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The Fourteenth Annual

John Wesley Powell – Illinois Wesleyan University

STUDENT RESEARCH CONFERENCE

To Recognize the Research Projects & Creative Endeavors of IWU Students

2003

SATURDAY, APRIL 12, 2003

Center for Natural Sciences

VISIT OUR WEBSITE AT: <http://www.iwu.edu/~jwprc/research.htm>

Fourteenth Annual

John Wesley Powell • IWU

Student Research Conference

Science Commons

Center for Natural Sciences

Saturday, April 12, 2003

8:30 a.m. - 4:00 p.m.

Official Program



ACKNOWLEDGEMENTS

This conference could not have been a success without the contributions of the Conference Faculty Advisory Committee, whose members were (alphabetically) Joy Calico, Carren Moham, Ram Mohan, Mike Seeborg, and Dan Terkla.

Many thanks to Pat Neustel, who did all the work putting this program booklet together, as well as making all the arrangements.

SCHEDULE OF EVENTS

Saturday, April 12, 2003

8:30 a.m.	Continental Breakfast and Poster Setup	Science Commons
9:00 a.m.	Poster Session A	Science Commons
10:00 a.m.	Oral Presentations – Session I	
	Session 1	Anderson Auditorium
	Session 2	Beckman Auditorium
11:00 a.m.	Keynote Address: Jason Babcock '94	Anderson Auditorium
12:00 noon	Luncheon	Main Lounge
1:15 p.m.	Poster Session B	Science Commons
2:15 p.m.	Oral Presentations – Session II	
	Session 3	Anderson Auditorium
	Session 4	Beckman Auditorium

KEYNOTE SPEAKER

**"DEVELOPMENT OF COMPONENTS FOR THE
NEXT GENERATION SPACE SHUTTLE "**

Jason Babcock '94, Ph.D., Research Scientist, Ultramet, Inc.

11:00 a.m. Anderson Auditorium (C101)

Jason Babcock graduated from Illinois Wesleyan University with a B.A. in Chemistry in 1994. He went on to the University of Chicago, where he completed an M.S. in 1995, and a Ph.D. in inorganic chemistry in 1998. While at the University of Chicago, Jason was a research assistant in Lawrence Sita's group, where his work included probing the metathesis of carbon dioxide with metal amides, and the development of a new method for the formation of high molecular weight polystannanes via transition metal catalyzed dehydropolymerization. Following this work Jason went on to a postdoctoral fellowship in Tobin Marks' group at Northwestern University. While there he prepared novel inorganic compounds that were used as MOCVD precursors and assisted in the growth of high-purity metal oxide and nitride films using these precursors. For the last three years Jason has been a research scientist at Ultramet, Inc., in Pacoima, California, where he has managed small business innovative research (SBIR) programs, with funding in excess of \$1 million in the past year. He is an expert in catalysis, thermal barrier coatings, volatile organic compound removal, and ceramic matrix composites, and film growth by sol gel and chemical vapor deposition. His recent publications include "Economical fabrication of thick-section ceramic matrix composites," and "Advanced monopropellant catalysts."

STUDENT PARTICIPANTS

Adhia, Nimish	O3.1	Maxwell, Emily	P25
Aggen, David	P1	Melick, Matthew	P27
Arnold, Joshua	P2	Melton, James	O4.2
Bae, Alexis	P3	Minnich, Leslie	P30
Bartelt, Marybeth	O2.1	Mogilevsky, Dmitry	P26, O2.3
Billings, Kylee	P5	Myers, Elizabeth	P28, O1.2
Binder, Joseph	P7	Norris, Jake	P30
Blumer, Kory	P6	Notz, Elizabeth	O4.3
Nick Brazis	P14	O'Neill, Erin	P29, P30
Brombosz, Scott	P8	Papreck, Justin R.	O3.4
Bush, Jilann	P9	Peterson, Katherine	P31
Carroll, Lauren	P10	Pierce, Jennifer	P32
Clauson, Cheryl	P11	Poppe, Emilia	P7
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Kohaus, Rob	P23	Tisoncik, Jennifer	P43, O2.2
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Longo, Julie	P24	Zolot, Liza	P44
Lyons, Christopher	O4.1	Zupancic, Melanie	P45
Marusarz, Rachael	O4.4		

ORAL PRESENTATIONS - SESSION 1

10:00 – 11:00

ANDERSON AUDITORIUM (C101)

- 1.1 Brekke A. Kroutil-Mueller,
Greek and Roman Studies
- 1.2 Elizabeth Myers,
Greek and Roman Studies
- 1.3 Patrick Spangler,
Economics

ORAL PRESENTATIONS - SESSION 2

10:00 – 11:00

BECKMAN AUDITORIUM (C102)

- 2.1 Marybeth Bartelt,
Biology
- 2.2 Jennifer Tisoncik,
Biology
- 2.3 Dmitry Mogilevsky,
Computer Science

ORAL PRESENTATIONS - SESSION 3

2:15 – 3:35

ANDERSON AUDITORIUM (C101)

- 3.1 Nimish Adhia,
Economics
- 3.2 Ann Steele,
Nursing
- 3.3 Kara Wolff,
Psychology
- 3.4 Justin Papreck,
Physics

ORAL PRESENTATIONS - SESSION 4

2:15 – 3:35

BECKMAN AUDITORIUM (C102)

- | | |
|-----|---|
| 4.1 | Christopher Lyons,
International Studies |
| 4.2 | James Melton,
Political Science |
| 4.3 | Elizabeth Notz,
Political Science |
| 4.4 | Rachael Marusarz,
History |

Note: Student's name is underlined, faculty advisor designated with *

Presentations are 15-20 minutes in length. If time permits, there will be a question-and-answer period for all presenters following the final presentation.

Oral Presentation O1.1

THE CONTEMPORARY ALEXANDER ROMANCE IN MULTI-MEDIA: HOW WE REGARD AND UTILIZE THE IMAGE OF ALEXANDER THE GREAT

Brekke A. Kroutil-Mueller and Nancy Sultan*
Department of Greek and Roman Studies, Illinois Wesleyan University

The historical figure of Alexander the Great has been shrouded since antiquity by the mythical Alexander. The so-called Alexander Romance is a blend of truth and fiction that has become so intertwined that every element of Alexander's life is touched by the seemingly fantastical. Indeed, Alexander seems a character entirely of legend more on par with tales of King Arthur and the round table than a real historical individual grounded in factual certainty. Because of this mythic quality, the Alexander Romance has continued to survive and inspire the perception of Alexander's character in many cultural traditions by easily adapting to the mores of the times. In the Western culture heavily influenced by the global turn of events in the twentieth century, the Alexander Romance has prevailed in film, historical fiction, the internet, and in academic writings. In the last few years it has become popular for historians to either vilify Alexander as one of the first in a long line of Western military oppressors or to hail him as an early example of multiculturalism. Yet in popular media, the perception of a heroic and romanticized Alexander prevails.

I argue that the Alexander Romance is alive and flourishing today in how we portray and perpetuate the image of the man Alexander. I will detail the progress and evolution of this new Alexander Romance by providing overviews of how Alexander is portrayed by scholars vs. popular culture and how this reflects contemporary Anglo-American notions of what makes a hero. I will approach this chronologically. First I will attack the problem that the Alexander Romance has always provided for scholars and what has gradually evolved into their consensus as to his either heroic or villainous character. Then I will contrast this academic view of Alexander with the popular view of Alexander's heroism by studying his image in the following mediums: fiction, film, and the internet. Each sub-category will be an overview of how that genre contributes to the Alexander Romance and how this reflects contemporary notions of heroism. Historical background information will precede each category. I will focus most of this exploration on the last twenty years.

Oral Presentation O1.3

COBWEB SUPPLY ADJUSTMENT AND THE MARKET FOR LAW STUDENTS

Patrick W. Spangler and Robert S. Leekley*
Department of Economics, Illinois Wesleyan University

This project investigates the factors that influence law school enrollment trends, particularly “boom” and “bust” cycles that can be explained by the cobweb model of supply adjustment. Determining factors that influence enrollment trends can create a better insight for law school administrators who control class sizes and acceptance rates. Taking into account the natural time lag for entrance into the market for lawyers (law school), this paper analyzes the significance of demand and supply factors using two-stage least squares. By examining the effect of wages three years prior on current enrollments, this paper finds the components of the cobweb model to have a large effect on enrollments trends although results did show some degree of linear adjustment.

Oral Presentation O2.2

**THE CONTRIBUTION OF COPB IN THE FUNCTION OF THE TYPE III
SECRETION APPARATUS FOUND WITHIN *CHLAMYDIA TRACHOMATIS***

Jennifer Tisoncik and Ken Fields*

Department of Biology, Illinois Wesleyan University
Laboratory of Intracellular Parasites, Rocky Mountain Laboratories

Chlamydia trachomatis is an obligate intracellular parasite that exists in two major forms during its developmental cycle: as an infectious particle known as an Elementary Body (EB) and *Chlamydia trachomatis* is an obligate intracellular parasite that exists in two forms during as a metabolically active, yet noninfectious Reticulate Body (RB). RBs replicate within an intracellular vacuole termed an inclusion. Gram-negative bacteria use a type III secretion system (TTSS) to export bacterial proteins into the extracellular environment or directly into eukaryotic cells (Hueck, CJ. 1998). The chlamydial genome contains genes encoding a type III secretion apparatus and it has been shown that TTSS is functional in *C. trachomatis* (Fields, KA. 2000). It is speculated that the TTSS is utilized by *Chlamydia* to deploy proteins that modulate host-cell pathways in order to maximize full virulence and to maintain the integrity of its intracellular niche. CopB (chlamydial outer protein B) may be the earliest protein exported by the TTSS, embedding itself into the eukaryotic membrane. This would suggest that CopB plays an important structural role in the initiation of the secretion pathway by creating a pore between cellular environments. The current paradigm of the TTSS illustrates that secretion is contact-dependent, indicating that only when bacteria come into contact with a host cell are effector proteins injected directly into the host cell cytoplasm (Hueck, CJ. 1998). However, expression studies have confirmed by immunoblot analysis that CopB is translocated from the cytoplasm of the bacteria into the eukaryotic membrane approximately 2 hours post-infection. This implies that the TTSS is independent and regulated by a mechanism other than contact in *C. trachomatis*. Furthermore, the data suggest that the protein apparatus is established prior to invasion and functions early in infection.

Poster Presentation P42, O3.2

**ON VS. OFF: CORONARY ARTERY BYPASS SURGERY FROM
A PATIENT'S PERSPECTIVE**

Ann Steele and Susan Swanlund*
School of Nursing, Illinois Wesleyan University

Throughout the years, technological advances have changed the face of cardiac surgery, but at times, it is a return to a previous technique, which proves beneficial. Prior to the introduction of cardiopulmonary bypass, cardiac surgery was performed on a beating heart, but due to the lack of an appropriate immobilizing device, the surgery was extremely complicated. With the introduction of new stabilization devices, immobilization of the heart has become easier and beating heart surgery has gained popularity once again. Multiple studies have been done which discuss the benefits of off-pump coronary artery bypass surgery (OPCAB), but none of the studies have explored the surgery from a patient's perspective. The patient is medicine's most important ally and as such, it is important that health care providers understand the fears, anxieties, and experiences that their patients undergo. Studies have compared OPCAB with conventional coronary artery bypass (CABG), but the patient's experience has not been explored.

The purpose of this study was to determine how people who have had both OPCAB and CABG view the surgical experience, their outcomes, and the fears they had prior to surgery. The sample was comprised of four men living independently in a small Midwestern community. The sample was recruited with the help of a local cardiovascular surgeon's office. The participants were interviewed using an interview guide. Interviews were audiotaped and transcribed. Inductive data analysis was completed using the transcribed interviews as well as field notes from the researcher. From the data, eight categories and five subcategories were formed. The categories included suggestions to other patients, recommendations to healthcare professionals, preoperative preparation, medications, symptoms prior to surgery, trust in doctors, postoperative depression, and comparisons between CABG and OPCAB. The last category was further subdivided into five subcategories, which included general comparison, subjective look of patient, length of stay, recovery period, and intubation experience.

The information gleaned from this study is of importance to nurses as well as other healthcare professionals as they work with patients before and after either type of bypass surgery. "It's a lifetime experience," and, therefore, it is important that healthcare professionals are fully prepared to care for and educate patients as their hearts are mended. The findings of this study may help to provide insight and knowledge about the patient's experience as they undergo one of these life-changing surgeries.

Oral Presentation O3.3

WOMEN AND GOD

Kara Wolff and Vicki Magee*

Department of Psychology, Illinois Wesleyan University

Many studies have shown that the transition into college can lead to stress and that stress can lead to depression in both men and women (e.g. Lopez & Gormley, 2002). Depression cripples both men and women. The lifetime risk of major depression is 10-25% for women and 5-12% for men (Greenspan, 2001). Mild symptoms rob men and women of energy needed for academic and social pursuits (Beeber, 1999). Depression results in poor over-all functioning, emotional behavioral problems and low self-esteem (Reinherz, Giaconia, Hauf, Wasserman & Silverman, 1999). Individuals with depression also have more problems in intimate relationships with friends and family (Reinherz et al., 1999).

This exploratory study, which launches a more in-depth investigation of Magee's (2001) unexpected finding about prayer journals, ultimately seeks to understand how to promote resiliency against threats to healthy development among college-aged women. This is a narrow inquiry guided by two research questions: (1) what role does belief in God play in the psychological and social development of college-aged women who self-identify as Christian; and (2) also, what is the relationship between prayer journals and depression.

Preliminary findings, based on survey data from college-aged women who self-identify as Christian, provide a framework to more fully understand the role that one's spiritual beliefs play in young adult women's psychological and social development. Discussion of findings included an interpretation of the relationship between one's perceptions of happiness, and unconditional love/joy.

Oral Presentation O4.1

INSIGHT INTO ILLINOIS WESLEYAN UNIVERSITY STUDY ABROAD

Christopher Lyons and Mona Gardner*

Department of International Studies, Illinois Wesleyan University

This project focuses on the reasons students do and do not study abroad during their years at Illinois Wesleyan. Currently, most IWU students do not study abroad for at least a semester, and I wish to analyze the factors behind this. My study abroad experience was one of the highlights of my IWU education, vastly increasing my self-reliance and knowledge of the world. I wish this experience could be realized by a majority of IWU students; therefore, I hope, as a long-term goal, that my research will provide insights that may lead to an increase in the number of IWU students who study abroad.

Following a review of the research literature about study abroad, and drawing on my skills as a Computer Science major, in March 2003 I conducted an internet-based survey at IWU. It was open to all students, including those who had and had not studied abroad. Questions attempted to attain students' perceptions of study abroad as well as their reasons for deciding or declining to do so. The survey was actually 5 separate instruments, with students choosing which pertained to them most, based on the following options:

1. Those who had studied abroad.
2. Those who had not studied abroad, but definitely planned to.
3. Those who had not studied abroad, but were considering studying abroad.
4. Those who were undecided as to studying abroad.
5. Those who did not plan to study abroad.

Students were invited to participate in the survey through email, and during the 5 days that I administered it, 516 students, or 25% of the 2,045 students in Spring 2003, responded.

Based on the literature and my study-abroad experience, I hypothesize that a large majority of students who have studied abroad have enjoyed their experiences, with many wishing they had had time to go abroad for another semester. I also predict that students will report that they had to surmount many hurdles before they could study abroad, and I hope that my research will show that these hurdles can be minimized or removed with some effort on IWU's part. Among those students who have not studied abroad, I predict that a vast majority, upon looking back, will wish that they had done so. Furthermore, I predict that most students who have not studied abroad have not done so because they believe their majors do not allow for a semester or more of off-campus study.

I will analyze the result not only to examine these hypotheses, but also to determine whether there are significant differences in responses based on gender, year in school, major(s)/minor(s), ethnicity, and hometown background.

The results of this study will be used to help increase student enrollment in study abroad programs in the future. The International Office will benefit directly by being enlightened as to study abroad perceptions that were previously unknown and can use the findings to improve services including, but not limited to advertising, increased cooperation with academic departments, and better communication with students. In the longer run, IWU will benefit from an increased rate of study abroad participation, allowing it to be more competitive in national rankings. Perhaps most important, an increase in study abroad participants will improve students' perceptions of the world and bring a greater appreciation for diversity to the campus.

Oral Presentation O4.2

THE IMPORTANCE OF MASS CULTURE FOR DEMOCRATIZATION

James Melton and James Simeone*

Department of Political Science, Illinois Wesleyan University

In the last thirty years, the importance of political culture in political science has risen, declined, and has risen again. Although the theories of political culture have been strengthened and refined in this process, modern culture theorists have yet to empirically demonstrate culture's ability to be used as an independent variable or to make causal claims using culture. This paper makes an attempt to solve these empirical deficiencies in cultural theory by setting up what Brian Barry calls a "critical test." Using the former USSR and the post-communist countries in Eastern Europe, I will test two hypotheses. First, mass values and not elite bargaining caused the transition from communism to democracy in these countries, and second, these mass values were not a result of "rational self interest" or elite manipulation, but they formed through the interaction of different sub-cultures. The first hypothesis will be tested by a quantitative analysis of the relationship between mass political protest and democratization, and to be considered valid, the peak level of democratization should follow the peak of mass political protest relatively closely. The second hypothesis will be tested using a cross-tab between culture and indicators of democratic values from the World Values Survey. To be considered valid, there should be a relatively strong significant correlation with individualist and egalitarian cultures displaying more democratic values than fatalist or hierarch culture. From the data gathered, these hypotheses seem to be valid; however, economic variables seem to play a minimal role as well.

Oral Presentation O4.3

CONTENTIOUS POLICIES: THE EXPERIMENT WITH AFFIRMATIVE ACTION IN UNDERGRADUATE ADMISSIONS TO PUBLIC UNIVERSITIES

Elizabeth Notz and Greg Shaw*
Department of Political Science, Illinois Wesleyan University

Affirmative action policies have polarized the American public for over a quarter of a century. With regard to undergraduate university admissions, the Department of Education has not issued a definitive policy stance and has chosen to rely upon the results of previous and forthcoming research. Most scholars have not seized the opportunity to explore the effectiveness of affirmative action on a university's minority admission or enrollment rates. Additionally, scholars have not established the role that other confounding factors, such as financial aid and academic preparation, play in determining admission or enrollment rates. This research explores the role of affirmative action policies and percentage plans in determining the admission and enrollment rate of African Americans and Hispanics at the University of California and the State University System of Florida. Results indicated that affirmative action increased the admission rates of the three disadvantaged minority groups while it decreases the enrollment rates of same groups in California. The amount of financial aid was also statistically significant when used to determine a minority group's admission or enrollment rate. In the Florida case, affirmative action was a factor in determining undergraduate admissions and enrollment rates. However, the models did not have the explanatory power of the California models. These findings have substantial implications for current public policy as the U.S. Supreme Court will consider two lawsuits against the University of Michigan and its various admissions policies.

POSTER SESSION A

9:00 - 10:00 a.m.

Odd-Numbered Posters

POSTER SESSION B

1:15 – 2:15 p.m.

Even-Numbered Posters

Note: Student's name is underlined, faculty advisor designated with *

During each poster session the author will be present to discuss her or his research with conference attendees, and answer questions.

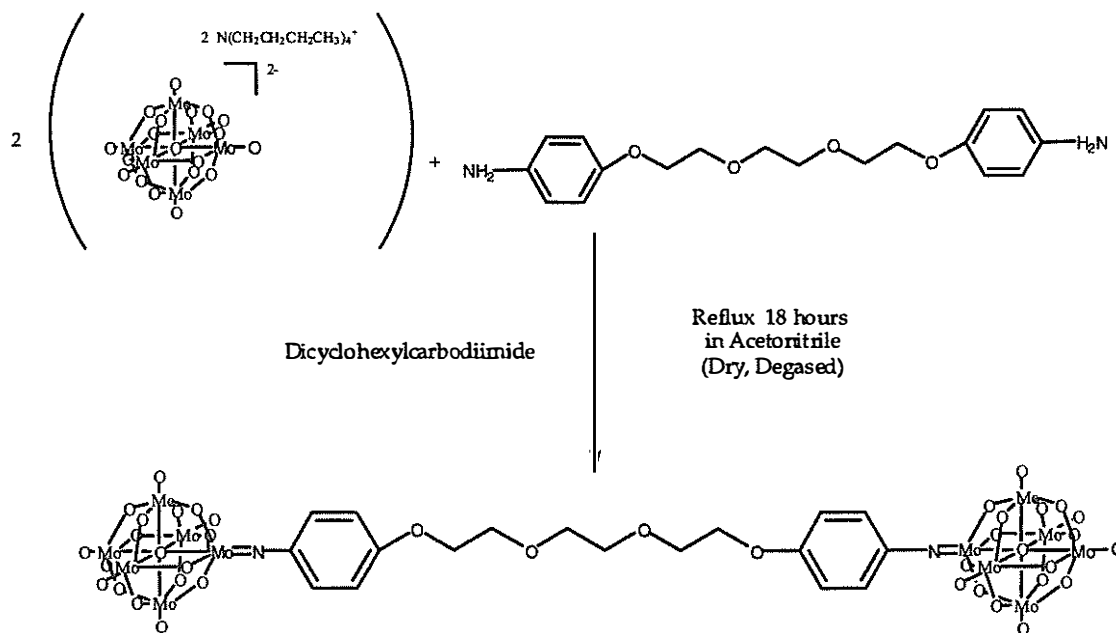
Poster Presentation P1

SYNTHESIS OF HEXAMOLYBDATE-POLYETHER DIAMINE COMPLEXES

David Aggen and Rebecca Roesner*

Department of Chemistry, Illinois Wesleyan University

Polyoxometalates are a class of highly symmetric anion clusters that have applications in supramolecular chemistry. These polyoxometalate clusters may be able to act as “ends” which trap macrocyclic rings on linear carbon chains. Polyoxometalates have already been incorporated into polymers¹ and dendrimers.² Our research involves the synthesis of a dumbbell shaped molecule through reaction of two equivalents of tetrabutylammonium hexamolybdate ($[\text{Bu}_4\text{N}]_4[\text{Mo}_6\text{O}_{19}]$) and 1 equivalent of a polyether diamine strap. The diamine was prepared from 4-acetamidophenol and 1,2 bis(2-chloroethoxy)ethane. Further reaction of the prepared diamine with the hexamolybdate ion $[\text{Mo}_6\text{O}_{19}]^{2-}$ was facilitated using dicyclohexylcarbodiimide ($\text{C}_{13}\text{H}_{22}\text{N}_2$) which acts as a catalyst and a dehydrating agent. Dicyclohexylurea ($\text{C}_{13}\text{H}_{24}\text{N}_2\text{O}$) is formed as a byproduct.³ Formation of the diamine-hexamolybdate adduct was verified by ^1H NMR and FT IR. We hope to refine our synthetic procedure to achieve higher yields.



¹ Moore, Aaron R.; Kwen, Haidoo; Beatty, Alicia M.; Maata, Eric A. *Chem. Comm.* **2000**, 1793-1794.

² Zeng, Huadong; Newkome, George R.; Hill, Craig L. *Angew. Chem. Int. Ed.* **2000**, 39, No. 10, 1772-1774.

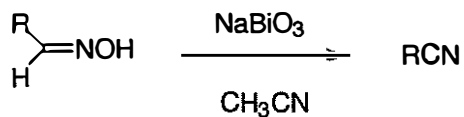
Poster Presentation P2

**A NEW METHOD FOR THE CONVERSION OF OXIMES TO
NITRILES USING SODIUM BISMUTHATE**

Joshua N. Arnold and Ram S. Mohan*

Department of Chemistry, Illinois Wesleyan University

Bismuth compounds are relatively non-toxic, easy to handle, and insensitive to small amounts of air and moisture. Hence they are attractive for use as catalysts and reagents in organic synthesis. The conversion of oximes to nitriles is a useful synthetic transformation. We have discovered that aldoximes can be smoothly converted to nitriles using sodium bismuthate. The results of this study will be presented.



Poster Presentation P3

CROSS-CULTURAL STUDY OF FRIENDSHIP: US AND KOREA

Alexis Yun-sun Bae and Doran French*

Department of Psychology, Illinois Wesleyan University

The present study explores different friendship characteristics among Korean and American college students. The concepts of Individualism and Collectivism, which have been applied to previous cross-cultural studies, will be examined in this study also in attempt to explain why differences in friendship characteristics exist across cultures. We expect to find in this study that Korean and American students emphasize different characteristics as important in friendships. Whereas Americans may emphasize enhancement of self-worth (i.e. friendships makes oneself feel better) as important in a friendship, Koreans may emphasize instrumental aid as an important factor in friendship. Other characteristics such as intimacy, disclosure, exclusivity, etc are also compared across the two cultures. Cross-cultural research in Korea and the U.S. has been completed, with 41 Korean participants from Yonsei University in Seoul, Korea, and 88 participants from Illinois Wesleyan University in Bloomington, Illinois. 2 questionnaires were administered to all participants, The Friendship Quality Questionnaire and Individualism and Collectivism scale, along with the Friendship Interview. The Friendship Quality Questionnaire and the Friendship Interview asked questions about the same 2 friends the participant indicated as being his/her closest friend. The Individualism and Collectivism questionnaire assess the participant on how individualistic or collectivistic he/she is. Analyses of the data are expected to show considerable differences between Korean and American friendship characteristics. The present study will apply Individualism and Collectivism to explain some aspects of the results, but will also emphasize the limitations of the concepts as well. We are expecting to demonstrate that these concepts may be too narrow to apply to every aspect of a culture, and will attempt to explore other explanations for the differences in friendship characteristics that are emphasized across the 2 cultures.

Poster Presentation P4

**THE *bchC* GENE IN BACTERIOCHLOROPHYLL
BIOSYNTHESIS IN RHODOBACTER CAPSULATUS**

Marybeth Bartelt and David Bollivar*

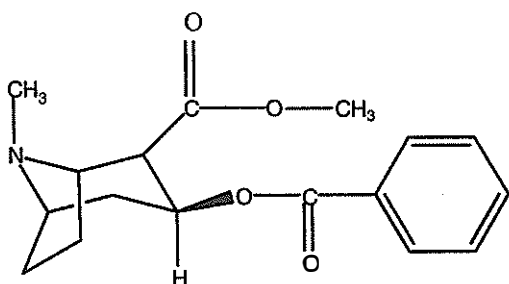
Department of Biology, Illinois Wesleyan University

This project was designed to test the hypothesis that the *bchC* gene of *R. capsulatus* contributes to bacteriochlorophyll biosynthesis and encodes the 2-hydroxyethyl bacteriochlorophyllide dehydrogenase. The gene was cloned and inserted into *E. coli*, and overexpression of the BchC protein was induced. A mutant strain that accumulates 2-hydroxyethyl bacteriochlorophyllide *a*, an intermediate in bacteriochlorophyll synthesis, provided a substrate for BchC assays. Activity of the BchC protein was indicated by presence of bacteriochlorophyllide *a*, as detected by fluorescence analysis. It was demonstrated that the BchC enzyme requires NADPH to perform its catalytic role.

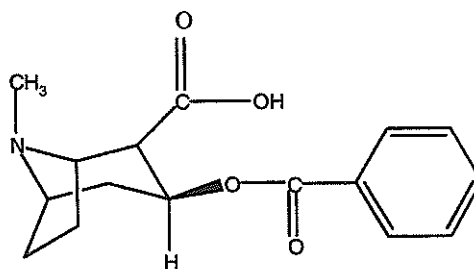
Poster Presentation P5

ISOLATION OF A COCAINE DERIVATIVE AND ITS
QUANTIFICATION IN URINE

Kylee Billings and Stephen Hoffmann*
Department of Chemistry, Illinois Wesleyan University



Cocaine



Benzoyllecognine

Benzoyllecognine (BE) is the most abundant metabolite of cocaine found in the human body. Analysis of BE in urine by gas chromatography/mass spectrometry is the method currently used to detect cocaine abuse. This current method is costly and time consuming, so finding an easier and more cost-effective approach is the goal of this research.

Due to BE being a zwitterion, it is highly soluble in water and very difficult to extract from urine. Once the pK_a values of BE are determined, either the cation or anion form of BE can be formed from the zwitterion by adjusting the pH appropriately. When BE is in a cationic or anionic state, it can be ion-paired with an appropriate counter-ion to form a neutral ion pair. This ion pair can then be extracted into a non-polar solvent, concentrated, and quantitatively determined by UV-Vis spectroscopy.

The following portions of this project have been completed: BE was synthesized, characterized, and purity tests were performed. Preliminary UV-Vis spectra of BE were measured to determine absorption bands of BE in various solvents. Based on these preliminary UV-Vis spectra, dichloromethane was determined to be the best organic extracting agent. Next, pK_a values were experimentally determined, with a pK_{a1} of 2.15 +/- .01 and a pK_{a2} of 11.41 +/- .01. The pH of the BE zwitterion solution was adjusted according to these values, and ion pairings and extractions were performed using various ions. Many ion pairs failed to give clear results. There has been some initial success with the ion pair formed between BE and Dragendorff's reagent. This ion pair is currently being tested and data gathered in order to generate a clear calibration curve.

Poster Presentation P6

**THE EFFECTS OF EXECUTIVE COMPENSATION STRUCTURE
ON SHAREHOLDER WEALTH AND COMPANY PERFORMANCE**

Kory Blumer and Michael Seeborg*
Department of Economics, Illinois Wesleyan University

Corporate executives are paid at extremely high levels compared to lower-level employees, especially in the United States, and their level of compensation usually does not change based on company performance with respect to competitors, but rather with changes in their company's stock price. It is well known that executive compensation among U.S. corporations is comprised mostly of stock options, sometimes up to 90% of overall compensation (EDGAR 2003). These stock options allow executives, namely chief executive officers (CEOs), to cash in big bucks during good times and risk zero losses during bad times. I use principal-agent theory and past literature to hypothesize the pattern of changes in shareholder wealth, and in reported earnings, from 1993-2001 for 20 U.S. "blue chip" companies. Using simple linear regression analysis, I find that differences in CEO compensation structure have no significant effects on shareholder wealth and reported earnings. I also find that companies whose CEOs sell an unusually high value of stock options suffer a significant decline in shareholder value in the following year. Policy implications, based on my findings and other literature, are also discussed.

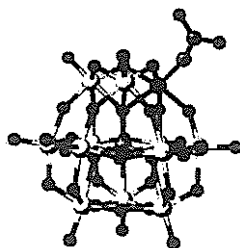
Poster Presentation P7

LINKING POLYOXOMETALATES WITH AMIDE BONDS

Joseph B. Binder, Emilia Poppe, and Rebecca A. Roesner*
Department of Chemistry, Illinois Wesleyan University

Polyoxometalates (POMs) of the Keggin structure, $[XM_{12}O_{40}]^{n-}$, are large metal-oxygen anions. One type, the unadecatungstophosphate lacunary Keggin ion ($[PW_{11}O_{39}]^{7-}$) has one fewer W-O unit than the usual Keggin ion, leaving a hole into which another metal atom can be inserted. In previous work, we inserted a rhodium atom with a carboxylate ligand into the vacancy and reacted this product with aniline to form an amide.

In the current work, the amide-forming reaction has been attempted with a diamine ($H_2NPhOC_3H_6OPhNH_2$). With two amine groups on the same molecule, two carboxylate groups on two polyoxometalates can form amide bonds with the same amine, tethering the two POMs together. The products of these reactions have been characterized spectroscopically.



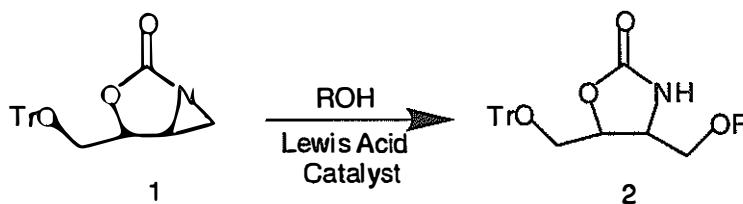
Keggin ion with rhodium-carboxylate adduct occupying vacancy

Poster Presentation P8

**SYNTHESIS OF A BICYCLIC AZIRIDINE COMPOUND AND
SUBSEQUENT RING OPENING REACTIONS**

Scott M. Brombosz and Jeffrey Frick*
Department of Chemistry, Illinois Wesleyan University

The bicyclic aziridine was synthesized from 2-butene-1,4-diol in several steps. We are currently studying the reaction of **1** with alcohols to form oxazolidinones (**2**). Synthesis of **1** and results of the ring opening reaction will be presented.



Poster Presentation P9

**THE EFFECT OF EXTRACURRICULAR ACTIVITIES ON
EARLY SCHOOL DROPOUT**

Jilann M. Bush and Doran French*

Department of Psychology, Illinois Wesleyan University

This study examined the relation between involvement in school-based extracurricular activities, particularly athletic involvement, and early school dropout. The Mahoney and Cairns (1997) model that shows that extracurricular involvement protects against early school dropout, especially among at-risk students, was tested in a large, middle class, predominantly white suburban sample. Assessments were completed for 501 8th grade students, 1,082 10th grade students, and 386 students at both levels. These students were also followed up at the 12th grade level only to assess school dropout status. Extracurricular activity data was collected from high school yearbooks. Logistic regression analyses showed that athletic involvement protected against early school dropout even after gender, attendance, achievement and antisocial behavior were controlled for. Subsequent analyses revealed that athletic involvement protected against early school dropout for both male and female students. Further analyses will assess the relation between extracurricular activities and early school dropout in high and low risk groups, as defined by achievement and antisocial behavior.

Poster Presentation P10

VIRTUAL BETTA

Lauren Carroll and Susan Anderson-Freed*

Department of Computer Science, Illinois Wesleyan University

My project is an interactive fish written in JavaScript and Cascading Style Sheets on the web. I drew all of the pictures needed for it and made and colored the animations. The user can choose the colors of various parts of the fish and then make the fish swim across the screen. I plan to use a poster to present the details of my project. I would like to have a computer available so that viewers will be able to try out the fish for themselves.

Poster Presentation P11

**PORPHOBILINOGEN SYNTHASE IN THE HEME
BIOSYNTHESIS PATHWAY OF *R. CAPSULATUS***

Cheryl Clauson and David Bollivar*

Department of Biology, Illinois Wesleyan University

Porphobilinogen synthase is an enzyme that is essential to the biosynthesis of tetrapyrroles, such as heme and chlorophyll, in organisms from bacteria to humans. The PBGS of purple non-sulfur bacteria of the genus *Rhodobacter* are thought to be unique in that they do not require zinc in the active site of the enzyme and that the enzyme is also not stimulated by the presence of magnesium, as it is in plants and the bacterium *Escherichia coli*. The *hemB* gene from *Rhodobacter capsulatus* was sequenced, and showed great sequence similarity to the related species *Rhodobacter sphaeroides*. The *hemB* gene was cloned into an expression plasmid to create an expression strain of *E. coli* to obtain large quantities of the PBGS protein. The protein was purified from the *E. coli* in milligram quantities and is in the process of being crystallized to determine the three-dimensional structure. Activity assays have shown that zinc, while not required in the active site, does stimulate the activity. Potassium also stimulates the enzyme activity. Magnesium, which has been shown to stimulate in some species, does not seem to stimulate the *R. capsulatus* PBGS. More activity assays are planned and include β -mercaptoethanol, and pH tests to find the optimal pH for the enzyme activity. Other work includes making a knockout mutation of the PBGS gene in *R. capsulatus* as there is evidence for viable mutants in *Rhodobacter sphaeroides*, which is significant since heme is required for life and this pathway is the only known mechanism for making heme.

Poster Presentation P13

**THE EFFECT OF SUPPLY AND DEMAND FACTORS
ON THE AFFORDABILITY OF HOUSING**

Jamie Davenport and Margaret Chapman*
Department of Economics, Illinois Wesleyan University

The difficulty of acquiring affordable rental units remains the most significant concern for low-income households. Despite the strong economic growth of the 1990s, one-third of all households spend more than the recommended thirty percent of their incomes on rental costs. These cost-burdened households face diminishing affordable rental units due to gentrification, rental rates increasing faster than real incomes, and the expiration of government subsidized rental units. The rental market is the focus of this paper since low-income households face the greatest barriers to acquiring affordable housing.

This paper uses an empirical analysis of the supply and demand factors affecting affordability as measured by the percentage of cost-burdened households in a metropolitan statistical area (MSA). The cross-sectional OLS regression uses data from 131 MSAs nationwide to examine the effects of household median income, fair market rents, population change, rental vacancy rates, percentage change in rental units, percentage of low-income households, and percentage of low-rent or subsidized units. The results indicate the significance of income levels and demonstrate the need for increased effectiveness of housing policy to make housing more affordable to low-income households.

Poster Presentation P14

PREPARATION OF A LINEAR, CONJUGATED AMINE AND ITS REACTIVITY WITH THE HEXAMOLYBDATE ION

Amy Durkin, Nick Brazis and Rebecca Roesner*
 Department of Chemistry, Illinois Wesleyan University

Polyoxometalates are anionic transition metal oxide clusters. The metal ions in these clusters are typically d^0 species: V(V), Nb(V), Ta(V), Mo(VI), W(VI). In some cases, it is possible to form bonds between common organic functional groups and these inorganic clusters. Organic derivatives of polyoxometalates have potential uses in medicine; in catalysis; and in the preparation of macromolecular and supramolecular species, such as polymers and rotaxanes. A rotaxane is a supramolecular entity in which a linear molecule has been threaded through a macrocyclic ring. The ring is held in place through the addition of bulky stoppering groups to the ends of the linear molecule. We propose to build a rotaxane using a conjugated, difunctional amine as the linear molecule, an appropriate macrocycle as the ring, and hexamolybdate ions ($\text{Mo}_6\text{O}_{19}^{2-}$, a common polyoxometalate) as the stoppers. To this end, we have prepared the amine shown below (Figure 1) according to the procedure of Hogarth et al.¹ and have explored its reactivity with n-tetrabutylammonium hexamolybdate (Figure 2).

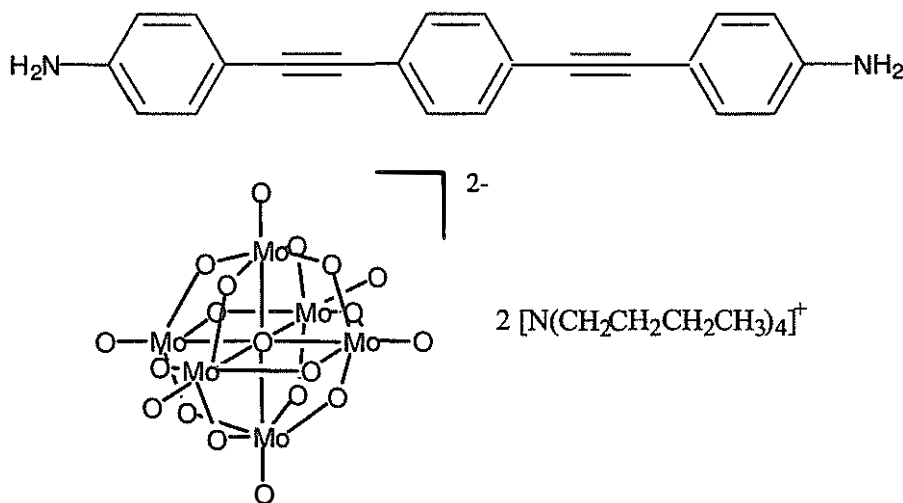


Figure 1. A linear, conjugated amine.

Figure 2. The n-tetrabutylammonium salt of the hexamolybdate ion

¹Hogarth et. al. "Linking metal centers with diimido ligands: synthesis, electronic and molecular structure and electrochemistry of organometallic ditungsten complexes $[\{\text{WCl}_2(\text{Ph}_2\text{PMe})_2(\text{CO})\}_2(\text{N-X-N})]$ ($\text{X} = \pi$ -conjugated organic) *J. Chem. Soc., Dalton Trans.*, 1999. pp 2705-2723.

Poster Presentation P15

ISOLATION, AMPLIFICATION, AND EXPRESSION OF *BCHC*

Eileen Forde and David Bollivar*

Department of Biology, Illinois Wesleyan University

The *bchC* gene of *Chloroflexus aurantiacus* has been identified by the use of computer based sequence homology searches. To test for function of the proposed gene, it was necessary to create a system so that the polypeptide encoded by the gene could be expressed and identified. Oligonucleotide primers were designed to amplify the *bchC* region so that this gene could be cloned. The amplified gene was cloned and sequenced, and ultimately placed in an expression vector that resides in the bacterium *E. coli*. The protein was then expressed using an arabinose induction system. SDS-PAGE and Western analysis have been used to confirm that the polypeptide is expressed properly. Enzymatic assays were then performed to test for function of the *bchC* gene product. The demonstration of the enzyme activity, 2-hydroxyethyl bacteriochlorophyllide oxidase, was successful allowing the designation of this gene as sufficient for the enzymatic activity.

Poster Presentation P16

THE TRUTH ABOUT INCOME INEQUALITY

Juliana Giraldo and Ilaria Ossella-Durbal*
Department of Economics, Illinois Wesleyan University

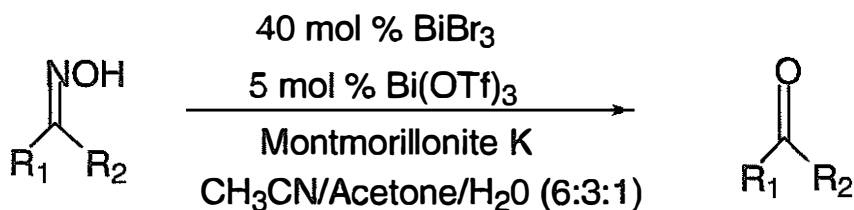
Until recently, sustaining high economic growth was thought to be the ultimate goal of development. Unfortunately, economic growth does not necessarily imply an improvement in the standards of living of all of the country's citizens due to the unequal distribution of income. Income inequality is a problem for both developing and developed nations across the globe, but it is most evident in the great metropolis of the developing world. Since economists have failed to come to an agreement as to what is the true relationship between growth and income inequality, researchers have shifted their emphasis to try to ascertain exactly what social and economic determinants affect the level income inequality in a country. Besides the level of income, this paper focuses on determining the effects that structure of output, structure of employment, population growth and the level of human capital have on the unequal distribution of income. Based on Kuznets' U-hypothesis and the two sector labor surplus model, this study uses two different simple regression models in order to establish the relationship between income inequality and each of these determinants. The results for this research show some evidence on the existence on the U-hypothesis as well as determine that the most important factors affecting income inequality are the level of human capital and population growth. Based on the results policy implications are discussed in the last section.

Poster Presentation P17

**A FACILE METHOD FOR THE DEPROTECTION OF OXIMES
USING BISMUTH BROMIDE-BISMUTH TRIFLATE**

Patrick D. Hayes, Joshua N. Arnold, Robert L. Kohaus and Ram S. Mohan*
Department of Chemistry, Illinois Wesleyan University

Ketones are obtained in good yields by treatment of oximes with 40 mol % BiBr₃ and 5 mol % Bi(OTf)₃ in CH₃CN/acetone/H₂O (6:3:1). Since oximes can be obtained from non-carbonyl compounds, this method also constitutes a useful synthesis of ketones. Advantages of this method include the use of relatively non-toxic and inexpensive catalysts. The results of this study will be presented.



Poster Presentation P18

**ORGANOCHLORINE PESTICIDE CONTAMINATION
PATTERNS IN NEARCTIC RESIDENT BIRDS**

Jeffrey Horvath and R. Given Harper*

Department of Biology, Illinois Wesleyan University

Thirteen species of Nearctic resident passerines and woodpeckers collected in central Illinois and North Carolina between 1991 and 2001 were analyzed for the presence of 17 organochlorine (OC) pesticides and metabolites. OC compound residues were detected in 29 of the 32 individuals examined.

Contaminated birds contained from one to eleven different compounds, with aldrin (mean \pm SE; 97.25 ± 35.16 ng/g), beta-BHC (20.60 ± 5.36 ng/g), DDE (26.65 ± 4.53 ng/g), dieldrin (24.88 ± 7.99 ng/g), endosulfan I (24.13 ± 4.76 ng/g), heptachlor (13.02 ± 2.40 ng/g), and heptachlor epoxide (18.35 ± 2.27 ng/g) appearing most frequently. Levels of contamination for specific compounds ranged from 3.84 ng/g to 688.95 ng/g. For the 15 specimens from Illinois, there was no significant difference in total OC levels in birds collected in urban locations (370.50 ± 143.43 ng/g) compared to birds collected in rural locations (112.91 ± 25.38 ng/g; $t = -1.95$, $df = 10.63$, $P = 0.08$). There was no significant difference in total OCs in birds collected from Illinois vs. North Carolina. Likewise, in the pooled sample there was no significant effect of diet (granivorous/insectivorous vs. insectivorous), or age class (AHY vs. HY) on total pesticide levels.

Use and production of the majority of the OC compounds detected have been banned or restricted in North America for 5-30 years. The high frequency of OC contamination in Nearctic resident birds indicates the presence of OC compounds in the environment through extended persistence, atmospheric deposition or illegal usage.

Jeffrey J. Horvath¹, R. Given Harper¹, Jeffrey A. Frick², Angelo P. Capparella³, John Gerwin⁴, and Rebecca Browning⁴

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Poster Presentation P19

**ENERGY CONSUMPTION OF EMBRYONIC STAGE IN THE
POND SNAIL *Physa* SP.**

David Jabs and William Jaeckle*
Department of Biology, Illinois Wesleyan University

The pond snail *Physa* sp. lays its eggs in egg masses containing a variable number of egg capsules, each housing an individual embryo. The egg capsules have an average length of ca. 800 μ m. Development from a single cell to a juvenile hatchling is complete in 4-5 days at 25° C. The energy consumption of individual *Physa* sp. embryos was estimated by measuring the rate of oxygen consumption. Respiration was measured by placing an individual in a water-jacketed micro-respiration chamber; the floor of the chamber was a micro-cathode oxygen electrode. Respiration of each embryo was measured as the decrease in oxygen within the chamber. All measurements were made at 20° C. The rates of O₂ consumption by embryos at 2 different stages were measured. Rates of O₂ consumption were converted into rates of energy consumption using the appropriate oxyenthalpic equivalent. The rates of energy consumption were found to range from 300 to 1200 μ J per embryo per hour. Being able to calculate the rate at which energy is consumed in each stage of development by the same individual will have several significances, it will (1) allow for the comparison between individual stages, (2) allow for the total cost development to be estimated, and (3) provide further understanding in the area of metabolic energy cost in invertebrate development.

Poster Presentation P20

THE ENVIRONMENT ENRICHMENT OF SUN BEARS

Natalie Jordan and James Dougan*

Department of Psychology, Illinois Wesleyan University

The present study studied the effects of environmental enrichment on the stereotypical behavior of zoo animals. Enrichment tubes were given to two Malaysian sun bears (*Helarctos malayanus*). The tubes, constructed of PVC pipe, were filled with a mix of peanut butter and popcorn. The bears' behavior was observed for hour sessions each day. The experimental design consisted of 3 phases: baseline, intervention, and baseline recovery. During the baseline phase the researcher recorded the initial stereotypical behavior of the bears for comparison with the other phases with no enrichment tubes. In the intervention phase the peanut butter and popcorn mix was placed in all four foraging tubes. The time the bears spent with each foraging tube and all of the bears' behavior was recorded. Lastly, the baseline recovery phase the baseline recovery phase was simply a return to baseline procedures in which the foraging tubes were again not present and the behaviors of the bears were recorded as in the baseline phase. The results have implications for the enrichment of captive zoo animals..

Poster Presentation P21

**LIVING DREAMS: A COMPARATIVE ANALYSIS OF “LAVIDA ES
SUENO” AND “WAKING LIFE”**

Jonathan Kaplan and Carolyn Nadeau*

Department of Hispanic Studies, Illinois Wesleyan University

The movie “Waking Life,” written and produced by Richard Linklater, can easily be compared to Calderon de la Barca’s play “Life is a Dream.” Calderon de la Barca helped revolutionize philosophy during the seventeenth century by comparing our dreams and reality. In the play, Prince Segismundo is struggling to find himself and his place in society while always questioning whether his life is real or if it is simply a dream. Similarly, Linklater’s movie focuses on our dreams and using them to understand life. By comparing the presence of fate vs. free will, dreams, philosophies on life, and many other ideas present in both the play and the movie, it is evident that “Waking Life” is a great modern day example of the play “Life is a Dream.”

Poster Presentation P22

**TWO FACETS OF COMPETITIVENESS AND THEIR INFLUENCE ON
PSYCHOLOGICAL ADJUSTMENT, ACHIEVEMENT, AND
DECISION-MAKING**

Elaine Kayhan and David Hibbard*

Department of Psychology, Illinois Wesleyan University

The purpose of this study was to better understand the influence of competitiveness as a personality trait on several life domains including psychological adjustment, achievement, and decision-making. Competitiveness was differentiated into two distinct facets. Superiority competitiveness represents a drive to outperform others with an emphasis on social comparison. Mastery competitiveness was differentiated as a focus on self-improvement and mastery of absolute challenges without regard for external standards. In terms of psychological adjustment, the effects of these facets of competitiveness on depression, loneliness, self-esteem, anxiety, and eating patterns were examined. Achievement was measured by assessing an individual's Grade Point Average and degree of conscientiousness. By looking at decision-making, the aim was to better understand how competitiveness influences our decision to pursue challenging situations. The relationship between future aspirations and competitiveness was also explored. Within the domain of psychological adjustment, it was hypothesized that superiority competitiveness was associated with higher degrees of depressive symptoms, loneliness, anxiety, and disordered eating patterns than mastery competitiveness. Mastery competitiveness was predicted to be associated with higher degrees of self-esteem than superiority competitiveness. It was also hypothesized that mastery competitiveness would be associated with an elevated level of academic achievement and would be related to the desire to pursue challenging situations compared to superiority competitiveness. Participants included 60 General Psychology students. Questionnaires were used to assess the aforementioned dimensions within psychological adjustment, achievement, and decision-making. A vignette was administered describing a typical situation students would face, in which participants were required to indicate their personal response by choosing one out of the two options. The results of the study will most likely reveal a relationship between superiority competitiveness and higher levels of depressive symptomology, anxiety, loneliness, and disordered eating patterns. With mastery competitiveness, a relationship will most likely be observed in greater levels of academic achievement and self-esteem. Results will probably also indicate an association between mastery competitiveness and a greater inclination to pursue challenging situations.

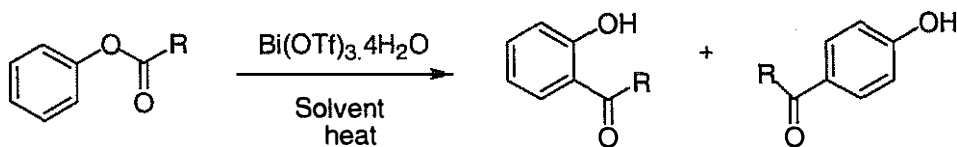
Poster Presentation P23

**THE UTILITY OF BISMUTH TRIFLATE AS A CATALYST
FOR THE FRIES REARRANGEMENT**

Robert L. Kohaus and Ram S. Mohan*

Department of Chemistry, Illinois Wesleyan University

Bismuth compounds are relatively non-toxic, easy to handle, and insensitive to small amounts of air and moisture. Hence they are attractive for use as catalysts and reagents in organic synthesis. The Fries Rearrangement is a useful synthetic transformation that allows the conversion of esters to hydroxy substituted ketones. Bismuth triflate is found to be a catalyst for the Fries rearrangement. The results of this study will be presented.



Poster Presentation P24

**MASCULINE THREAT, SELF-ESTEEM, AND HOMOPHOBIC
BEHAVIORS IN COLLEGE MEN**

Julie Longo and John Ernst*

Department of Psychology, Illinois Wesleyan University

Threatened masculinity may play a role in homophobic responses in college men. This idea is supported conceptually by Claude Steele's work on self-affirmational processes (1975, 1988, & 1993) and Roy Baumeister's work on self-esteem (1992; Baumeister & Tice, 1985; Baumeister, Smart, & Boden, 1996). Empirically, this is consistent with studies showing that masculinity and homophobia are positively correlated. In this study, homophobic or non-homophobic responses to a gay confederate were measured after a masculine threat or no threat manipulation. In the masculine threat condition, participants were given a test that was said to measure masculine knowledge and then received false feedback. The feedback that they received told them that their score was one standard deviation below the mean for college men. The no threat condition involved a general knowledge test in which no feedback of any kind was given. After the manipulation, the gay confederate would come in wearing a gay pride tee shirt and carrying a backpack with gay pride paraphenalia on it. We postulated that the masculine threat participants would have a homophobic response as a way of affirming their masculinity and their self-esteem. This response was measured by a professionalism questionnaire given to all participants. In this questionnaire, the participant was asked to rate the gay confederate ('experimenter') on a number of dimensions. We hypothesized that those who had been in the masculine threat condition would rate the experimenter poorly, thus exhibiting a homophobic response, when compared to the no threat condition. Results will be discussed.

Poster Presentation P25

AN INVESTIGATION OF DIFFERENT DIMENSIONS OF LONELINESS

Emily Maxwell and John Ernst*

Department of Psychology, Illinois Wesleyan University

Loneliness is thought to have multiple-dimensions: isolation, connectedness, and belongingness (Hawkley, et al., 1999). Isolation is a feeling of isolation, that is not limited to a lack of intimate others (Bednar & Ernst, 1999). A lack of connectedness corresponds to the absence of a close friend or partner. (Hawkley et al., 1999). Lack of belongingness represents feelings of inadequacy in relating with and inclusion in a group (Hawkley, et al., 1999). Male and female undergraduates completed a new measure of loneliness, the Loneliness Dimension Scale, which is intended to assess these three dimensions of loneliness. Factor analyses will be presented to assess whether these three factors are separable. If loneliness can be separated into two or more reliable dimensions this would have theoretical implications for the study of loneliness.

Poster Presentation P27

**THE RELATIONSHIP BETWEEN UNEMPLOYMENT FACTORS AND
MOTOR VEHICLE THEFT RATES**

Matthew D. Melick and Robert Leekley*
Department of Economics, Illinois Wesleyan University

This study attempts to bring together two opposing theories used to explain the relationship between unemployment factors and motor vehicle theft rates. One theory is that higher unemployment rates create an increase in the supply of criminals, while the other theory suggests an increase in the unemployment rate reduces the supply of property crime victims. The study uses state level data, from 1978 until 2000, on unemployment rates, unemployment insurance (a.k.a. welfare), and motor vehicle theft rates to determine what effect unemployment rate changes and variations in the generosity of unemployment insurance have on the motor vehicle theft rate. Control variables are also implemented to help explain variations in motor vehicle theft rates across states. The author proposes that a negative relationship exists between stationary, current levels of unemployment and the motor vehicle theft rate while as unemployment rates increase from one period to the next so do motor vehicle theft rates. The author also proposes that more generous unemployment insurance programs lead to lower motor vehicle theft rates. While the study confirms the hypotheses regarding unemployment rates, there are mixed results relating unemployment insurance and the motor vehicle theft rate. These results show that both the supply of offenders and the supply of victims help determine the motor vehicle theft rate. The mixed results found for unemployment insurance show the data restrictions and the ambiguous nature of the subject.

Poster Presentation P28

DEVELOPMENT OF AMINE PROTECTING GROUP STRATEGIES
COMPATIBLE WITH THE HEXAMOLYBDATE ION

Elizabeth K. Myers and Rebecca Roesner*

Department of Chemistry, Illinois Wesleyan University

Polyoxometalates are large, symmetrical, anionic metal-oxygen clusters of the groups V and VI transition metals in their highest oxidation states. They are known for their many interesting and useful properties: catalytic activity, reversible oxidation, applications in supramolecular chemistry, and anti-viral and anti-tumoral behaviors. Many of these properties could be better utilized through the introduction of organic and bio-organic substituents as linkers, handles, or tethers to the surface of the polyoxometalate. One widely studied polyoxometalate is the hexamolybdate ion $[\text{Mo}_6\text{O}_{19}]^{2-}$. One possible tool to better control the products of reactions between aromatic diamines and $[\text{n-Bu}_4\text{N}]_2[\text{Mo}_6\text{O}_{19}]$ is to use protecting groups.

A method was developed to protect only one end of a difunctional amine with the BOC protecting group. The BOC protecting group was successfully used to protect 1,4-butylene-bis(phenoxy-4-amine), and mono-BOC-protected 1,4-butylene-bis(phenoxy-4-amine) was isolated. The mono-BOC-protected 1,4-butylene-bis(phenoxy-4-amine) was then successfully reacted with $[\text{n-Bu}_4\text{N}]_2[\text{Mo}_6\text{O}_{19}]$ (Figure 1).

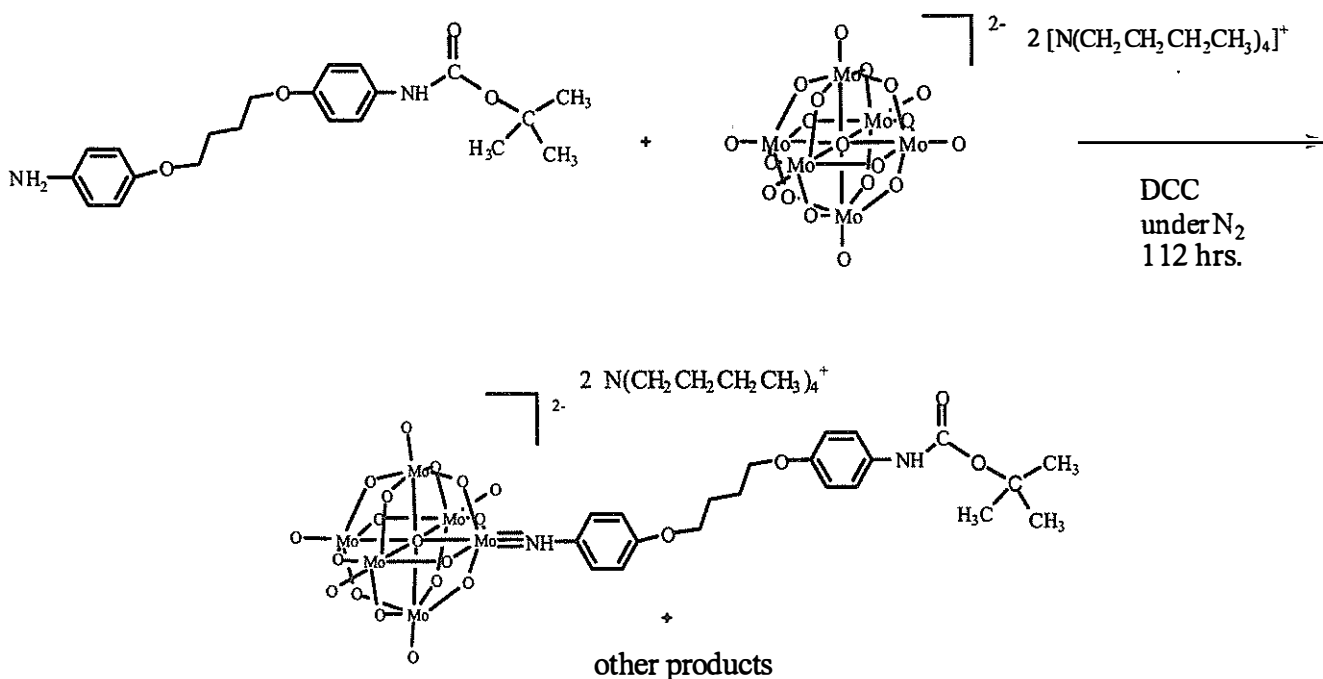


Figure 1: The reaction of mono-BOC-protected 1,4-butylene-bis(phenoxy-4-amine) with $[\text{n-Bu}_4\text{N}]_2[\text{Mo}_6\text{O}_{19}]$

Poster Presentation P29

**BEHAVIORAL TIMING THEORY APPLIED TO A DRL-LIMITED
HOLD PROCEDURE**

Erin L. O'Neill, Leslie Minnich, Jake Norris and James Dougan*
Department of Psychology, Illinois Wesleyan University

The Behavioral Theory of Timing (BeT, Killeen and Fetterman, 1988) argues that the timing of short intervals is mediated by collateral/adjunctive behavior. Numerous studies have supported the predictions of BeT. For example, the accuracy of timing behavior is positively correlated with rates of collateral behavior, and timing is more accurate when an explicit collateral behavior is made available or required. The present experiment sought to examine BeT under a DRL limited-hold procedure. In a DRL limited-hold procedure, subjects must wait a certain time interval before responding - early responses are not reinforced and reset the clock. However, the response must be made before expiration of a second time period. Six rats were exposed a step-down procedure in which they were required to stay on a platform for t seconds. The clock reset if the animal responded early, and reinforcers were not delivered. After t seconds elapsed, responses were reinforced only if they occurred before an additional h seconds (the hold period) had elapsed. Rats were tested in both the presence and absence of a stimulus for collateral behavior (a chew block). The results have implications for behavioral timing theories, as well as for schedule behavior in general.

Poster Presentation P30

**THE EFFECTS OF A PARENT-CHILD COMMUNICATION INTERVENTION
ON THE WORRIES OF SIBLINGS OF CHILDREN WITH AUTISM**

Erin L. O'Neill and Linda Kunce*

Department of Psychology, Illinois Wesleyan University

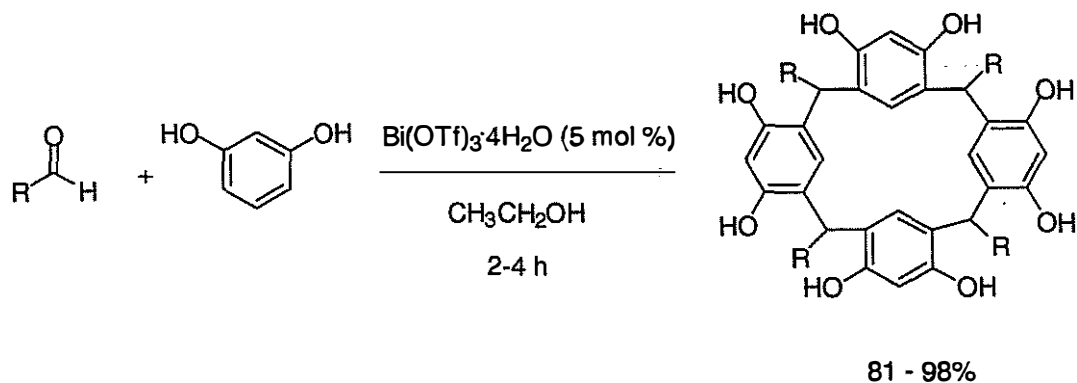
This study is designed to assess the effects of two different parent-child activities on the siblings of children with autism. Existing research suggests that the experience of having an autistic child in the family is highly variable and may have negative outcomes for the typical sibling. The difficulty in predicting sibling outcome may be caused by the lack of a theoretical framework organizing the factors hypothetically affecting sibling coping abilities, therefore a stress and coping model of siblings of children with autism is provided. Currently, there has been only limited information reporting successful intervention efforts for this population. This study attempts to correct many of the limitations of previous sibling intervention studies by including a larger sample size, objective measures, a control group, and parental involvement in the intervention. Participants are siblings of children with autism and their parents. This study uses a between groups design to evaluate the worries of sibling of children with autism after a brief one-time intervention. One group will complete a workbook focused on autism-specific worries, while another group of parent-child pairs will play games together. The children in each group will complete a questionnaire about their autism-related worries at the end of the activity.

Poster Presentation P31

**BISMUTH TRIFLATE CATALYZED SYNTHESIS
OF RESORCINARENES**

Katherine E. Peterson, Russell C. Smith and Ram S. Mohan*
Department of Chemistry, Illinois Wesleyan University

Resorcinarenes are macrocycles formed by the condensation of resorcinol with various aldehydes and have interesting applications as liquid crystals and cavitands. Bismuth triflate has been shown to be a very efficient catalyst for this condensation. Bismuth compounds are attractive Lewis acid catalysts because of their low toxicity, low cost and insensitivity to small amounts of air and moisture. The results of this study with several different aldehydes will be presented.



Poster Presentation P32

THE EFFECTS OF INCUBATION TEMPERATURE ON DEVELOPMENT TIME AND JUVENILE SIZE IN THE FRESHWATER SNAIL *PHYSA* SP.

Jennifer Pierce and Will Jaeckle*

Department of Biology, Illinois Wesleyan University

In 2002 we discovered that eggs of the snail *Physa* sp., when incubated at 20 °C, produced larger juveniles than eggs incubated at 25 °C. This study is a continuation of this earlier effort. *Physa* sp. eggs are laid in masses, with many egg capsules surrounded by a gelatinous material. Collected masses were each divided into four equal parts. Two sections were separated into individual capsules. The other two sections were kept in a mass form. One mass section and one group of individual capsules both were incubated at 20 and 25 °C. All individuals in each experiment were at least half siblings. Capsules were incubated with 12:12 hour light cycles and checked twice daily for hatching. Eggs incubated at 25°C took a significantly less time (average = 82 h) to hatch than those incubated at 20°C (average = 152 h). Incubation at the higher temperature resulted in significantly smaller juveniles (shell lengths) than the individuals produced from sibling capsules incubated at 20°C. Despite a significant difference in shell length among juveniles incubated at different temperatures, there was no significant difference in dry organic weight (biomass) of the individuals. These results indicate that shell length is not an accurate predictor of snail size (biomass) and shell growth and biomass growth are not equally affected by temperature. We propose that rate of biomass growth decreases with decreased temperature, but shell growth rate remains the same, or slows to a lesser degree. Thus, the processes involved in biomass growth are more temperature sensitive than those for shell growth.

Poster Presentation P33

**VARIATION IN RATES OF ASEXUAL REPRODUCTION BY
*CONVOLUTRILLOBA RETROGEMMA***

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Convolutriloba retrogemma, an acoel turbellarian (phylum Platyhelminthes), engages in an obligate symbiotic relationship with unicellular algae. This species reproduces asexually by budding from the posterior end of the parent individual. The rate of reproduction of 24 newly budded flatworms of various sizes was studied over a period of six weeks. Flatworms were individually placed into 6 mL of 0.2 μ m filtered seawater of 33.2 ppt salinity in each of the 6 wells of a multiwell plate. All plates were placed into an incubator set at a constant temperature of 25° C with invariable light conditions (12D:12L light cycle). Reproduction reached a peak during the third and fourth weeks when each flatworm produced an average of four clones. The average overall rate of reproduction was one clone every four to five days. However, observations of the budding process revealed a positive relationship between the size of the parent to the size of the clone and the number of clones produced, which may explain the substantial amount of variability in the rate of reproduction among individual flatworms. The results of this study suggest that the nature of the symbiotic relationship between the algae and the flatworm is mutualistic. Since budding proceeded without access to prey, the environmental conditions were adequate to promote photosynthesis by the algal symbionts resulting in sufficient energy for the flatworm to reproduce. The flatworm, in return, provides shelter and potentially nutrients to the algae.

Poster Presentation P34

**THE SYNTHESIS AND ISOLATION OF MONO-BOC-PROTECTED
1,4-PHENYLENE DIAMINE AND FURTHER REACTION WITH
HEXAMOLYBDATE**

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When reacting unprotected diamines with polyoxymetalates, a mixture of di-, mono-, and unsubstituted products is obtained. A simple aromatic diamine, 1,4-phenylene diamine, was used to investigate a method through which a mono-BOC-protected diamine could be synthesized and isolated for further reaction with the hexamolybdate ion to obtain a mono-substituted product. The 1,4-phenylene diamine was purified by sublimation and the purified diamine was then reacted in a 1:1 mole ratio with di-*tert*-butyl dicarbonate to mono-protect the diamine. According to GC-Mass Spectrometry, the acetonitrile-soluble products of this reaction were 97.7% mono-protected and 2.0% di-protected. The mono-protected product was then purified via column chromatography with final percent yields of 89.1% and 81.5% in two trials. Purity was verified by GC-Mass Spectrometry and H-NMR. The mono-protected 1,4-phenylene diamine was reacted with the hexamolybdate ion to yield a mono-substituted 1,4-phenylene diamine.

Poster Presentation P35

**THE PHOTOCHEMISTRY OF NITROUS ACID IN
AN AQUEOUS MATRIX**

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The thermal and photochemical decomposition of aqueous solutions of nitrous acid and nitrite ion were studied, with a focus on the production and subsequent reaction of hydroxyl radicals. The production of these radicals in aqueous solution may be determined indirectly by disappearance of nitrous acid, or more directly by their interaction with a radical scavenger. Benzene was used to scavenge hydroxyl radical and the products of reactions with hydroxyl radical as well as nitrous acid were characterized. The role of temperature, pH, and dissolved gases were also examined.

Poster Presentation P36

**NARRATIVE UNDERSTANDING AND THEORY
OF MIND IN PRESCHOOLERS**

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Social cognitive development is a phenomenon psychologists have studied for many years. Recent studies have focused on children's understanding of a theory of mind, that is, understanding what it means to say that someone thinks, believes, or knows something. In other words, a theory of mind represents an understanding of epistemic mental states that humans use to describe, predict, and explain behavior (Baron-Cohen, 1996).

The present study examined the relation between a developing theory of mind, emotion regulation, and language ability, by specifically examining changes in children's understanding of the feelings, thoughts, and actions of storybook characters. Children (n=15; aged 34 to 57 months) were given pre-tests and a post-test involving false belief tasks, deception tasks, the ability to understand facial expressions of emotion, and language comprehension, in order to detect differences in individual scores before and after children were read 14 different stories rich in mental state situations. These readings occurred over a 4-5 week period at the child's day care center or nursery school. The storybook sessions were taped in order to examine trends and patterns in the children's developing theory of mind. These data were collected as part of a larger study examining the impact of cumulative experiences with mental-state rich narratives on false belief understanding where preliminary analyses indicated that overall, scores improved from pre-test to post-test (n=38). In the present study, "correct" responses to questions elicited from the children during the storybook readings were assessed for three types of questions: Appearance/reality, the definitions and description of mental state phenomena, and explanations of mental-state related behaviors. Number of correct responses to these three question types will be examined with respect to children's performance on the language and theory of mind measures.

Poster Presentation P37

**THREATENING MASCULINITY AND ITS EFFECTS ON
ANTIGAY ATTITUDES AND BEHAVIOR**

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This study examined the relationship between threatening masculinity identity in men and antigay attitudes and behaviors. In a mass testing session, college men were assessed using scores on the Male Role Norm Scale, which measures participants' perception of what constitutes male roles. Male participants were called back for the second part of the study, in which they were hooked up to psychophysiological recording equipment and assigned to one of two conditions. In the masculine threat condition, participants took a test supposedly measuring masculine knowledge and received false feedback of poor performance. In the no threat condition, participants took a test supposedly measuring general knowledge, but did not receive any feedback on performance. Following the experimental manipulation, a male confederate, wearing a t-shirt and backpack with homosexual paraphernalia, then administered a professionalism questionnaire, in which the participant was asked to rate the professionalism of the male confederate. This questionnaire was used as a behavioral measure. Participants were then asked to complete another battery of questionnaires relating to attitudes toward gays, women, and minorities. It is predicted that participants with high masculinity will express more antigay attitudes and behavior in the masculine threat condition than participants with low masculinity. Participants in the no threat condition are expected to express the least antigay attitudes and behaviors, regardless of masculinity levels. For all participants, we expect to see a clear physiological threat pattern in the masculine condition and an absence of this pattern in the no threat condition.

Poster Presentation P38

MACROECONOMIC EFFECTS ON THE HORSE RACE BETTING MARKET

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There are many similarities between the market for horse race betting and the stock market. Some of these similarities include a large number of participants, complete ease and entry into the market, and extensive market knowledge. Both markets also operate under conditions of risk and uncertainty. Previous research has shown that the stock market responds to macroeconomic indicators. Due to the similarities between the stock market and the market for horse race betting, I hypothesize that the market for horse race betting also responds to macroeconomic indicators. Based on the wealth effect, an increase in wealth represented through improving macroeconomic conditions should cause individuals to consume more, in this case on horse race wagering. I look at total United States horse race wagering and GDP figures, as well as Illinois and California's GSP, unemployment rate and horse race wagering totals. To test the hypothesis, I run a correlation between GDP and wagering totals and run a linear regression for Illinois and California using horse race wagering figures as my dependent variable and state GSP and unemployment for my independent variables. The results show a positive relationship between wagering totals and GSP and a negative relationship between wagering totals and unemployment. Though the results vary in the level of significance, they imply that macroeconomic indicators affect the market for horse race betting. Positive macroeconomic announcements increase the demand for horse race betting and negative macroeconomic announcements decrease the demand for horse race betting.

Poster Presentation P39

THETA RESET AND WORKING MEMORY IN HUMANS: AN EEG STUDY

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The purpose of this study is to determine the nature of frontal lobe activity, specifically theta EEG activity, while performing a working memory task. Theta activity, which is evident in cortical areas such as the entorhinal cortex, the hippocampus, and the anterior cingulate plays an important role in information processing (Bland, 1986; Chrobak and Buzsaki, 1998b; Dickson et al. 1994, Givens and Olton, 1994, 1995; Mizumori et al., 1990; Sarnthein et al., 1998; Sato and Sakata, 1999; Winson, 1978). One way the theta rhythm may influence cognitive processing is by theta resetting in which the ongoing theta rhythm becomes phase-locked to the onset of a sensory stimulus (Givens, 1996). Theta reset follows stimuli across a number of sensory modalities in a variety of cognitive tasks, indicating that theta reset may be a general neural mechanism to enhance learning and memory.

Previous research by Williams, Johnson, and Givens (submitted to Journal of Neuroscience, 2002) recorded theta activity of rats while performing a working memory task. This study investigated whether theta reset in the frontal area of the brain can also be detected in humans during a working memory task. The memory task proposed for this study is similar to Williams' delay non-match to position task used in rats in that both tasks contain an encoding and retrieval phase in which the subject must recall, after a delay period, the initial sample in order to make a correct choice. Therefore it is predicted that the proposed study should yield similar patterns to those discovered in rats.

Thirty male and female student volunteers from the General Psychology courses at Illinois Wesleyan University will serve as the participants in this study. Each participant was asked to complete a series of computer-based working memory tasks created by the program "Superlab" of Cedrus Corporation (Phoenix, AZ). At the same time that these students performed the computer tasks, EEG data was collected from two frontal brain areas (midline and either left or right) via an electrode cap to monitor changes in theta activity. Differences in theta activity of each area before and after encoding and retrieval phases of the task will be noted. Currently data is being analyzed and results will follow.

Poster Presentation P41

**P-FASTUS: INFORMATION EXTRACTION SYSTEM
IMPLEMENTED IN PROLOG (SICStus)**

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P-FASTUS is an Information Extraction (IE) system developed in SICStus Prolog based on the implementation of FASTUS. FASTUS is an IE system developed by Stanford Research International uses a cascade of finite state automata.

A vast majority of the information held by businesses, government agencies and individuals alike are stored in text files. With the advent of the internet, the amount of textual information in the form of natural languages has been growing exponentially. Searching for documents containing relevant information on the web has become a fairly daunting task. Reading through thousands of documents to obtain the information that you require can be cumbersome. In order to address this issue, researchers have been developing Information Extraction systems using the techniques of Natural Language Processing (NLP).

The goal of Information Extraction is to extract from a set of documents, prominent facts about pre-specified types of events, entities or relationships. P-FASTUS is a system that extracts pre-specified information such as the name of the company, location and the position being advertised from "Job Postings" in text files. The system, like FASTUS, is composed of different levels of processing that are developed using Finite State Automata.

Finite State Automata are ideal machines not bound by any physical constraints that are composed of one or more states. The machine moves from one state to another based on the input. The movement is governed by a transition function at each state. When the entire input is read and the machine either stops at what is known as an accepting state or state that rejects the input. For the purposes of Information extraction Finite State Automata are used to approximate finite-state grammars which are then used for pattern matching of specific linguistic constructs that contain the information desired to be extracted.

Most of the IE systems were implemented in Lisp and C and none in Prolog despite the fact that Prolog's features make it a language that is more suitable for NLP. SICStus is a version of Prolog that supports constraint programming capabilities. The goal of this project was to implement FASTUS in a constraint logic programming language and assess possible advantages of implementing an IE system in such a language.

Poster Presentation P42, O3.2

**ON VS. OFF: CORONARY ARTERY BYPASS SURGERY FROM
A PATIENT'S PERSPECTIVE**

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Throughout the years, technological advances have changed the face of cardiac surgery, but at times, it is a return to a previous technique, which proves beneficial. Prior to the introduction of cardiopulmonary bypass, cardiac surgery was performed on a beating heart, but due to the lack of an appropriate immobilizing device, the surgery was extremely complicated. With the introduction of new stabilization devices, immobilization of the heart has become easier and beating heart surgery has gained popularity once again. Multiple studies have been done which discuss the benefits of off-pump coronary artery bypass surgery (OPCAB), but none of the studies have explored the surgery from a patient's perspective. The patient is medicine's most important ally and as such, it is important that health care providers understand the fears, anxieties, and experiences that their patients undergo. Studies have compared OPCAB with conventional coronary artery bypass (CABG), but the patient's experience has not been explored.

The purpose of this study was to determine how people who have had both OPCAB and CABG view the surgical experience, their outcomes, and the fears they had prior to surgery. The sample was comprised of four men living independently in a small Midwestern community. The sample was recruited with the help of a local cardiovascular surgeon's office. The participants were interviewed using an interview guide. Interviews were audiotaped and transcribed. Inductive data analysis was completed using the transcribed interviews as well as field notes from the researcher. From the data, eight categories and five subcategories were formed. The categories included suggestions to other patients, recommendations to healthcare professionals, preoperative preparation, medications, symptoms prior to surgery, trust in doctors, postoperative depression, and comparisons between CABG and OPCAB. The last category was further subdivided into five subcategories, which included general comparison, subjective look of patient, length of stay, recovery period, and intubation experience.

The information gleaned from this study is of importance to nurses as well as other healthcare professionals as they work with patients before and after either type of bypass surgery. "It's a lifetime experience," and, therefore, it is important that healthcare professionals are fully prepared to care for and educate patients as their hearts are mended. The findings of this study may help to provide insight and knowledge about the patient's experience as they undergo one of these life-changing surgeries.

Poster Presentation P43

**CHARACTERIZATION OF NUTRIENT ASSIMILATION FROM
EXTRAEMBRYONIC INTRACAPSULAR 'FLUID' RESERVES DURING
NONPLANKTONIC DEVELOPMENT OF THE FRESHWATER SNAIL
PHYSA SP.**

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Many species of gastropod snails undergo development from a zygote to a juvenile while enclosed within an egg capsule. Egg capsules are embedded within a discrete gelatinous mass that is deposited onto a substratum. Within each capsule, an embryo is bathed in a nutrient-rich intracapsular fluid. This fluid serves as the primary source of nourishment and is essential for the complete development of the embryo. My project explores the process of macromolecule acquisition and translocation during the encapsulated development of the freshwater pulmonate, *Physa* sp. Dextran compounds were carefully injected using a glass micropipette into capsules of newly laid egg masses and the embryos were observed over the course of development until they hatched. FITC-Dextran was used to evaluate the distribution of assimilated materials as development progressed in living embryos. Fluorescence microscopy revealed that all embryonic cells directly exposed to the intracapsular fluid at early stages of development incorporate the labeled molecule, thus there was no cellular specificity for the uptake of material. As the embryo develops into a juvenile, the fluorescent label was localized within a recognizable structure, identified as the visceral mass, irrespective of the stage the embryo was exposed to FITC-Dextran. This evidence is further supported by the results from an experiment examining non-living embryos exposed to iron dextran. Capsules were injected with iron dextran at the initiation of the cleavage stage and then fixed at daily intervals. The embryos were removed from the capsule and the iron incorporated in the embryonic cells was detected using the Prussian Blue Reaction.

Poster Presentation P44

**DEVELOPMENT OF A MEASURE OF MEN'S OBJECTIFICATION
OF WOMEN**

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The purpose of this study was to develop a measure of men's objectification of women. This measure focuses on one way in which men evaluate and comment on women in everyday contexts. Objectification is defined as any action that separates a woman's body, body parts, or sexual functions from her person or regards her body as representative of her. Based on research in areas of sexual harassment and self-objectification, items for this measure were developed to examine six research questions: When a man objectifies a woman, do his comments exclude her face and emphasize her body? Is objectification practiced as a social behavior around other males? Are women constantly under surveillance of a man who objectifies? Will a man objectify a woman regardless of whether he is attracted to her? Does a man try to remain anonymous from the women he objectifies? Does a man's objectification behaviors and attitudes lack respect for women? Approximately 100 Illinois Wesleyan University male students enrolled in general psychology and other courses completed the preliminary measure, and analyses were conducted to examine whether the items were consistent with one another.

Poster Presentation P45

**STRUCTURAL IMPLICATIONS OF FLUORESCENT PROPERTIES
OF THE GLOBAL TRANSCRIPTION FACTOR, FNR**

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The FNR protein is a transcription factor that allows *Escherichia coli* to undergo anaerobic cellular respiration. It is known to positively regulate the expression of several genes required for anaerobic respiration as well as negatively regulate genes responsible for aerobic respiration. Consequently, FNR is active under anaerobic conditions and inactive under aerobic conditions. Although the tertiary structure of FNR is unknown, previous studies have indicated that FNR is inactive in the monomeric state and active in the dimeric state. Thus, it is believed that in anaerobic conditions, FNR undergoes a conformational change from the monomeric to dimeric state. The mechanism involved in going from the monomeric to dimeric state is not completely understood, but it is thought to be triggered by the acquisition of a $[4\text{Fe-4S}]^{2+}$ cluster in the N-terminal region of FNR. The acquisition of the cluster causes a conformational change to be transmitted through the allosteric domain to the dimerization helix resulting in the active dimeric species. Information regarding the environment of amino acid residues in the dimerization helix in both the active and inactive forms of FNR could be helpful in eliciting a better understanding of the dimerization mechanism. Such environmental conditions can be determined by the fluorescent properties of the amino acid, tryptophan. Surface exposed tryptophan residues are expected to have a longer λ_{max} than those buried in the hydrophobic core. In order to gain insight into the environment of the amino acids on the dimerization helix we have created tryptophan mutants that either lay on or near the helix. The mutants LW146, KW163, and KW164 all lie on the periphery of the helix while MW147 lies on the helix. Of the four mutants, MW147 and KW163 retained anaerobic activity indicating that their structure is similar to the wild type protein with the exception of the single amino acid substitution. Because MW147 lies on the helix directly it is a better candidate to yield information regarding conformational changes along the helix during the monomeric-dimeric shift than KW163. By comparing the fluorescence of the active and inactive forms of MW147 and KW163, we hope to gain a better understanding of the dimerization mechanism of FNR.