high-speed internetworks. This presentation explores the Internet Protocol in depth, how ATM network's function, and the implementation details of Ipsilon's IP Switch.

## "Prayer of a Naturalist": Poems from the Woods

Jill Robin Sisson  
English Department  
Dr. William Edinger

I am creating a collection of poetry as part of my English honors project. I will be reading five original poems: "Prayer of a Naturalist," "Fossils," "First Time," "Deserters," and "Plowing By Night." As a group, the poems explore the various ways in which man relates to the natural world. For example, in the following poem, "Prayer of a Naturalist," the speaker is concerned with the ties between stars, salamanders, anthropomorphism, and Christian and Greek mythology:

We guess the huge numbers  
that give us life:  
temperatures of stars,  
distances. We marvel over proportions,  
smile about luck, make grave  
predictions.

But I can tell you one thing:  
it is under a stone where life begins.  
Roll it away - in dark and dust  
you will find a trace of water  
shaped like a salamander,  
surprised or justified  
with light.

Surely he would find his image  
in you, head for a shadow,  
burrows for fingers.  
But he can not imagine -  
flattened, parched -  
your height or your action.

Because we can look up,  
we suffer from self-love.  
Hercules and Cassiopeia  
have become dwarfs and giants,  
born and dying. Myth or fact,  
what they give us is too great;  
we must give it back. ·

# Quantification of Some Material Properties of the Human Hyoid Bone

Jason D. Smith

UMBC Department of Mechanical Engineering

Advisors: Tim Topoleski, Ph.D. and David Fowler, M.D.

A pilot investigation into quantification of some material properties of the human hyoid bone is presented. The goals of this project were: (1) to determine if the average ultimate bending load and average ultimate stress of the hyoid can be quantified *in vitro*; (2) to determine if our testing apparatus and procedure can accomplish this effectively; and (3) to determine the average stress under which the hyoid fails in bending.

Eight hyoid specimens in the 40-49 y/o age group were harvested, disarticulated, and dissected midsagittally, yielding two sets of matching hyoid halves. The first set was loaded at 0.1 mm/sec, and the second set at 10 mm/sec. The tests were conducted using the MTS BIONIX™ Testing Machine at UMBC. The specimens were potted in polymer epoxy and held in the test fixture so as to not interfere with their natural geometry. The load at fracture, the nature of failure, and the cross-sectional dimensions at the fracture point were recorded, and the specimens were returned to the Medical Examiner's Office at UMAB for histological examination.

RESULTS	F max (N)	CTmax {ksi}
Slow Load	12.2 +/- 2.9	5.44
Fast Load	21.4 +/- 4.4	2.93

The average ultimate bending stress of both loading groups was 4.18 ksi (roughly equivalent to that of hard synthetic rubber). The required stresses were higher in slow loading than in faster loading, which is consistent with current viscoelasticity theory.

Currently, the study is continuing with more specimens to be divided among three age groups: 21-30, 41-50, and 61-70 years old. The thyroid cartilage of each specimen will be tested as well, using the same preparation, and loading protocol; this will yield four sets of data for each specimen harvested (slow hyoid, fast hyoid, slow thyroid, and fast thyroid tests). Approximately eight specimens per loading rate per age group will be tested (approximately 96 tests in all). Average ultimate stresses for each specimen type and loading rate will be determined and correlated to percent calcification obtained from histological examination. The ultimate goal of this study will be to present to the forensic examiner hard data that can be used both in medical research as well as in testimony in a court of law.

## **Higher Education: A Tool of Empowerment for Single Parent African-American Women**

Ngozi Smith

Social Work Department Dr. Judith Bremner

This study examines and identifies perceived barriers to educational opportunities by single parent African-American women. The participants were interested in pursuing additional educational opportunities in order to achieve a higher socioeconomic status. The participants responded to questionnaire which a) assessed perceived barriers to secondary and higher education; b) identified how informed their choices were in regard to higher education; and c) identified resources they felt were necessary in order to return to school.

## **Evaluation of Substrate Specificity for *Flavobacterium Odoratum* Ca<sup>2+</sup>-ATPase Using Kinetic Analysis**

Sherri K. Taylor

Dr. Wend Peiffer UMAB

Eukaryotes and prokaryotes both maintain intracellular calcium at micromolar concentrations, but prokaryotes were believed to regulate calcium mainly via antiporters in contrast to the eukaryotic system that uses Ca<sup>2+</sup>-ATPases. Therefore, the discovery of Ca<sup>2+</sup>-ATPase in the prokaryote *Flavobacterium odoratum* was significant. Recently, however, it has been shown that the enzyme is an either an ATPase nor is it calcium dependent: it appears to have a broad substrate specificity, and it uses zinc instead of calcium. It is therefore unclear what the actual function of the enzyme is in the bacterial cell. The purpose of my research is to further examine the substrate specificity of the enzyme using kinetic analysis to compare and evaluate a variety of substrates.  $K_m$  and  $V_{max}$  are determined by measuring the initial velocity of the enzyme reaction at increasing substrate concentrations. It was found that the enzyme has a  $K_m$  of 25.6  $\mu$ M and a  $V_{max}$  of 490nmol/min/mg for ATP. All other substrates analyzed so far had a lower  $V_{max}$  than ATP and in the following order: ATP>phosphoenolpyruvate>AMP ~ ADP>glucose 6-phosphate (glu6P). In general, some activity was evident for very phospho-substrate tested except for cyclic AMP, which does not contain a free phosphate. The results clearly show that the enzyme is not ATP-specific and can function to some degree on any of the substrates utilized by an alkaline phosphatase (e.g. AMP, glu6P, etc.) as well as others. Further experiments with other substrates and inhibitors will possibly reveal the primary substrate of the enzyme and perhaps the actual function of the enzyme as well.

## **Coping with Caring: Gender, Race, Class, and the Experience of Alzheimer's Caregivers**

Bonnie Davies Yeiser

Department of Sociology/ Anthropology

Brandy M Britton Ph.D.

With the continued "graying of America", into the 21<sup>st</sup> century, the number of individuals faced with caring for partners, parents, or others with Alzheimer's disease or similar dementia continues to rise. Cuts in funding at the federal, state, and local levels for day and respite care for caregivers coupled with the expense of skilled nursing and other long term care alternatives has complicated the caregiving task for many families. This paper examines the experience of caring for an Alzheimer's patient at home, from the perspective of the caregivers themselves. Forty women and men were interviewed using a qualitative and quantitative format regarding their caregiving experiences, the difficulties associated with this task, the coping mechanisms they employed, and the impact of formal and informal supports on their daily lives. The analysis presented also examines the role of gender, race, and class in shaping the problems and stressors faced by caregivers. Women liken the experience of caregiving to that of raising a child, with added complexities and fewer rewards. Constant physical and emotional attention to the patient, repetitive tasks, and preventing physical harm to the Alzheimer's victim, characterize the daily lives of caregivers. Multiple roles, such as caring for other dependents and employment, few financial resources, lack of formal or informal respite care, criticism from others regarding caregiver performance, relationships with other family members, and the stage of illness of the patient set the stage for highly stressful and problematic caregiving experiences. Conversely, financial resources, familial support, and quality respite care help mediate the stress of caregiving. Women who care for Alzheimer's patients were more likely to articulate problematic caring experiences, to be criticized by others for their role performance, have dual or multiple caring/work tasks, and to report a decline in their mental health as a result of caregiving than were their male counterparts. African American caregivers relied more heavily on other family members for assistance with caregiving tasks and were often economically disadvantaged so had fewer material resources with which to cope with an Alzheimer's patient than did white caregivers. The implications of study findings for public policy are discussed and suggestions for developing support systems for caregivers are outlined.

## POSTER PRESENTATION

### **Not all Calories are Created Equal**

Kathleen M Bowen

Psychology - Zoe S. Warwick, Ph. D.

Numerous studies have illustrated, in humans and rats, that high fat foods typically foster greater weight gain than foods high in carbohydrates. (Neuroscience and Biobehavioral Reviews: 1-7; 1995, Physio. Behav. 55: 465-470; 1991). In these studies, the entire diet was either high fat (HF) or high carbohydrate (HC). The purpose of the present study was to examine the effect of HF or HC foods as only a portion of total caloric intake. One group of rats (n=8) consumed 30 ml/day of a high fat drink (HF=69 calories) in addition to unlimited chow. Another group of rats (n=8) consumed 30 ml/day of a high carbohydrate drink (HC=69 calories), plus unlimited chow. Intake of chow was measured daily, and body weight was measured weekly. The duration of the experiment was sixteen days. A trend of greater consumption of chow (and thus total daily calories) among rats fed a HF drink emerged; however, this was not significant. Despite the equivalence of caloric intake by groups, the HF group gained significantly more weight. Follow-up studies using high fat chow and HF and HC drinks are currently in progress. Implications for human dietary habits are that the type of calories consumed, not just the amount calories consumed, is important for body weight control. For example, 200 calories of butter (fat) may promote greater weight gain than 200 calories of bread (carbohydrate).

### **Regulation of Human Cytochrome P450 4b1 Gene: Presence or Absence of Polymorphism in 4b1 Protein**

Ali Byrant

Taro Akiyama and Patson T. Nhamburo

Department of Pharmacology, University of Maryland School of Medicine

Cytochrome P450 consists of a superfamily of genes that play key roles in the detoxification of many foreign chemicals as well as endogenous substances. The focus of the laboratory is to further elucidate the role 4B1 protein performs during normal and abnormal lung development. We have shown that glucocorticoids stimulate the 4B1 mRNA levels, and this glucocorticoid effect was inhibited or prevented by a sub-threshold concentration of cycloheximide. The first objective of the study was to develop Western immunoblot assays in order to measure the effects of cycloheximide on the levels of glucocorticoid receptor (GR) protein. Proteins were extracted from rat subcellular fractions, resolved on SDS-PAGE and blots were probed with a GR polyclonal antibody. The results so far indicate that we are close at defining the exact experimental conditions required to specifically identify GR protein. A second objective of our studies was to use a combination of Polymerase Chain Reaction (PCR) and endonuclease restriction cleavage analysis to investigate the presence or absence of an apparent polymorphism in the coding region of the human 4B1 gene. Human genomic DNA samples prepared from individuals that exhibited the apparent polymorphism are serving as the source of templates for PCR amplification studies. The results of our studies could be fundamental to understanding mechanisms that underlie normal and abnormal lung development. (Supported in part by USPHS training grant HL07716-05 and GM49961).

## Abstract: Molecular Modeling of Complex Carbohydrates

Kou-Wei Chiu

Complex carbohydrates of the type found in glycoproteins and bacterial polysaccharides serve as receptors in important cellular processes. An important aspect of understanding their mechanism and structure is the determining of their absolute conformations. This can be achieved via experimental methods such as NMR, X-Ray crystallography, and various forms of chromatography. To supplement the experimental data, the conformations of these complex carbohydrates can also be explored using computer modeling, where classical potential is used to represent chemical bonds. One then determines the most likely conformer based on whichever one has the lowest potential.

This paper presents a method for molecular modeling on disaccharides running CHARMM/Quanta on a UNIX platform. Molecular mechanics is employed to determine the energies of the conformers. The six-membered pyranose rings of carbohydrates remain essentially rigid in its preferred "chair" conformer, thus the conformations of carbohydrates is largely determined by the dihedral angles of the glycosidic linkages. By making potential energy a function of these glycosidic angles  $\Phi(05-C1-Ox-Cx)$  and  $\Psi(C1-Ox-Cx-Cx-1)$ , a two-dimensional energy map can be generated to approximate the dihedral angles of the lowest energy conformer. A history-independent "star" algorithm is used in which the molecules are returned to the initial conformer at new  $\Phi/\Psi$  angle. The rest of the molecule is minimized using mathematical methods such as Adopted-Basis Newton Raphson, Conjugate Gradients, and Steepest Descent. The algorithm, presented in the form of CHARMM text scripts, is tested on three disaccharides: d-gal- $\beta(1\rightarrow4)$ -d-glcNac, d-gal  $\alpha(1\rightarrow3)$ -d-gal, and d-man- $\alpha(1\rightarrow3)$ -d-man. The energy maps produced are compared to those previously done by Brady and others using alternative molecular modeling programs PFOS and MM2.



## Improving a Head Start Outdoor Play Space

Erin Colgan

Department of Education

Mary Rivkin. Ph.D.

Outdoor play space is important for children for numerous reasons. According to the National Association for the Education of Young Children, children need space to "practice large muscle skills, learn about outdoor environments, and experience freedom not always possible indoors." Outdoor space can be used to enrich and extend children's learning and is ideal for hands-on activities. Outdoor play helps children develop large muscle and motor skills as well as test their abilities and their knowledge of the physical world. Outdoor play space, when well designed, furthers the specific goals of the program for which it is planned.

This project will improve the outdoor play space for approximately 35 children in an inner-city Head Start program (St. Veronica's Head Start at Lakeland Elementary School, Baltimore, Maryland). I selected this site because I participate in this class two mornings per week as part of the Early Childhood Education certification program at UMBC. I have observed that the current space for these children lacks any natural materials such as dirt, grass, or sand; the aging asphalt lot contains only one tree and a few weeds. The equipment available to the children is similarly inadequate. This outdoor space will be improved by obtaining age-appropriate materials and equipment for the children's use outdoors. Because of Head Start's budget constraints, contributions from community leaders and organizations will be sought to provide needed items.

This "action research" project will be carried out in three phases. First, I will analyze current conditions at Lakeland Elementary school. I will photograph the existing outdoor play space and complete a detailed analysis of space and equipment. Next, I will interview teachers, parents, and the children to determine needs, goals, and priorities with respect to outdoor play experiences. Community and cultural values as well as practical concerns (i.e., theft, storage) must be considered in planning suitable outdoor play opportunities. Additionally, administrators at both St. Veronica's Head Start and Lakeland Elementary School will be contacted to provide their input and approval.

The second phase of this project is planning alterations to the play space, including a detailed list and diagram of equipment and materials desired. This plan will take into account the values and goals of teachers and parents, as well as practical concerns identified during the second phase. Planning will be carried out in accordance with Guidelines for Developmentally Appropriate Practice in Early Childhood Programs. I will create a detailed plan for the solicitation of contributions from the community (private, non-profit, and government individuals and/or organizations). The third phase of this project will be the action--obtaining materials and equipment and making changes to the play space.

A poster of the project will illustrate the importance of outdoor play spaces and the steps involved in conducting an improvement project (assessment, planning, and actions). Actual improvements to the play space are expected to be minor in the time allotted to this project, but the process of conducting this action research project will be highlighted. Diagrams and photographs will illustrate the positive impact of even minor alterations on children's outdoor experiences.

## **Build it... and They Will Come**

Billie Jane Crouse

Interdisciplinary Department

Dr. James McKusick & Bryan MacKay

During Earth Week 1996, a bluebird trail was constructed along the fields adjacent to Pig Pen Pond, UMBC campus. Observation of bird nesting behavior determines if bluebirds could be attracted to a properly constructed bluebird trail.

Ten bluebird nest boxes were constructed and placed along the trail. Nest boxes were monitored on a weekly basis throughout the 1996 breeding season. Monitoring sheets were used to record the data.

Observations of area showed evidence of bluebird territorial nesting behavior by May. Construction of nests evident in boxes 8 & 9. Subsequent monitoring revealed the bluebirds had been ousted by tree swallows. Evidence of tree swallows in boxes 3, 4, 5, & 10. In the latter part of the summer, wrens-built nests on top of the abandoned bluebird nests.

Bluebirds prefer low-cut open fields to nest and feed in. When the nest boxes were installed the field grasses were low. As the season continued, grasses grew to about 40" in height. The bluebirds preferred boxes in the mowed area of the trail.

Further research for Spring 1997 is directed at the coexistence of bluebirds and their competitor, tree swallows. Some nest boxes were re-sited to take advantage of the protection tree swallows offer. By pairing two nest boxes 5' - 25' apart, with a 300-foot interval to the next pair, will allow these territorial species to coexist.

One advantage of paired nest boxes is that tree swallows will defend both boxes from competitors. Tree swallows will not allow other swallows, wrens, or sparrows near the nest boxes. Especially desirable for bluebirds since house sparrows are both their competitors and predators. House sparrows have been known to kill adult bluebirds as well as their young.

Pairing also reduces amount of direct competition for one box. Tree swallows are, more aggressive than bluebirds, so if only one box existed the tree swallow would most likely drive away the bluebirds. Each species does not compete for the same food since tree swallows are aerial feeders and bluebirds are ground feeders.

Field and library research are compiled into a manual to provide UMBC with an educational resource. Bluebird authors were contacted to confirm information and inquire for their feedback on the bluebird pamphlet and website. ([www.gl.umbc.edu/~bcrous1/](http://www.gl.umbc.edu/~bcrous1/)) Visited other trail sites, contacted Bob Mason of Pickering Creek trail to discuss use of a "Noel predator guard". This guard adequately protects boxes from cats and raccoons. in the mowed area of the trail.

Project Supported By 1996 Provost Undergraduate Research Award

## Perception and Originality

Elizabeth Donovan

Visual and Performing Arts, Kathy O'Dell

The times in which artists work, shape, define, and relegate the ways in which their works are viewed from the perspectives of originality and individuality within partnerships. The effect on each artist as an individual, the effect on the resultant work of each, and the effect on the perception of their works, when art is created by artists involved in a creative partnership, is the focus of my research. Using as a case study Lee Krasner and Jackson Pollock I have researched their creative partnership and also the Modernist era in which they worked. I looked at the specific output resultant from the creative closeness of these and other artists, studied the tenets of Modernism, which helped shape the artist's working relationships, and the way in which their works were perceived.

Jackson Pollock, the more famous of the two artists in my case study, is looked at to define his original concepts in the creation of his 'signature style' and the effect others, including his wife, Lee Krasner, may or may not have had on this output. The ideals of Modernism are closely studied to discern the extent to which the theories and ideas of the times effected the output, collaboration, and critical and social attention given these artists. Also of interest are artists of the Modernist' era who were also involved in artistic partnerships, however, on different terms, i.e., Pablo Picasso and Georges Braque's platonic male/male relationship, and Robert and Sonia Delanauy; as a married couple who were less unequally - celebrated than Pollock and Krasner, as a few examples.

My research includes not only the study of Modernism and its ideals but also the study of Postmodernism. Included is a look at the perception of Jasper Johns and Robert Rauschenberg's artistic and personal affiliation, as well as others. In looking into the ideals of Postmodernism. of most interest were the ideas of artist working today. In my research I conducted two separate surveys of students here at UMBC, asking question s pertinent to their ideas on art in general, the function of art, and their ideas on the loss, or gain, of originality when artists work in partnerships. Also, a survey was administered to two members of UMBC's faculty who work in digital media. The surveys helped to identify ideas current with today's art world. Of interest were artist's views on partnerships in art, their ideas on copying and, ultimately, their views on originality.

Thus far in my research I have concluded that from the uncertainty of the Modern world faced with war and the general turmoil of modernization itself, came a need to have a 'tidying up' of ideas, a need to interpret and cope with the world around them which was reflected in how they viewed individuals and people of difference. I term this need the need to have individuality within a hegemony.

Postmodernism, on the other hand, relating back to the Modernist hegemony, relished difference. This ideal is reflected in the accommodation of new voices and also voices that would speak back to the 'old school' art practices of exclusion. In this way Postmodernism can be seen as more liberating, but through my research I have come to conclude that while honoring difference, the need for a sense of security is still a natural trait. I have found that in the face of our form of modernization, that of a scattering of information, while trying to claim a community of difference and solidarity within which to operate with security, the ideal of Postmodernism turned to one of hegemony in difference.

Both categories, whether individuality within a hegemony, or hegemony in difference, carry their own specific baggage that relates to the output, articulation, and perception of art in ways that can be limiting.

I have tried to define Modernism and Postmodernism, and within them discern the ideas of originality. And I have found that the ideas of originality are not only affected by partnerships, but also by the times in which the artists were working as relates to the specific categories of discourse I have put forth above.

## Synthesis of a Hydantoin Nucleoside Derivative

Nina V. Encarguez and Rong Liang

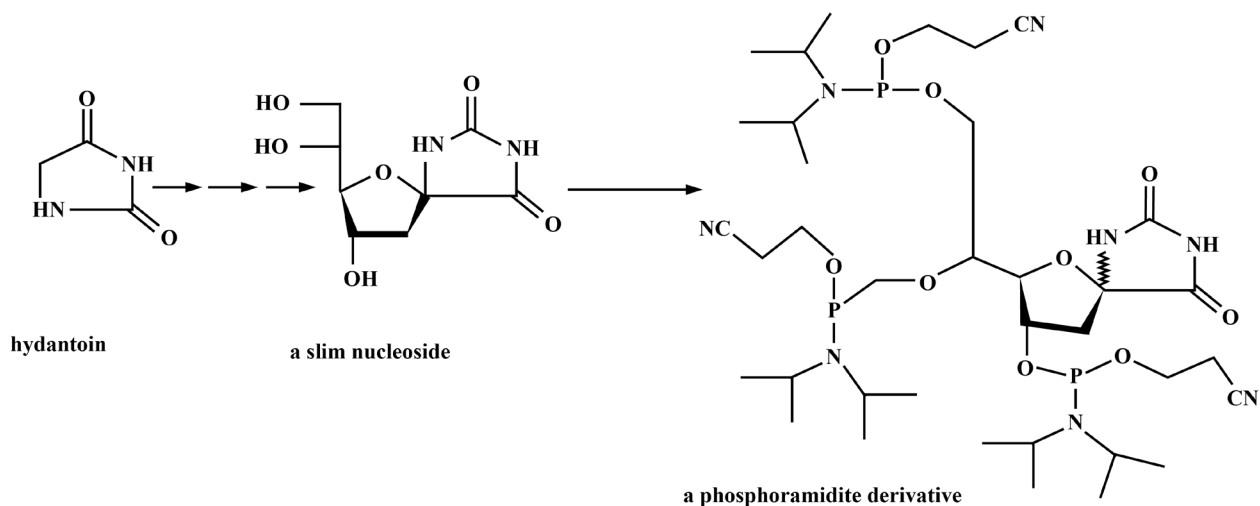
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The great demand and short shelf life of blood today has led to attempts in developing artificial blood that can be stored indefinitely. Many studies have focused on the blood's essential component, hemoglobin, the oxygen carrying protein consisting of two alpha-beta dimers. But hemoglobin degrades into the dimers once out of its natural environment and gets eliminated by the kidneys. Consequently, attempts are now made in creating a reagent that can link the dimers together and thus, keep the hemoglobin in circulation for prolonged periods. This study aims to synthesize a hydantoin nucleoside analog and study its potential ability to cross-link the hemoglobin dimers.

The synthetic scheme of this experiment starts with the transformation of the hydantoin nucleoside into a slim nucleoside. It is then modified into its phosphoramidite derivative that can then be analyzed and tested for its cross-linking ability. This derivative may also be studied further for its possible implications in diabetes, and inhibition of viral replication and cancer growth. Hydantoin nucleoside derivatives have recently garnered attention for their potent activity against viruses, convulsion, and depression, among many other biomedical applications.



## **Tickling Behavior**

B. A. Fischer, IV

Department of Psychology

R. R. Provine

Tickle is a social behavior. That is why you cannot tickle yourself, and why tickle is so difficult to study in a laboratory setting. A tickle questionnaire was developed and administered (N=422) to examine tickling in the context of social interactions. The results revealed several key concepts regarding the behavior.

Laughter is as often reported by the "tickler" as by the "ticklee". Indeed, respondents reported more pleasure in tickling than in being tickled. Gender plays an important role. People both tickle and are tickled, and desire to tickle and be tickled, by members of the opposite sex. As age increases, the likelihood of tickling and being tickled decreases. Tickle is a vital component of touch-based social communication between mother and child, friends, relatives, and lovers.

# **The Effects of Chronic Haloperidol Treatment on Striatal Size in the Rat**

Dawn Glass

Maryland Psychiatric Research Center, Department of Psychiatry,  
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Rosalinda C. Roberts, Ph.D.

Schizophrenia is a devastating mental illness which afflicts 1 % of the population. The disease is heterogeneous in its symptoms and can be subdivided into three broad and slightly overlapping entities: hallucinations and delusions, formal thought disorder and the deficit syndrome (Carpenter et al., 1994). The etiology of schizophrenia is unknown, though it is thought to be a developmental disorder and there are several risk factors that predispose an individual to the disease. These are genetics, winter birth, traumatic birth, and maternal influenza during the second trimester. Biochemical and anatomical abnormalities in the schizophrenic brain occur in multiple brain regions, are often subtle and are not apparent in all schizophrenics. In part, this may be due to the heterogeneity of the disease and whether the person was taking antipsychotic medication at the time of death.

Antipsychotic drugs are the treatment for schizophrenia, and alleviation of symptoms is directly correlated with the ability of the drug to block dopamine receptors. The striatum, a complex basal gangli structure which interacts with other brain areas to affect motor, cognitive and emotional behavior, is one of the brain regions affected in schizophrenia. In comparison to normal controls, schizophrenic striatum manifests several abnormalities including enlarged size, a change hypothesized to be caused by antipsychotic drugs (Bilder et al., 1994; Bogerts et al., 1985; Breier et al., 1992; Chakos et al., 1994; Elkashef et al., 1994; Heckers et al., 1991; Jernigan et al., 1991; Keshavan et al., 1994; Swayze et al., 1992). It is very important to determine which changes in the schizophrenic brain are related to the disease and which are caused by drug treatment, which can normalize abnormalities as well as produce alterations.

The purpose of this experiment is to determine if the change in size in the striatum can be caused by treatment with the typical antipsychotic, haloperidol. Adult rats were treated with water (n=10, as a control) or haloperidol (n=30) in dosages equivalent to those given to schizophrenics. Treatment lasted for 6 months during which time animals were tested for oral dyskinesias, a side effect of antipsychotic treatment in both humans and rats. At study end the animals were sacrificed and the brains removed. The striatum was section throughout its entire rostrocaudal extent at a thickness of 40 $\mu$ m. Every 8th section was mounted on subbed slides, stained with cresyl violet (a stain for neurons and glial cells). The size of the striatum will be measured in each of these sections and used to calculate the entire volume of the striatum using unbiased stereology techniques. Rats will be grouped into two groups (drug and control) to determine if chronic haloperidol treatment can enlarge the volume of the striatum. The brains will be grouped into 3 groups (control, dyskinetic and nondyskinetic) to determine if there is an effect correlated with dyskinetic behavior.

The results of this experiment will show if chronic haloperidol treatment can enlarge the striatum in rats, and if there is any correlation with the behavior. This will be important for animal studies as synaptic and neuronal density measurements, which show differences in drug treated rats, may not accurately reflect absolute changes, if the volume of the striatum is changing. Moreover, since the enlargement of the striatum in schizophrenics has been hypothesized to be a result of antipsychotic treatment, the results of the present study may or may not support this hypothesis.

## The Perfect Palindrome of the Escherichia Coli Biotin Operator

Ashita Goel

Department of Chemistry

Dr. Dorothy Beckett

The repressor used to regulate the transcription of the biotin biosynthetic operon in the *Escherichia coli* is BirA. BirA complexes with the substrates biotin and ATP to form the active intermediate BirA-bio-5'-AMP. This complex is able to bind to the biotin operator to repress transcription. During transcription, two polymerase molecules bind to the promoter sequence and transcribe divergently. However, if the BirA-bio-5'-AMP complex is bound to the operator, the polymerases cannot function and transcriptional activity ceases. The wild type biotin operator sequence to which the BirA-bio-5'-AMP can bind is an imperfect palindrome; it is a few base pairs shy of being symmetrical.

5' GACTTGTAACCTAAATCTTTCAATTTGGTTTACAAGTC 3'  
CTGAACATTTGGATTTAGAAAAGTTAAACCAAATGTTTCAG

By incorporating five point mutations, the imperfect palindrome can be converted to the following perfect palindrome.

5' GACTTGTAACCAAATTGTATACAATTTGGTTTACAAGTC 3'  
CTGAACATTTGGTTTAAACATATGTTAAACCAAATGTTTCAG

In my research, the object is to obtain a perfect palindrome of the biotin operator and measure its binding to the BirA-bio-5'-AMP complex. The palindrome is similar to the wild type sequence. However, the wild type biotin operator sequence has an inherent asymmetry. The palindrome which lacks this asymmetry may have a different binding strength for BirA-bio-5'-AMP. However, if the binding strength of the symmetrical sequence is comparable to the wild type, the symmetrical nature could be used in crystallization studies and will provide insight into the binding mechanism of the BirA-bio-5'-AMP complex.

The first step in the research is to construct the perfect palindrome by combining two unequal but overlapping sequences. This palindrome must then be incorporated into bacterial plasmid DNA and copied to produce large quantities of sequence essential for binding studies. Binding of the BirA-bio-5'-AMP complex to the perfect palindrome will be measured and compared with the binding to the wild type sequence.

Thus far, the palindrome has been constructed and incorporated into bacterial plasmid DNA. Also, large quantities of the plasmid containing the palindromic sequence have been obtained. These, however, are only the preparatory steps in the research. The next step is to measure binding between the BirA-bio-5'-AMP complex and the palindrome.

## **Inhibition of Sporulation in *B. Pumilis*: Sequencing the 9kb Fragment of the pPL576 Plasmid**

Heather P. Green

Paul Lovett, PhD.

Biological Sciences Department, UMBC

Plasmid pPL576 (45kb) inhibits sporulation in its host *Bacillus pumilis*. When the plasmid is digested with EcoRI, three fragments of lengths 23, 14, and 9kb are produced. The 14kb fragment contains sequences necessary for replication in *B. subtilis*. This was previously determined by joining the 14kb fragment to a selectable marker, *trp*. The 14kb fragment does not inhibit sporulation but a plasmid containing both the 14 and 9kb fragments (plus the *trp* gene) is inhibitory to sporulation. Thus, we infer the 9kb fragment contains the spore-inhibiting activity: We have been unable to clone the entire 9kb and 14kb fragments on a high copy plasmid in either *Escherichia coli* or *B. subtilis*. Therefore, sequencing of both fragments requires a non-standard approach.

Small Sau3A sub-fragments of the 9kb and 14kb fragments were cloned into pUC18 vector, using *E. coli* as a host. The Sau3A fragments were sequenced, and primers were designed for PCR amplification of regions in both the 9kb and 14kb fragments. The nucleotide sequence of 2.5kb and the 9kb fragment has been determined. The sequence suggests this portion of the 9kb fragment may be related to the origin region of the *B. subtilis* chromosome, which is surprising since only the 14kb fragment is capable of autonomous replication. Currently, the remainder of the plasmid is being sequenced in an effort to identify the basis for the spore-inhibiting phenotype.

## **Optimizing the Purification Scheme for Some Recombinant/Chimeric Forms of Monoclonal Antibodies**

Marcellus D. Harper

Dr. Jeffrey Schlom & Diane Milenic

Laboratory of Tumor, Immunology and Biology (LTIB)

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This study was undertaken to evaluate additional immunoaffinity supports for the purification of monoclonal antibodies in the laboratory. Chimeric CC49 (the monoclonal antibody used in this investigation) derived from mouse ascites was used in the purification process. Ascites contains a number of contaminating proteins including immunoglobulin from the host mouse. Reacti-Gel, a commercially available immunoaffinity support is the standard method used in the laboratory. Due to problems with the Reacti-Gel support such as contamination of the purified antibody with mouse immunoglobulin (due to non-specific binding of protein to the support) an alternative method was desired. Three affinity supports were compared to the Reacti-Gel using several criteria. The Amino link affinity support yielded the best purification results. It was the only support to yield an apparently pure Chimeric CC49 that retained immunoreactivity with its antigen, and which appeared homogeneous.



## Evaluation of Pre-Chromatography Sample Preparation Methods

Matthew B. Herwig and Natraj Ram  
Chemical and Biochemical Engineering  
Antonio R. Moreira

Purification of proteins invariably requires buffer exchange and desalting before chromatographic steps. Several methods exist, namely stirred-cell or tangential flow membrane filtrations, and gel filtration, to provide the pre-chromatographic preparation. A model protein system, consisting of a mix of standard proteins, is used to study the effectiveness of each method with respect to yield, process time and scale, cost, and final product quality.

## Super MuA: Selection Method for Enhanced Activity Mu Transposase Mutants

Shahla Hosseini<sup>1</sup>

Dr. Phoebe Rice, Dr. Kiyoshi Mizuuchi<sup>2</sup>

<sup>1</sup>UMBC <sup>2</sup>Laboratory of Molecular Biology, NIDDK, NIH

Advisor: Dr. Phillip Sokolove

The bacterial virus, Phage Mu, infects *E.coli* cells with its DNA and a number of enzymes in a manner similar to that of the HIV virus infecting human T-cells. A key enzyme injected into the bacteria by Phage Mu is MuA, which is responsible for the cleavage of and DNA transfer between the phage DNA and the *E.coli* host chromosome. This phenomenon is called transposition.

We worked on optimizing conditions in a method for the isolation of mutagenized MuA DNA sequences responsible for encoding enhanced activity MuA enzyme mutants, which are able to perform transposition reactions despite the modified unnatural reaction conditions we create inside the cells.

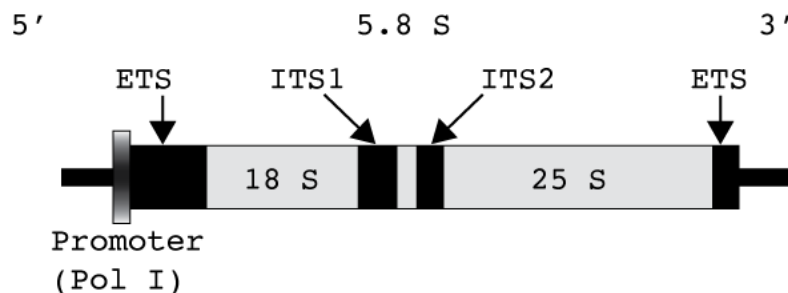
# COMPARATIVE SEQUENCE ANALYSIS OF INTERNAL TRANSCRIBED SPACER 1 INVARIOUS SPECIES OF YEASTS

Charay D. Jennings

Department of Biological Sciences

Dr. Lasse Lindahl

Investigation into the sequence and structure of ITS1 region of several species of yeasts helps gain insight on the parts that are conserved and consequently may be important to the expression of the final ribosomal RNA transcript. Internal transcribed spacer 1 falls between the genes of 5.8 S (downstream) and 18 S (upstream) ribosomal RNA ITS1 in *Saccharomyces cerevisiae* contains 360 bases. Specific nucleases cleave out external and internal transcribed spacers. The endonuclease RNase MRP, which contains an RNA subunit, is responsible for cleaving ITS1. The total function and structure of this endonuclease is not completely understood but it is structurally related to RNase P which processes tRNA precursor transcripts. Other workers in the lab are determining the sequence of the RNA subunit of RNase MRP in the same species. I am using ITS1 sequencing to find evidence of covariation of ITS1 and the sequence of the RNA subunit of RNase MRP.



Double-stranded and single-stranded PCR has been successfully done on *Saccharomyces glous*, *Saccharomyces bayanus*, *Saccharomyces uvarum*, for which the sequences are unknown, and *Kluyveromyces lactis* and *Torulasporea delbruecki*, for which the sequences and structures are already known. The amplified ITS1 fragment was purified by Centricon 30, and single-stranded sequencing was performed for all species using Sequenase version 2.0.

After the sequences are obtained from the species being tested, certain conclusions will be made about the similarities and differences between ITS1 region of the each species. Also, the conserved portions can give evidence of specific factors, such as cleavage site, that are essential to the function of RNase MRP in cleaving the spacer in the rRNA transcript. Some of the speculations regarding the structure of RNase MRP could be further evaluated as well. My research (supported by a grant from the American Cancer Association) will be looking for covariation between ITS1 of the various species of yeast and the RNA subunit of RNase MRP. In addition, covariation will be identified within the ITS1 sequence of each species. The existence of such covariation will give evidence of an interaction, such as a binding site, between certain regions on ITS1 and regions on RNase MRP. This would allow us to construct and test models for the mechanism of interaction.

# Characterization of Ribosomal RNA Synthesis in Yeast

April Kinsler

Biology

Lasse Lindahl and Janice Zengel

The research described herein attempts to characterize the different classes of small nucleolar ribonucleoprotein (snoRNP) molecules involved in ribosome biosynthesis under different growth conditions. Each snoRNP consists of a subset of proteins and a single snoRNA molecule. Through genetic depletion experiments, several snoRNA molecules have been determined to be necessary for cell growth (Tollervey, D and Venema J., (1995). Processing of Pre-Ribosomal RNA in *Saccharomyces Cerevisiae*. Yeast 11, 1629-1650.). To date no work has been done to demonstrate how fast and slow growing yeast cultures differ in their snoRNA composition. Understanding where, when and how these trans - acting factors work in yeasts permits a greater comprehension of ribosomal RNA processing in all eukaryotic cells.

The general methodology is as follows. The ribosomal RNA obtained from *Saccharomyces Cerevisiae* strain Yll153 is run on an acrylamide gel. The ribosomal RNA is then transferred to a nylon membrane (Northern Blot). After a successful transfer the ribosomal subunits are probed with radiolabeled oligonucleotides complementary to different snoRNA molecules.

To date, the ribosomal RNA has been successfully extracted and transferred to the nylon membrane.

## Wavelength Modulation in Bottlenose Dolphin Visual Pigments

Meghan Kirksey and Tyrone Spady

Biological Science

Dr. Phyllis Robinson

The primary focus of our research has been elucidating the biochemical mechanisms of wavelength modulation in the visual pigments of the bottlenose dolphin (*Tursiops truncatus*). The absorption maxima of the dolphin pigments are significantly blue-shifted relative to the pigments of terrestrial mammals. Based on the seven amino acid residues that are responsible for the difference in the absorbance maxima of human red and green visual pigments, the absorbance maximum of the bottle nose:: dolphin green visual pigment was predicted to be 555 nm. However, spectral analysis of the dolphin visual pigment has yielded an absorbance maximum of 524 nm. Likewise, the dolphin rod visual pigment rhodopsin, has an absorbance maximum of 486 nm, which is a 14 nm blue-shift from terrestrial mammalian rhodopsins which maximally absorb around 500 nm. In an effort to explain these differences in absorption maxima of the dolphin visual pigments, a number of sites that have been found to be important in wavelength modulation of other blue-shifted visual pigments, are thought to play a similar role in wavelength modulation in the bottlenose dolphin green visual pigment.

Using the technique of transformer mutagenesis, the S-308-A mutant of dolphin green, and S-292-A and S-299-A mutants of dolphin rhodopsin are currently being confirmed by sequence analysis.

## Minimum Sequence Required for Enzymatic Biotination

Lena Kovaleva

Department of Chemistry and Biochemistry, Dr. Dorothy Beckett

The Escherichia coli biotin holoenzyme ligase, BirA, catalyzes the transfer of biotin from an activated biotin adenylate complex to the epsilon amino group of a specific lysine residue of the biotin carboxyl carrier protein (BCCP) subunit of acetyl-CoA carboxylase and to a COOH-terminal 87 residue truncated form (BCCP87). Biotinylated sequences of natural substrates are highly conserved among different species, and apparently involve complex interactions including those with residues surrounding the modified lysine that is recognized by biotin ligase. To characterize the site specificity of Bir A we measured the kinetics of biotination of a 23 residue peptide that carries no significant resemblance to BCCP's binding site sequence, but is, however, enzymatically biotinated *in vivo* (Schatz, 1993). The rates of biotin transfer to the 23 residue peptide are similar to those determined for BCCP87. To further elucidate the minimum required sequence, kinetic measurements were performed on a series of amino- and carboxy-terminal truncates of the 23-mer. The results, measured by stopped-flow fluorescence, identified a 14 residue peptide as a minimal sequence required for biotination. The rate of biotin transfer to this peptide was determined to be similar to that of the natural substrate, BCCP87. Additional support was obtained using matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) mass spectrometric analysis of peptides that had been incubated with an excess of BirA-bio-5'-adenylate complex. Kinetically inactive truncations showed no significant shift in molecular mass peaks to the values expected for biotinated species, whereas active truncations exhibited 100% biotination. Initial rate kinetic measurements, therefore, were in good agreement with molecular mass determinations based on the steady-state conditions. Additional studies are being conducted using circular dichroism spectroscopy to determine the relationship, if any, between the secondary structures of the peptides and their activity in biotination.

# Superquadrics in Glyph-Based Visualization

James M. Kukla

Department of Computer Science and Electrical Engineering

Dr. David S. Ebert

In this research, I propose the use of *superquadric* surfaces (see below) to aid in the understandable display of *n-dimensional* data sets. (See below)

A large and highly applicable branch of computer graphics today deals with visualization of large data sets in potentially infinite dimensional spaces, and the problem of how to visualize data in these *n-dimensional* spaces is still an open problem with many already moderately successful solutions. One such solution is *glyph-based rendering* where data are encoded as shapes (called *glyphs*) to facilitate rapid and uniform display of the data. In this presentation I propose an extension to glyph-based rendering which involves the use of a family of surfaces called *superquadrics* to encode several data dimensions into the shape of the glyph itself.

If the data are *qualified* (characterized by discrete, possibly linguistic terms such as "good" and "bad" or "old" and "new") then traditional manipulation of the shape (such as making "new" things cubes and "old" things spheres) can suffice. However, if the data are *quantified* (numeric in nature), the problem of manually fitting shapes to ranges of data becomes a tedious (if not intractable) task. The advantage of using superquadrics is that they are a procedural geometry and thus can be defined fully by a set of functions which are parameterized to control their shapes. Given that the data we receive are based on ranges of numeric values, these ranges can be transformed arithmetically to fit the ranges of any of the five classical superquadric parameters, and thus the data can control the shape of the glyph automatically, with only a high level of direction from the user.

Work thus far is based on the notion of taking the complexity of the mapping procedure from the user and placing it on the machine, thus leaving the user free to examine the data without taking the time to preprocess them. This notion of complexity versus control is a recurrent theme in computer science as a whole and if done properly, procedural methods allow the user to specify *enough* information to direct the action without delving into the thick mass of details involved in many tasks. This is an excellent application of that idea.

My poster for the session will detail the nature of glyph-based rendering and superquadric surfaces, a description of the complexity-versus-control phenomenon and its application here, as well as sample displays of the visualization application that uses these shapes.

This project is an application of the research of Alan H. Barr ("Superquadrics and Angle-Preserving Transformations", IEEE CG&A, 1981) and an extension of the glyph-based rendering work begun in part by Papathomas, Schiavone, and Julesz ("Applications of Computer Graphics to the Visualization of Meteorological Data", SIGGRAPH 1988 Conference Proceedings) and extended by many through today.

# **Chromatophore Distribution and Composition in Five Color Variants of the Japanese Medaka (*Oryzias Latipes*)**

Dani Lipski

Department of Biology

Dr. Brian Bradley and Tina Lamonte

In order to determine the role of chromatophores in protection against UV-B radiation, pigment patterns in five mutant strains of Japanese medaka were examined. Four-day old larvae, ten from each strain, were euthanized, imbedded in transparent jelly and photographed using a dissecting microscope with a camera mount. Slides of each animal in four positions, dorsal, ventral, left and right aspects, were scanned into a Macintosh computer where the area of the fish covered by chromatophores was determined using NIH Image 1.6. Leucophores were primarily found in almost equal amounts on both the dorsal and ventral views. Xanthophores were found in almost equal amounts on both the dorsal and ventral views. Xanthophores were found in slightly lower amounts on the left and right aspects than dorsal and ventral. The chromatophore composition of the cream, orange-red and white strains was at least 80 percent leucophores, with xanthophores comprising the remaining 20 percent. Greater than 95 percent of chromatophores present in the leucophoreless strain were melanophores with the remaining 5 percent composed of xanthophores.

## The Effects of Social Movements on Definitions assigned to Obscenity and Indecency

Kimberly D, Martin

Political Science, Dr. Cynthia Hody, Advisor

"Obscenity" and "indecency", the two terms generally discussed with respect to the censorship controversy, elicit most debate when questions of the constitutionality of regulations of the Internet, radio and cable television arise. Beginning with the very first case that dealt with obscenity, *The Commonwealth v. Sharpless and Others* (1815), obscenity and indecency have been defined in a subjective manner. Upon examining the definitions that have been assigned to indecency and obscenity over time, it becomes apparent that no one definition has withstood the test of time. This research has sought to examine why this general trend has occurred by offering just one explanation for changing definitions. The explanation that this research analyzes is that of changing social movements. This also includes relevant social events within a given period. This research does not mean to suggest that social movements constitute the only reason that the definitions have changed, but that they represent one important factor in explaining why we have witnessed changes in construction of the definitions.

A timeline of both social events and obscenity and indecency laws and regulations was used to come up with the research findings. The timeline consisted of three columns; the first column listed the time periods which were broken down into intervals of approximately thirty to forty years, the second column listed those events and movements within each period that constituted the major focus, theme, or issue of the period, and the third column listed the major obscenity and/or indecency events, cases and legislation occurring within each period. Upon completing construction of the timeline, three patterns emerged:

**Pattern One:** During times when America has experienced a resurgence of religious piety, restrictive obscenity cases and/or legislation emerge, severely hampering freedom of speech.

**Pattern Two:** When the United States is engrossed in periods of expansion and progress, there exists greater tolerance for personal expression.

**Pattern Three:** When the United States is engaged in national crisis or violent conflict, we see a drop off of obscenity cases.

A bi-product of the three patterns is also explained within the research. The bi-product states that the manner in which jurists and legislators have treated indecency and obscenity in the past has grown from an established definitive standard to a condition of uncertainty.

The research concludes with an analysis of the three patterns and the bi-product in the context of current dynamics in the censorship debate. Other issues discussed include the validity of both the Telecommunications Act of 1996 and the 1996 Communications Decency Act. Observations are also made about the potentiality of currently accepted definitions.

## **Mechanism of Deactivation of Rhodopsin by Phosphorylation and Arrestin Binding**

Gregory McCarty

Biological Sciences

Dr. Phyllis Robinson, advisor

Rhodopsin is a transmembrane protein in the outer segment within photoreceptor rod cells which, when exposed to a photon of light; changes conformation and activates a biochemical process that eventually communicates the visual information to the brain. We are primarily concerned with how the active form of rhodopsin (metarhodopsin) is phosphorylated by rhodopsin kinase and how this facilitates arrestin binding, which inevitably inactivates the molecule.

There are seven possible sites of phosphorylation on the cytoplasmic tail and the primary question is which of these, or what combination of these sites, are sites of phosphorylation and are responsible for arrestin binding in order to properly inactivate the molecule.

This question has been approached by making a series of mutants of rhodopsin. In each of these mutants one or a combination of certain of the seven possible sites was changed so that they could not be phosphorylated (or bind arrestin) while leaving the others intact in order to test whether or not the remaining sites could properly inactivate the molecule.

My primary focus has been the creation of some of these mutants using a process called Transformer Mutagenesis which involves the formation of oligonucleotides used to prime the synthesis of the entire gene. These mutated genes are amplified in bacteria, isolated, and then introduced into mammalian cells which produce the mutant protein. The protein is isolated and used in a *in vitro* assay to examine their ability to be phosphorylated and bind arrestin.

Two mutants made were found to have bound kinase but showed minimal arrestin binding. This and data from other mutants has indicated that it may not necessarily be the location, but to what degree the molecule has been phosphorylated, which suggests a threshold and not a site specific response. The creation of more mutants and tests of their ability to bind arrestin are necessary before this can be concluded.



## **Identification of a Previously Unseen Taste Organ in an Insect**

Carrie McManaman

Biology Department

Dr. Frank Hanson

The major goal of this research project is to understand what sense organs play an important role in the choice of food for phytophagous insects. The model insect used in this study is the caterpillar, *Manduca sexta*. A phytophagous insect decides what is an edible plant by the way the plant tastes. The taste organs used in this process are located near or inside the mouth of the caterpillar. Although some of these receptors have been studied and well documented in the past, others are not well documented. My research has identified and photographed a previously unseen chemoreceptor located in the oral cavity. Other studies have indicated that receptors in this location are important in controlling feeding behavior. My figures for presentation are scanning electron micrographs which show the size, shape and location of the receptor.

## **The Use of Fluorescence Microscopy to Detect Transfection Efficiency**

Nkhensani Nguyyza

Mathematics Department

Apoptosis is a term used to describe the morphological changes that occur during programmed cell death. Though many intracellular regulators of this pathway are unknown, cellular transfection can be used to examine the regulatory role of specific proteins. Additionally, Fluorescence microscopy is a technique that allows visualization of fluorescent proteins and of chemicals within a cell. One advantage of using Fluorescence Microscopy over other fluorescence techniques is the ability to examine cellular morphology and the actual protein expression of the cells simultaneously. We used Fluorescence Microscopy to monitor transfection efficiency. More specifically, a green fluorescent protein (Green Lantern®) was used as a co-transfection vector to monitor transfection of normal rat kidney (NRK-52E) cells with Extracellular Regulatory Kinase-2 (ERK-2) and ERK-1 His Mutant plasmids. Following transfection, the cells were treated with 0.5 $\mu$ M okadaic acid (an apoptosis inducer) and the morphological response of the cells were compared. Our results showed that 4 $\mu$ g/mL Green Lantern was sufficient for visualization of transfected cells. In addition, it appears as though cells transfected with ERK-2 His Mutant are more susceptible to okadaic acid-induced apoptosis while the ERK-WT are protected. These studies imply that ERK-2 may play a protective role during okadaic acid-induced apoptosis in NRK-52E cells.

# Determination of Complexation Equilibrium Constants from Uv-Visible Absorption Data

Andrew C. Orcutt

Department of Chemistry and Biochemistry

Ramona Zaini, Bradley Arnold

Since they were first used in the early 1950's, Benesi-Hildebrand (BH) plots have become infamous in the study of complexation reactions. These plots relate the concentration of one component (usually present in large excess) to the observed uv-visible absorption of the complex. While analysis of such data is relatively straightforward, the implicit assumptions of the method make the application of such plots to a wide range of complexation reactions difficult and often misleading results are obtained. Potential hazards in the use of BH plots include the following: incorrect concentration ranges, poor baseline corrections, multiple absorbers in the sample, and spectral variation with changes in the environment (*id est* solvent and temperature). These hazards leave characteristic hallmarks that can be observed when BH plots at numerous wavelengths across a complex absorption band are studied. This new method of analyzing families of plots will be presented and will demonstrate how the potential hazards are identified and errors in the analysis of complexation data avoided. In particular, studies of charge transfer complexes of iodine with methylated benzene donors will be presented.

## Construction and Characterization of BirA-197

Shreyesh Ruparelia

Department of Chemistry & Biochemistry

Dr. Dorothy Beckett

The *E. coli* repressor of biotin biosynthesis (BirA) not only represses transcriptional initiation of the biotin biosynthetic operon, but also acts as the catalyst for the attachment of biotin to a lysine residue in the biotin carboxyl carrier protein (BCCP). BirA is composed of three separate domains: the C-terminal domain, the central domain, and the N-terminal domain. The N-terminal domain contains a helix-turn-helix motif which interacts with the BioO region of the biotin operator sequence. The central domain catalyzes the synthesis of bio-5'-AMP and the transfer of biotin from the adenylate to a lysine residue of the BCCP protein. The functions of the C-terminal domain are as yet unknown. BirA has been found to be monomeric at concentrations that well exceed the normal concentrations required for DNA binding (Abbott and Beckett, 1993). However, binding to the bioO site occurs via cooperative binding of two BirA monomers. This indicates that the binding of holo BirA to the half operators promotes its dimerization. The location of the monomer-monomer interface of the dimer is unknown. A mutant of BirA, BirA-197, will be used to study the location of the dimerization interface. This mutant has a single site mutation of GAT to TAT at nucleotide 589 in the BirA gene. This changes the amino acid at 197 from aspartic acid to tyrosine. The mutant, which was first isolated by Barker and Campbell, was shown to have no repression activity. The results also indicated that the enzymatic activities of the protein were similar to those of wild type BirA. This indicated that the catalytic properties of the central domain were not affected and that only the DNA binding properties of the protein were being affected even though the mutation is in the central domain. This suggests that the mutation may be disrupting the dimerization properties of the protein and hence the mutation may indicate the location of the monomer-monomer interface. In this work, we have subcloned the BirA-197 gene into an overexpression vector, pBtac1, and transformed the plasmid containing the BirA-197 insert into *E. coli* strain JM109. The BiiA-197 gene has been sequenced to confirm that the correct sequence has been inserted into the plasmid. The protein will be purified and characterized. From this study we hope to better define the location of the monomer-monomer interface of BirA and also better understand the DNA binding properties of the protein.

# African-American Imagery in Television Advertising

Gail Ryder

Department of Sociology and Anthropology

Dr. J. Kevin Eckert

Objective of the research: The present study was undertaken to discover if stereotypical images of African-Americans are purposefully being presented in contemporary television advertisements, in order to appeal to specific consumer groups.

Methodology: As no contemporary problem is without some overlapping historical context, the original stereotypes (some of the most offensive of Black caricatures) are examined. The stereotyped characters of yesterday are discussed first, along with an assessment of their historical functions, in order to draw upon the classic relationships existing between them and present-day images.

A survey of the literature revealed the continued use of these stereotypical Black characters and variations of them as the only African-American images seen at all through the entire era of pre-television product advertising.

In order to find out how many African-American faces are featured in advertisements shown during a typical block of prime-time programming, the five television shows most watched by Black Americans, and the five top-rated shows of White audiences were used as the basis for data collection. The object was to discover how many commercials shown during these two separate blocks of programming featured African-Americans, and of those that did, which, if any, portrayed them in a stereotypical manner. The guidelines used to define stereotypical behaviors and /or appearances were taken from a 1982 "ad-watch campaign" conducted by the NAACP's Black Media Association, and also from the documented descriptions of scholars concerning the behaviors and physical characteristics typically associated with the historical caricatures.

Results: The results of the three-week, prime-time advertisement study revealed that African-Americans are featured far more frequently, and are more likely to exhibit stereotypical behaviors in those advertisements shown during African-American programming. Additionally, like the pre-television advertisements of the past, African-Americans were more often used to propagate certain types of products than Whites. Public service announcements shown during the prime-time groups were also shown to be audience-dependent in terms of the issues they addressed, and whether or not they featured African-American actors. Overall, whether or not Blacks were featured in the commercials at all was contingent upon the very nature of the prime-time programming itself; for example, all comedic programming, whether intended for Black or White audiences, revealed a tendency to feature African-Americans in more of their advertising than did dramatic or heavy-toned shows. Consequently, much of the advertising for these comedy series' proved to be stereotypical, whereas the commercials designated for "serious" shows did not.

## **Isolation and Characterization of the Trypanosome Antigen, Fla-2**

Rachelle Salomon

Dept. of Molecular Microbiology and Immunology, Brown University

Dr. Andrew G. Campbell

African trypanosomes are unicellular parasitic protozoa responsible for fatal African sleeping sickness in humans and related diseases in livestock and game animals. The parasites, and thus the diseases, are transmitted by the bites of the insect vector, the tsetse fly. Currently, no effective vaccines exist to combat these diseases which plague sub-Saharan Africa. To create vaccines against trypanosome infection and understand parasite motility and metabolism, we are characterizing a number of parasite specific proteins. This research focuses on the isolation and characterization of the protein, FLA-2, which may be an important protein for flagellar function and immunization to protect against trypanosomal diseases. The strategy for these studies is to culture parasites, isolate intact flagella, and subsequently purify FLA-2 protein. Antibodies raised in mice against FLA-2 will be used to confirm its location in the parasite and tested for their abilities to protect mice against fatal challenges by live parasites.

## **Laser Fluorometric N-nitrosamine Determination Following Electrolytic Reduction and Derivatization**

Robert Schafer and LeAnn M. Preston

Chemistry Department;

George M. Murray

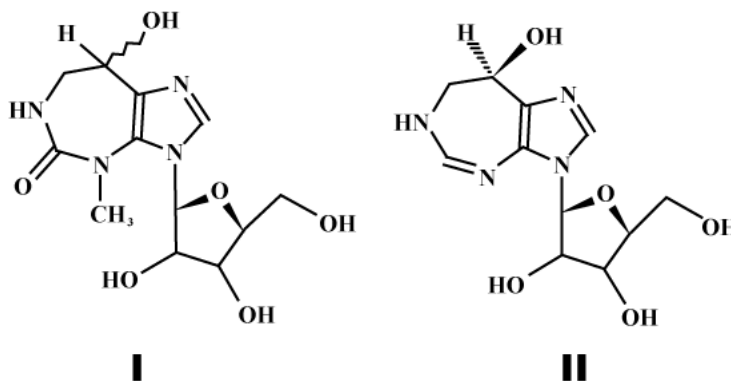
Cyclic voltammetry experiments have been used to determine the optimal conditions for the electrolytic reduction of highly carcinogenic N-nitrosamines to the corresponding amines. These amines have been derivatized by reaction with 7-chloro-4-nitrobenzo-2-oxa-1,3-diazole (NBD-Cl) for sensitive fluorescence detection. The reduction of three N-nitrosamines has been characterized with a microcomputer potentiostat, utilizing a gold amalgam working electrode, a silver/silver chloride reference electrode, and a platinum wire auxiliary electrode. Micellar electrokinetic capillary chromatography-laser fluorometric detection has been used to quantify the electrolytic reduction of the N-nitrosamines.

# An Approach to the Synthesis of an Analogue of Coformycin, a Naturally Occurring Antitumor Antibiotic

Nelly Smolyak

Ramachandra S. Hosmane  
Laboratory for Drug Design and Synthesis  
Department of Chemistry & Biochemistry  
University of Maryland Baltimore County

The long-term goal of our research project is to synthesize Compound I shown below, and biochemically study its inhibitory properties against the enzyme adenosine deaminase (ADA). Compound I is an analogue of the naturally occurring potent antitumor antibiotic, called coformycin (II), whose antitumor property is known to arise by its strong inhibition of ADA through irreversible binding. Since ADA is an important metabolic enzyme required for normal cellular function as well, prolonged disfunctioning of ADA leads to severe toxicities. Therefore, an inhibitor is needed which binds to ADA reversibly and only for a short period of time. To that end, our lab has recently explored the structural parameters of coformycin that are responsible for its tight-binding interaction with ADA, and has found that the conformation of the molecule plays an important role. Based on this result, coupled with extensive studies of molecular modeling aided by computers, we believe that the proposed target compound I will be a reversible, nevertheless potent, inhibitor of ADA. The progress made thus far toward the synthesis of the target compound will be reported.



## **“Conditioned Satiety”: Further Research Across Nutrients**

Stephen J. Synowski

Zoe S. Warwick

Dept. of Psychology

UMBC

Rats learn to modify their caloric intake in anticipation of feeling full. Training: 30mls of lemon-flavored nutrient at 0.2 kcal/ml(6 kcals) and 30mls of almond-flavored nutrient at 1.6 kcal/ml(48 kcals)were consumed on alternate days. Testing: (two-bottle test) One bottle containing lemon-flavored nutrient at 0.9 kcal/ml, and another bottle containing almond-flavored nutrient at 0.9 kcal/ml were presented simultaneously. Previous research in this lab demonstrated that in two-bottle tests, rats consumed more lemon-flavored than almond-flavored nutrient. This is called "conditioned satiety," and reflects a learned modulation of intake, in anticipation of feeling full. The rats expected that the almond-flavored nutrient would deliver more calories because of previous training with high calorie almond. This was shown when glucose, sucrose, fructose, and maltodextrine were used as training nutrients. The current studies aimed to replicate and expand these previous findings. In Experiment I, rats were trained with corn oil emulsions. Half the rats were made hungry before the test. Both hungry and non-hungry rats failed to exhibit conditioned satiety. In Experiment II, rats were trained with MCT emulsions. MCT is a fat that is digested in much the same way carbohydrates are digested. The rats demonstrated conditioned satiety in this experiment. Experiments III and IV were inspired by Lucas and Sclafani, who found that a high fat maintenance diet enhanced fat-calorie based learning. In Experiments III and IV, rats ate a high fat maintenance diet (corn oil and powdered Purina chow) for two weeks prior to and throughout training. In Experiment III, rats trained with corn oil emulsions, again failed to demonstrate conditioned satiety. In Experiment IV, rats trained with sucrose solutions flavored with grape or cherry (instead of lemon and almond) exhibited conditioned satiety, consistent with previous findings. In Experiment V, rats were trained again with corn oil, however the high calorie emulsion's caloric density was doubled in training (almond-flavored nutrient at 3.2 kcal/ml=96 kcal). The rats were then tested in a two-bottle test (both emulsions at 1.7 kcal/ml). Rats had a tendency to consume less almond-flavor than lemon-flavored nutrient (conditioned satiety). However, this finding was not statistically significant. In summary, conditioned satiety is exhibited, when carbohydrates or MCT are used as a training nutrient, but corn oil is much less effective. It appears that the locus for digestion of training nutrients has a direct effect on conditioned satiety.

# Identity System for Baltimore Pediatric Hospital

Ugo Ugbor  
Art Department  
Franc Nunoo Quarcoo

This work shows the identity system of a pediatric hospital, one which displays an inviting environment for both children and adults.

The system comprises mainly of bright colors. Colors chosen were yellow-orange and violet; complementary colors, meant to stimulate the spirit and thus elevate anyone from a morbid sense of a hospital to a bright and hopeful one.

The system includes a logo, logotype, stationery, architectural signage, directional signage, transportation, and miscellaneous promotional materials.

In creating an image, attention to detail, close criticism, and sensitivity, is required in order to create and maintain a coherent visual identity system for a corporation. Thus, the manual serves as a basis to ensure that visual standards are maintained regardless of the means of production.

Companies well known around the world have been successful for two main reasons. One is the consumers, the people that actually use the goods and services being produced. The other is the company's image.

This is a cause-and-effect idea, that the way the company portrays itself influences consumer behavior, and in order to ensure a positive response, an identity system must lead the way.

Thus, the Baltimore Pediatric Hospital identity system leads the way for this branch of pediatric hospitals.





## Mary Banning: A Maryland Woman of Achievement

Christine Verdon

English and Women's Studies Departments

Jessica Berman—Advisor

This poster presentation will exhibit biographical information and several sample paintings of Mary Banning, a nineteenth century scientist who lived and worked in Baltimore. Through my unique internship with "Women of Achievement in Maryland History," I have been researching the life stories of eccentric, intelligent, dedicated, and passionate women whose labors have largely gone unrecognized in history books. "Women of Achievement" aims to publish a hard-cover reference book next May that will recount the stories of accomplished women such as Mary Banning. From among an impressive list of names such as Harriet Tubman, Clara Barton, Adrienne Rich, Anne Tyler, Frances Ellen Watkins Harper, and Gertrude Stein, there are hundreds of other lesser-known women who have, nonetheless, also served Maryland in many ways.

Mary Banning's story has impressed me more so than any other I have encountered thus far. Both the magnitude of her research and the quality of her work prove her commitment to studying the natural world in spite of a lack of support from the male-dominated scientific institutions of the nineteenth century. Fascinated with the natural world and imbued with the belief that nature can rejuvenate the soul, Mary Banning dedicated her life to the field of mycology -- the study of mushrooms. Her manuscript, "The Fungi of Maryland," a labor of love in which she invested more than twenty years and over two hundred dollars, was never published because local scientists did not take her work seriously. Frustrated by this rejection, Mary presented her manuscript as a gift to the only scientist who had supported her endeavors, the state botanist at the New York Museum in Albany. He found her work accurate and meticulously detailed, but nevertheless, too voluminous for publication. The manuscript sat unopened in the museum for almost 80 years, but a curator at the museum is presently re-working it into the form of a historical novel so that her work can at last be published. The re-discovery of her work is so important not only because of the unique style and scope of her work, but also because there is no other record of Maryland mushrooms from this time period that exists.

In her diary-like catalog of her discoveries can be found evidence of her daily excursions through places in Baltimore like Druid Hill Park. With passion, zest, and precision, she recorded the appearance, intricacies, shapes, smells, and even tastes of her subjects. To further document her findings, Mary developed her talent for painting by capturing the beauty of fungi in the form of bright and bold watercolors. The New York State Museum houses all 175 of her paintings. Unlike other scientists, Mary relied on her teaching position to fund her research. But as her health began to fail in her later years, poverty forced her to leave Maryland and take a room at a boarding house in Virginia. She died in obscurity in 1903 at the age of 81.

Mary Banning's story makes for a most unique and eye-catching research presentation. As my shining example, her multi-genre talents are represented of the diversity of women's achievements in Maryland's history.

## The Decorated Legislature

Nikki M. Walker

Political Science

Dr. Diana Dwyre

I am going to develop a poster of my current research project. This semester, I am interning for the Maryland State Legislature; consequently, I have access to a wealth of information. I have decided to interview men and women legislators in order to test my hypothesis that in comparing state legislators, women tend to introduce different bills than men in part because they, as a minority adding a new point of view to the legislative body, have different priorities than men. As of now, I am working on my literature review. I have found all the books and articles I need. This week, I begin my interviews, and my interview questions have already been formulated. For example, I will ask the legislators to give their opinion about whether or not gender affects the types of bills legislators choose to introduce. In addition to my interviews, I will analyze the bills introduced in 1996 to see who sponsored which types of bills. Gender is my primary independent variable, but I will also look at age, party, and race.

After my data are collected, I will create tables and graphs of my information that will be put on the poster. Then, my conclusions will be formulated, and on the poster, I will demonstrate my conclusions, illustrating them graphically and in writing.

I have named this project "The Decorated Legislature," because it is noticeable that the addition of women to the state legislature has expanded the range of legislative policies introduced. Not only does the legislature deal with policies of concern to men, but today, it is decorated with policies of concern to both of the sexes.

I am retesting a hypothesis confirmed by other scholars in order to justify it using different units of analysis. I expect to find similar conclusions to the ones formulated by these scholars. For instance, it is expected that bills traditionally of concern to women will be the female legislators' top legislative priorities. These are issues concerning families, children, and education.

My personal objective of this research project is to give myself experience with developing a hypothesis, researching an interesting topic, collecting data, and using appropriate methodologies to test my hypothesis. I look forward to finding out my interesting conclusions, creating a wonderful poster, and displaying it for UMBC to see.

## **Synthesis and Rate Studies of a Highly Reactive Epoxide: Model for a Cancer-causing Compound**

Danying Zhu

Department of Chemistry

Dr. Dale Whalen

It has been discovered that Benzo[a]pyrene -- BP breaks down DNA backbone and causes cancer in human's body. The concentration of BP in environmental pollution is significant. Yet, there is no any detail mechanism to explain how BP interacts with DNA.

In this research project, the most important and difficult step is to synthesize an epoxide compound that has similar structure as BP. Spending almost one and half semesters, I eventually made the final product from a simple starting reagent.

The next step of this project was to measure rates of this epoxide in different pH buffers so as to find any reasonable mechanism for BP. This step is still in process.

## **Women, Victimization, and Incarceration**

Rachel Zilkoski

Department of Sociology and Anthropology

Brandy M Britton. Ph.D.

Our research looks at women who have been in jail or prison. We are researching the relationship between women's victimization and subsequent incarceration. We are examining women's pathways into jail/prison, focusing upon the way in which victimization coupled with structural inequalities and racism leads to incarceration. Our hypothesis is that drug use is a mediating variable into prison or jail. The process often begins with victimization (either physical or sexual abuse, often both), then women turn to drug use. Drug related criminal charges then lead to incarceration.

Along with investigating women's pathways into jail and prison we will explore existing programs in the state of Maryland for incarcerated women. The number and types of programs and the lack of job training and gender sensitive programs will be discussed. Improvements of public policy will also be addressed.

Data for this presentation come from the UMBC Baltimore Women's Health Study. The data is quantitative and qualitative in nature and includes interview material from three sub-samples of women: an addict sample, a household sample, and a shelter-based sample. These women were interviewed regarding victimization experiences, incarceration history, and life experience.

## Purification and Structural Analysis of MMTV Nucleocapsid Protein

Eric Zollars and Daniel Klein  
Howard Hughes Medical Institute, UMBC  
Dr. Michael Summers

A protein of the nucleocapsid of the retrovirus MMTV, murine mammary tumor virus, was purified using molecular biology techniques and the structure of this protein is currently under investigation using nuclear magnetic resonance spectroscopy.

The objective of this research is to gain insight into the structure of an integral part of the protein coat of a virus similar to HIV. The purification process was performed on site to develop the protein for the eventual nuclear magnetic resonance (NMR) imaging. Analysis of NMR data is used to determine the three-dimensional folding of the protein. The structure of proteins is useful in designing drugs to combat viruses:

Work began on this viral protein (herein referred to as MMTV-nc) in May 1996. The exact nucleotide sequence of a larger group of proteins which contained MMTV-nc (the *gag* sequence) had already been determined and it was a simple process of obtaining a length of DNA which coded for this group of proteins. The specific DNA for the MMTV-nc had to be cleaved from the larger mass of DNA. Once this segment of DNA was purified it became a question of how to produce the desired protein. This involves recombinant DNA technology, which simply is the process of forcing the bacteria to produce a protein foreign to their own. The piece of DNA which had been purified had to be altered so that a version of *E. coli* DNA, DE3(plys)E, would integrate the DNA into its own sequence. This process involves designing synthetic strands of DNA (oligomers) which will bind to the purified strand of DNA and facilitate its integration into a circular piece of the bacterial DNA known as a plasmid.

Once certain that the protein DNA and plasmid DNA have integrated successfully, then the new single piece of DNA is introduced into *E. coli* cells in a process known as transformation. The cells are then grown and forced to produce the protein they now find encoded into their plasmid DNA sequence. The cells are harvested, and the protein is purified from the cell mass.

Protein purification was finished by November 1996 and structural analysis of the protein was started in December. Using NMR we have begun to assign resonance spectra for amino acids of the protein. The protein was labeled using nitrogen-15, allowing three-dimensional NMR experiments to be conducted. A wide variety of experiments have already been carried out including: NOESY, HOHAHA, HSQC, HNHA, HNHB, and MNS. These each collect a slightly different type of data and these differences allow an interpretation of the protein to be performed. It is first necessary to find the location of each amino acid residue on the data plots and from this information, interactions through space can be evaluated.

We are currently sorting through all data that has been collected to find the locations of all the amino acids. There are still many months ahead of sorting data before even a working model of the protein structure can be started.

## PERFORMANCES

### **Solo Piano Performance**

Hui Sean Tan  
Music Department  
Dr. Rachel Franklin

I will be performing the first movement of a solo keyboard piece by J.S. Bach entitled Italienisches Konzert .

## DIGITAL PRESENTATIONS

### **TREE OF LIFE**

Ava Collins  
Visual Arts  
Steve Bradley

The Tree of life is an interactive sculpture in progress which compares man, and his life creating technologies, to God. The work is actually second to The Tree of Knowledge, a previously completed still image.

The Tree of Knowledge is a computer composed fantasy representation of the garden of Eden, with found objects attached to its surface. Inside the picture I have placed myself as a small child looking upwards toward the tree of knowledge and the apple hanging from its branch. The apple is actually the Apple Macintosh (TM) logo, symbolizing the fruit in the Bible which if eaten" then your eyes shall be opened, and ye shall be as gods, knowing good and evil". I am a small child looking toward my future as I plan my education around creation with the aid of the Macintosh.

The Tree of Life continues the story of Genesis in-which God has banished Adam and Eve from the garden. Just before sending them away god warns "behold, man is become as one of us, to know good and evil: and now, lest he put forth his hand, and take also of the tree of life, and eat, and "live forever" I am comparing the uses of our modern technologies to prolong our lives to the man's need to be like gods and to live forever. The interface of the piece will be the pages of Genesis in winch specific passages will lead to related animations. I intend to include several aspects of life prolonging sciences such as excisions, implants, and cloning.

The computer animation will be installed a life size cocoon, which will allow the viewer to enter the sculpture to interact with the movie. The cocoon allows the viewer to further feel the piece while extending its interactivity. I want the viewer to feel the warmth and the animal like quality of the cocoon and to express no matter how advanced we may seem we are still animals controlled by our emotions.

## **Nonretinal Thinking**

Daniel J. Masi

Visual Art Department

Steve Bradley

My interactive piece is about human observation and perception and how it affects our lives. I want people to think about and recognize stereotypes, racism, and other preconceived notions we get from our sight. What if people could not see another person's gender, color, weight, and other physical attributes? One would have to find other means of categorizing people. This sounds like an impossible task but really it is not. Those physically attributed categories are in the mind and can be overcome with thought. Note the people you try to meet and think about why you want to meet them. First, you do not know anything about this person except for what they look like. Second, why did you choose this person and not someone else? I think if you get an opportunity to meet anyone, take it and go from there. Meeting different people is what life is all about. All I want is for people to think about what they see and appreciate things for reasons other than its appearance. That does not mean beautiful things are not beautiful because what exactly is beautiful?

## The Interactive Book of Revelations

Matthew Mowczko

Visual Arts Department

Steve Bradley

The content of my work focuses on the Book of Revelations in the Bible, particularly the seven seals of the Apocalypse. Although one of my intentions was to present these passages in an interactive format, I also hoped to make my own commentary on the institution of religion. In my opinion, people have a tendency to forget their sense of humor when it comes to religion, especially where topics of morality are concerned. I felt that presenting the biblical version of the end of the world was relevant because, with the end of the millennium fast approaching, society seems caught in a wave of fin de siecle religious fanaticism. By injecting a little levity into the situation, I hope people will realize the absurdity of these modern-day soothsayers and simply enjoy themselves. Besides, the Book of Revelations is brimming with fantastic imagery, which, as an artist, I find irresistible.

The model that I based my aesthetic strategy on is the illuminated manuscript. One of the aspects of this style of text that I find so appealing is the integration of images with the written word. Often created at the time, these elements complimented one another and even shared certain characteristics. In my work, each screen is designed to resemble a manuscript page. In order to promote integration, I attributed both text and image with sound. In addition, I devoted a significant amount of time to research in order to give my project a feel of authenticity.

Color and light play a fairly important role in my work. Light has always been a symbol of divinity in the Christian faith, and I wanted to be able to incorporate that into my piece. As far as a comprehensive color system is concerned, I've tried to employ the limited color scheme found in a majority of Romanesque and Byzantine painting, which consists of colors like gold, red, and blue. This was a crucial factor in the final selection of my imagery.

Along with the actual biblical text, sound plays a pivotal role in conveying the underlying meaning of my project. The opening transition begins with two Gregorian chants, establishing a somewhat pious mood. In order to provide further emphasis, there is a somber voice narrating the passages from the Book of Revelations. It is not until the viewer selects the icons relating to the seven seals that the mood is broken by a cacophony of sound, ranging from breaking glass to mariachi musicians. To this effect, sound is the key ingredient to the set-up and punchline of my work.

## **Body-Shop**

Antonio Romero

Imaging and Digital Arts

Colin Ives

I've made concentrated studies using such mediums as acrylic paint, photography, video, sculpture, and computers. Over the last two years, I've created a large collection of art in which I have pushed myself and my ideas to the point of resolution. This collection includes a photographic study incorporating collage and chemical experimentation, acrylic paintings using a mono-print technique as well as contemporary painting, and artist's books documenting my college career. Presently, several of my paintings are being shown at Akira, in Baltimore. I am now working heavily with computer art. I am creating an interactive piece exploring the human anatomy as a machine, created on some sort of assembly line, one no different than the next. With the presence of cloned sheep today, this project has appropriate timing. I created all the sound and visuals myself, using the Director, Photoshop, Poser, and Soundedit programs. This project will be a critique of the body, how we look at the body, and how we use the body. There will be several legs that the user will navigate themselves through, each connected to a main menu.



## The Storm

Jennifer Sachs

Visual Arts Department

Kirsten D'Andrea

An animated short loosely based on a quote from Virginia Woolf's *A Room of One's Own* and dealing with the confusion of finding one's personal identity through the blitzkrieg of commercial media and popular culture. This search for identity is specifically focused on the female vision of self in our society.

Shot on 7248 Kodak color negative, the film is composed mostly of armature animation filmed with a 16mm Bolex camera and collage shots filmed with the same on a basic animation stand. Double exposures were done in post-production on a JK optical printer.

The sound for the film was mixed from a variety of sources. A prerecorded storm was combined with music mixed on a computerized keyboard and a sequence of voices. The Virginia Woolf quote was pre-recorded and later added to the final mix. All mixing was done in the keyboard program and on a four-track, with special assistance from Christopher Sachs, enabling a smooth recording to be transferred to a tape (for later transfer to mag stock).

The sound is an essential element of the film. The abstractness of the visual piece is grounded by the explicative nature of the text and the emotive qualities of the music. The landscape used in the film is a reflection of the inner self which is being bombarded by the limitations socially "acceptable" roles impose on the individual. The closing of the giant eye symbolizes a turning away from these prescriptive and stereotypical boundaries, an act that leads to the discovery of one's "own eyes" and a personal viewpoint.

Much of my work deals with the struggle of women in a patriarchal society. Touched by a very poignant quote by Virginia Woolf, I created this short piece as my first real attempt at animation and as a tribute to her wisdom. Sometimes it is necessary to close one's eyes to the restrictions of society, to examine objectively and to create from what lies within.

*"If we face the fact, for it is a fact, that there is no arm to cling to, that we go alone and that our relation is to the world of reality and not the world of men and women, then the opportunity will come, and to work, even in poverty and obscurity is worth while."*

V. Woolf

A Room Of One's Own (excerpted quote)

# UMBC Environmental Graphic Design Program: Guidelines for Campus Signage

Zahra Z. Safavian

Visual Arts Department

Franc Nunoo-Quarcoo

A tour of the UMBC campus reveals that it is lacking in attractive and effective directional signage. This ineffectiveness is indicated daily by the number of visitors who ask students for directions to a number of locations on campus. This design project attempts to create guidelines for a campus signage system that is both attractive and functional.

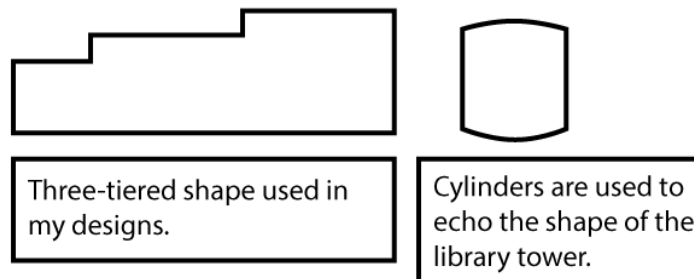
In this project I have chosen to emphasize the relationship between space, function, and form. To me, the space of UMBC has two prominent characteristics:

1. the library as a central building and
2. a three-tiered layout which adapts it to the hilltop on which it is built.

The library functions as a resource for research and a place for students to study. The new changes in its architecture make it stand out on campus. It is now a new and impressive space. Also, it is no coincidence that the library is visible from any point on the main path through campus. This placement is symbolic of UMBC's emphasis on academics. The three-tiered shape of the campus allows the campus to adapt to its site. I believe this is symbolic of the university's goal to prepare its students to adapt to all situations in life.

In my designs I have incorporated a three-tiered shape to symbolize the campus layout, and cylinders to symbolize the library tower. The colors used also have a symbolic function as well. The green I have chosen is a darker shade of the blue-green on the library tower. The gold is taken from UMBC's school colors-gold and black. Every element in my designs has been taken from the spaces and functions of UMBC to create forms meant to symbolize the spirit of this university.

Most importantly, I have designed by signs to effectively direct traffic around and inside the campus. Implementations of such a sign system prevents visitors from getting lost. As a result, they function to make visitors feel at home in this university.



## PHOTOGRAPHIC WORKS

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