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E I G H T H

A N N U A L

John Wesley Powell

IWU Student
Research
Conference

April 11 and 12, 1997

Center for Natural Science
Learning and Research



SCHEDULE OF EVENTS

Friday April 11, 1997

7:30 pm	Presentation by Mancur Olson Distinguished University Professor Department of Economics University of Maryland, College Park	Main Lounge
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Saturday April 12, 1997

9:00 am	Continental Breakfast and Poster Session A	Science Commons
10:30 am	Oral Presentations (Concurrent Sessions)	Beckman Auditorium Anderson Auditorium
12:00 pm	Lunch	Main Lounge
1:30 pm	Poster Session B Artificial Person/Robotics Tic-Tac-Toe Contest: Shelley (IWU) <i>vs</i> IRIS (ISU)	Science Commons
2:30 pm	Alumni Presentations, Recognition of Phi Kappa Phi Initiates and Certificate Presentations	Anderson Auditorium

The Organizing Committee would like to thank:

Minor Myers, jr, President, IWU

Janet McNew, Provost

Carl Teichman, Assistant to the President

Student Senate

Judy Huff, Natural Science Division Secretary

Lon Shapiro, Visiting Assistant Professor of Computer Science

Members of the Organizing Committee

Jeff Frick, Assistant Professor of Chemistry

Pam Lowry, Assistant Professor of Economics

Johnna Shapiro, Assistant Professor of Psychology

**ORAL PRESENTATIONS - SESSION 1
ANDERSON AUDITORIUM
(C-101)**

10:30 - 10:45	Erica Joncich
10:45 - 11:00	Nicole Busceni
11:00 - 11:15	Rebecca Brackmann
11:15 - 11:30	Catherine Webb
11:30 - 11:45	Krishnam Nambudiripad

note: * denotes faculty supervisor

Oral Presentation 1.1

REINVENTING THE WEST: A CULTURAL MAP OF RUSSIAN PERESTROIKA

Erica Joncich and Marina Balina*,
Department of Modern Languages and Literature, IWU

My research is an investigation into the roots of change that have shaped the cultural map of Russia. Russian culture has a distinct polarity, existing as two bipolar fields with no neutral zone. With this duality, there is no room for a neutral sphere of life and instead behavior is seen as fitting into one field of existence or another. This is known as the "binary model of Russian culture" as described by Yuri Lotman. The two most extreme periods in Russian cultural history, the time of Peter the Great and Mikhail Gorbachev, are characterized by explicit breaks with the past. Both of these leaders turned to the West as a compass for progress, causing the deepest conflicts of Russian culture to rise to the surface.

The strongest manifestation of binary logic in Russia is its attitude towards the West, creating a radical distinction between what is "ours" and what is "alien." This binary opposition does not exclude the idea of progress from its cultural vocabulary though and movement towards the future also follows a distinctive cultural map. Every period of Russian history is characterized by a decisive break with the past while, at the same time, there is evidence of repeated events that regenerate the culture of the past. The past is always negated but also rooted in the future.

A dualism exists in the understanding of the nature of cultural change for Russia, dividing the country into two camps: Slavophiles and Westernizers. Slavophiles defend the Russian tradition and believe evil comes from without (the West). They contend that Russia is a morally superior nation. Westernizers oppose this notion of Russia's higher calling and instead believe that the West should serve as a model of modernization. My research will examine the programs for change of both Peter the Great and Mikhail Gorbachev, demonstrating the similarities in their contributions to the shaping of Russia's cultural map.

Oral Presentation 1.2

**MALE AND FEMALE MODES OF ORDERING
IN THE CANTERBURY TALES**

Nicole Buscemi and Dan Terkla*, Department of English, IWU

In his Canterbury Tales, Chaucer examines a conventional, male mode of imposing order, characterized by destruction and containment. This mode is epitomized by Theseus in the "Knight's Tale," particularly in his construction of the lists. However, for the most part, this mode of ordering fails. So in the "Second Nun's Tale," Chaucer proposes, and prefers, an alternate and productive female mode ordering which starts in containment and expands outward, affecting people and situations exponentially.

The first part of my study focuses on the conventional mode of ordering, as utilized by Theseus, and this order's failure. I then discuss the female mode of ordering as demonstrated by the Second Nun, the Virgin Mary, and finally, St. Cecilia. I close by suggesting that Chaucer's method of ordering the Canterbury Tales parallels the female mode of ordering associated with the "Second Nun's Tale."

Oral Presentation 1.3

HARRY AT HARFLEUR: GENDER ROLES AND THE CHARACTER OF THE KING

Rebecca J. Brackmann and Dan Terkla*, Department of English, IWU

The battle of Harfleur in Shakespeare's Henry V has long been considered an example of Henry V's misogyny and ruthlessness. In the paradigm of Henry V proposed by Norman Rabkin, Henry can be either an ideal Christian king or a brutal warlord at different moments in the play, and most critics put the king at the battle of Harfleur solidly into the second category. This paper explores in depth the gender roles in the battle, with the feminization of the city and the resulting rape metaphor, but also shows that Rabkin's model for the play as whole also applies to the battle of Harfleur. While Henry is definitely an aggressor in the battle, the scene also subverts its own reading of Henry by the time the battle ends, much as the play as a whole sets up different readings of King Henry at different times.

Oral Presentation 1.4

"WEL KOUDE HE BLOWE AND SOWNE" MUSICAL SYMBOLISM IN CHAUCER'S "THE MILLER'S TALE"

Catherine Webb and Dan Terkla*, Department of English

Little is known about the life of Geoffrey Chaucer, but there is no evidence that he was a trained musician. In *The Canterbury Tales*, however, Chaucer uses music as a tool for social stratification. The way Chaucer's audience thinks about and responds to the music in the *Tales* lays a foundation for judgments of the pilgrims, the characters in their stories, and Chaucer himself. Chaucer was familiar with the writings of Boethius, and this may provide the link between the use of music in the *Tales* and social classification. In *De Musica*, Boethius writes that different types of music and musical instruments display different social strata. Through musical markers, Chaucer makes distinct comments on the social positions of his characters.

Chaucer's use of musical symbolism to suggest rank in *The Canterbury Tales* is perhaps most apparent in the character of the Miller. The Miller's description in the General Prologue includes references to his bagpipe, an instrument notoriously recognized as a symbol for lechery. The instruments and music associated with Absolon and Nicholas in "The Miller's Tale" reflect the morality (or lack thereof) of the two men. In addition, these musical symbols provide links between the characters in "The Miller's Tale" and other pilgrims on the way to Canterbury, adding another level of satire to the text. A better understanding of the ways Chaucer used the audience's preconceived expectations of music and musical instruments to manipulate their response to text adds meaning not only to his "The Miller's Tale," but to *The Canterbury Tales* as a whole.

Oral Presentation 1.5

**NORSE OPENMINDEDNESS AND
THE DISCOVERY OF VINLAND**

Krishnam Nambudiripad and Dan Terkla*, Department of English, IWU

Much has been said about the Christian/pagan conflict in Icelandic sagas. Eirik's Saga deals with this problem throughout the story. At the time this saga was written, the newly established Christian Church considered paganism evil. The scene entitled "Gudrid is Told Her Future" portrays the noble heathen in an odd way for the pagan magic works. Can the idols be considered evil and still have power to help? The story is definitely told from a Christian perspective, yet this scene does not deny the power of pagan rituals. To reconcile paganism in such a manner, the Norse left room to discuss ideas that conflicted with their beliefs. This open-mindedness may have been integral to their discovery of North America.

**ORAL PRESENTATIONS - SESSION 2
BECKMAN AUDITORIUM
(C-102)**

10:30 - 10:45	Beth Thorson, Dana Oesterlin, and Amie Ogden
10:45 - 11:00	Nathan Mueggenburg
11:00 - 11:15	Matt Milculcik
11:15 - 11:30	William Cooper
11:30 - 11:45	Meta Voelker

note: * denotes faculty supervisor

Oral Presentation 2.1

WORKING IN NON-TRADITIONAL OCCUPATIONS

Beth Thorson, Dana Oesterlin, Amie Ogden and Georganne Rundblad*,
Department of Sociology, IWU

This research is looking at the role of men in child care, a non-traditional male occupation. The role of men in child care is not only uncommon because of a "incapability" on the part of men to care, but rather it is also effected greatly by the pay, prestige, and social expectations of the men themselves, families, co-workers, and parents. The attempt of this research is to show that indeed men can care, and that like women men face many barriers, although different to those of women, in entering non-traditional careers. It is important to look at this research to show that both men and women can do many things, and also to show that the work done by women is legitimate work that men can also do. Showing the problems that men face in this occupation not only demonstrates that men are capable of caring, but it looks at the limits put on both men and women in sex defined roles, and it looks at the devaluation of traditionally female work.

Oral Presentation 2.2

ADAPTING DAUBECHIES' WAVELET ITERATION SCHEME TO BIORTHOGONAL SCALING FUNCTIONS

Nathan Mueggenburg and Tian-Xiao He*, Department of Mathematics, IWU

In 1988 Daubechies developed an iteration scheme to produce a D4 wavelet function which has since become very popular. This iteration scheme is based upon four conditions stated by Daubechies. One of these conditions required that the scaling function be orthogonal. We propose a new iteration scheme, similar in nature to Daubechies', but with a relaxed orthogonality condition. Our iteration scheme does not require that the scaling function be orthogonal, but only that it be biorthogonal. With this orthogonality condition relaxed, we can construct a dual of an unorthogonal function by using macroelement analysis, and thus create a larger set of possible initial functions for the iteration scheme. This new iteration scheme is then able to produce biorthogonal wavelet functions, a much broader group than that produced by Daubechies' iteration scheme. As an example we use the second order B-spline, commonly known as the hat function, as an initial function of our iteration scheme.

Oral Presentation 2.3

WEALTH THROUGH CHRIST?

Matt Mikulcik and Michael Seeborg*, Department of Economics, IWU

We would expect religious beliefs to have an impact on an individual's life. If this is so, belief in Christ can profoundly influence a person's life, affecting how they act, what they do, and what they desire. One question that can be raised from this is does a belief in Christ affect a person's economic well-being? If so, secondly, does the denominational affiliation of an individual also have an impact? These two questions are the main focus of this project. Many theories are found as to whether being Christian would have a positive or negative impact, and whether the impact is significant or insignificant. Theories are also found as to whether religious denomination should have an impact, such as Max Weber's theory that being Protestant would have a positive impact on economic well-being due to a "Protestant ethic."

The major contribution of this project is to empirically test these theories. The data used is taken from the National Longitudinal Survey of Youth. The results of the paper lend support to the theories that being Christian has a positive, significant impact on economic well-being and the hypothesis that denomination also has a significant impact.

Oral Presentation 2.4

REASSESSING THE MOZART EFFECT

William B. Cooper and Johnna Shapiro*, Department of Psychology, IWU

In 1993, Frances Rauscher, Gordon Shaw, and Katherine Ky reported a finding that listening to Mozart's piano sonata for two pianos in D major, K.448 significantly enhanced a person's performance on abstract reasoning tests from the Stanford-Binet intelligence exam (Rauscher, Shaw and Ky 1993). In 1995, a follow-up study replicated these findings and suggested that the enhancement affected spatial-temporal reasoning (Rauscher, Shaw, Levine, Ky, and Wright 1995). Interestingly, there are no published reports indicating that this enhancement has been replicated. There are, however, reports indicating that the effect was not reproduced (Stough, Kerkin, Bates, and Mangan 1994; Carstens, Huskins, and Hounshell 1995; Newman, Rosenbach, Burns, Latimer, Matocha, Vogt 1995). Clearly, there is some discrepancy with the earlier findings. Accordingly, it was this researcher's intention to investigate a spatial enhancement using two subtests from the Wechsler's Intelligence Exam. The two tests, Block Design and Digit Symbol are designed to measure spatial ability. It is predicted that if no effect is found that the enhancement could be test specific. If an effect is found, there will be more evidence to suggest that it is spatial reasoning specifically which is being enhanced by the Mozart piece. The second part of this study investigates whether the music from a different composer can produce an enhancement in spatial reasoning. Because Haydn is a contemporary of Mozart and it can be argued that their composing styles are similar with respect to time period, a piano sonata in the same key as the famed Mozart piece was selected. If an enhancement is found with the Mozart and the Haydn, new evidence will have been found which offers that the enhancement is not composer-specific. Finally, it was the researcher's intention to investigate whether amount of musical training played any bearing on the degree of enhancement from the music. Accordingly, through the use of a survey, information was recorded to differentiate the participants into "musician" and "non-musician" sub-groups.

Oral Presentation 2.5

STEINER TREES OVER GENERALIZED CHECKERBOARDS

Meta Voelker and Robin Sanders*, Department of Mathematics, IWU

Given n randomly placed points in the plane, how can these points be connected by a network of minimum total length? Using graph theory, the answer lies in the formation of a minimum spanning tree. If additional points can be added to the tree, then the minimum spanning tree can often be shortened even further, resulting in what is known as a Steiner minimal tree. Unfortunately, no simple, general algorithm exists for finding Steiner minimal trees.

In examining a specific class of graphs, Chung, Gardner and Graham investigated building Steiner trees over "checkerboards" built of unit squares ("Steiner Trees on a Checkerboard", Mathematics Magazine, V. 62, # 2, 1989). In generalizing their ideas to rhombuses, we have discovered that for certain checkerboards with "small enough" angle, the length of their corresponding networks can be shortened by considering the checkerboards as built from isosceles triangles rather than from rhombuses.

POSTER PRESENTATIONS

Session A: Odd numbered posters are presented

Session B: Even numbered posters are presented

note: * denotes faculty supervisor

Poster Presentation 1

**SYNTHESIS OF AN ORGANOPHOSPHORUS ANALOG OF
ACETYLCHOLINE**

Darshan Mehta and Jeffrey Frick*, Department of Chemistry, IWU

Acetylcholinesterase (AChE) is an important enzyme in our nervous system. In normal nerve function, AChE catalyzes the hydrolysis of acetylcholine (ACh) into its respective components, choline and acetate. Recent interest has been focused on AChE because of its potential role in the pathology of neurodegenerative diseases such as Alzheimer's disease. Studies have revealed that the active site of AChE contains an esteratic and several hydrophobic/anionic subsites. AChE is inhibited by organophosphorus (OP) compounds like sarin and soman. As a result, OP compounds have been used to study the structure of AChE and the mechanism by which it catalyzes the hydrolysis of ACh. No conclusion has been made as to the stereoselectivity of the phosphorylation of AChE because recent studies have yielded conflicting results. As a result, the synthesis of a conformationally constrained organophosphorus analog of ACh may provide definitive information about the stereoselectivity of the mechanism of AChE phosphorylation. Furthermore, it may increase understanding in the process of aging of the enzyme after phosphorylation. We present our efforts in the synthesis of that OP inhibitor.

Poster Presentation 2

THE EFFECTS OF CONTAINER PROXIMITY AND INFORMATION ON PAPER RECYCLING

Todd Carlisle and Linda Kunce*, Department of Psychology, IWU

Contrary to popular belief, paper products are the one material that has actually increased in our landfills in the past 25 years. While paper recycling programs have become more commonplace today, their effectiveness has plateaued. To better understand how to increase a person's recycling behavior, this experiment, using a multiple baseline design, measured the effects of (1) recycling container proximity and (2) information on the paper recycling levels of 150 undergraduate students. The results of the experiment suggest that increasing a recycling container's proximity and educating a person about recycling can influence a person's level of paper recycling.

Poster Presentation 3

TIP-SAMPLE INTERACTIONS IN MAGNETIC FORCE MICROSCOPY

Bill Murphy and Gabriel Spalding*, Department of Physics, IWU

This project presents approaches to studying the characteristics of interactions between magnetically polarized tips and ferromagnetic samples in magnetic force microscopy. The effects of the field emanating from the tip on the sample have been studied extensively. My work presents quantitatively the effect of the field emanating from the sample on the polarization of the tip, a novel approach to the study of tip-sample interaction. I consider several geometric models for the tip. The magnetic field that I am considering is emanating from samples of different geometrical shape and varying magnetic properties. I present results for different directions of sample magnetization and also different directions of initial tip magnetization. I demonstrate the change in magnetic polarization of the tip due to the sample stray field using a method of successive approximations and present a quantitative model to be explored experimentally. I also present images displaying magnetic force interactions between a magnetically polarized tip and a ferromagnetic sample.

Poster Presentation 4

PARTY CONTROL AND THE TAXATION OF THE RICH

Leslie J. Ayers and Robert Leekley*, Department of Economics, IWU

In the United States, many people identify themselves as either Democrats or Republicans. The two parties represent different ideologies that tend to attract different constituencies. Democrats tend to favor more government intervention to correct market failures, and to redistribute income in order to reduce the inequality among the classes. Republicans tend to have more faith in the capitalist system, and consequently prefer less government intervention. If the two parties actually act on their different ideologies, then the party in control should help explain policy outcomes. However, previous research, focusing on the link between Democratic party control and increased levels of spending, has yielded mixed results.

This paper examines the link between Democratic party control and tax policy. Based on their ideological differences, Democrats should tend to prefer a more progressive tax rate structure to redistribute income to the lower classes, while the Republicans should tend to prefer a flatter tax rate structure as an incentive to work. Hence, greater Democratic party control should result in a more progressive tax rate structure.

Over the period of 1960 to 1993, a measure of the overall progressivity of the tax rate system is developed by taking the difference between the tax rate of the rich, defined as the top ten percent of taxpayers, and the overall tax rate for each year. The independent variables include measures of the proportion of Democrats in the House of Representatives, the Senate, and the President's party affiliation. The average family income and the unemployment rate are used as control variables to isolate the party impact. Empirical results demonstrate that party affiliation of legislators assists in explaining the progressivity of the tax rate structure.

Poster Presentation 5

**IS THERE A RELATIONSHIP BETWEEN CEREBRAL
ATHEROSCLEROSIS AND ALZHEIMER'S DISEASE ?**

Vicki Whitcomb, Department of Psychology, IWU, John Lee*, Department of Neuropathology, Loyola University, and Wayne Dornan* Department of Psychology, IWU

Alzheimer's Disease (AD) is a progressive degenerative disorder of the brain clinically manifested by cognitive deterioration. It usually begins in later life (> 65 years old), and results in death in about 3 to 10 years. Although originally thought to be a rare disease, AD has now reached startling proportions. Indeed, AD is the fourth leading cause of death in adults, after heart disease, cancer and stroke, and is the most common form of dementia. Currently, 4 million Americans have AD, 19 million Americans say they have a family member with AD, and 37 million know someone with AD. Although significant progress has been made toward understanding the etiology of AD, presently there is no known cause or treatment. One neuropathological hallmark of Alzheimer's Disease (AD) is the extracellular deposition in the cerebral cortex, hippocampus, and basal forebrain of insoluble aggregates of a 40-42 amino acid long peptide called β -amyloid peptide (β AP1-42). This β AP is derived from a larger transmembrane precursor protein by an unknown proteolytic mechanism. Since the molecular events that are triggered during an ischemic stroke are similar to those that have been proposed for AD, we investigated whether age of onset of AD and the extent of amyloid deposition is different in neuropathologically confirmed cases of AD in people with atherosclerosis compared to AD patients without cerebrovascular disease. The results of this analysis will be presented at the conference.

Poster Presentation 6

**PERCEPTIONS OF PARENTS' MARITAL CONFLICT AS A
PREDICTOR OF YOUNG ADULT ATTACHMENT AND CAREGIVING
STYLES IN ROMANTIC RELATIONSHIPS**

Ben Chapman and Linda Kunce*, Department of Psychology, IWU

Attachment styles and caregiving styles have provided a useful framework for conceptualizing romantic relationships. The present study examined whether perceptions of parental conflict would predict attachment and caregiving styles in the romantic relationships of young adults. It was hypothesized that higher perceptions of parental conflict, as measured by the marital conflict subscale of the Family Structure Survey (Lopez, 1986) and by the Conflict Tactics Scale (Strauss, 1985), would correlate positively with maladaptive extremes of caregiving styles, measured using the Caregiving Questionnaire (Kunce and Shaver, 1994), and with less secure attachment styles, measured using both the Discreet Attachment Item (Bartholemew and Horowitz, 1991), and the Dimensional Attachment Style Questionnaire (Shaver, in press). Results are discussed in the context of a social-learning hypothesis for attachment and caregiving styles in the romantic relationships of young adults, with the parents' marriage considered as the primary model of romantic relationships.

Poster Presentation 7

ENVIRONMENTAL QUALITY AND ECONOMIC GROWTH

Dimitrios Dadakas and Robert Leekley*, Department of Economics, IWU

Economic growth is generally considered to have a negative impact on the environment. However, recent literature has suggested an alternative growth pattern. Alan B. Krueger and Nemat Shafik found an initial stage where increases in economic growth cause environmental degradation which is followed immediately by a subsequent stage of improving environmental quality. The result is an inverse U-shape relationship between economic growth and the quality of the environment.

This paper contributes to the existing literature by providing an analysis of this inverted U-curve based on the relative strength of the income and substitution effect: that is changes in consumption patterns with respect to changes in income. The paper also analyzes the responds of the political system to the degrading environment and to society's changing preferences for environmental quality. The empirical research uses a variety of pollutants with different characteristics to confirm that the reaction of the political system affects the shape of the inverted U-curve.

Poster Presentation 8

WOMEN: THEIR LIVES AND THEIR LOVES SINCE 1945

Kristin Ely and Georganne Rundblad*, Department of Sociology, IWU

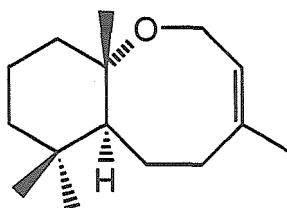
This research investigates the advice that women have been given over the past fifty years by the media regarding their relationships with men. Taken from both symbolic interaction and conflict theoretical perspectives, this study involves a content analysis of the popular magazine Good Housekeeping, with special attention to advice columns and feature articles which discuss the ways men and women interact throughout the span of romantic relationships. Looking at the time period between 1945 and 1995, the results suggest that what women are told about how to attract men, and then how to keep them or when to get rid of them, changes in accordance with societal expectations of women. As women are encouraged to have more confidence in themselves and their abilities, they realize they have more control over their lives and their relationships. This knowledge forces them to reconsider how they approach men and how they interact with them when their relationships become more intimate. One can see how authors of advice columns and magazine articles have tried to guide their readers as they flirt with, make up with, and break up with members of the other sex. It is thus concluded that, as the review of literature suggests, this guidance reflects how society has viewed women at different points in this fifty-year time period.

Poster Presentation 9

PROGRESS TOWARD THE TOTAL SYNTHESIS OF ARENARAN A,
A NOVEL ANTI-CANCER COMPOUND

Mark A. Kevan and Ram S. Mohan*, Department of Chemistry, IWU

Arenaran A, **1** is a sesquiterpene isolated from a marine sponge of the genus *Dysidea*. It contains an unusual 8-membered cyclic ether. Arenaran A has been analyzed for its potential cytotoxic properties and was found to be in-vitro active against several types of cancer cells. Total synthesis of this molecule should provide access to larger quantities of material than can be obtained by extraction from natural sources. Also, the construction of the 8-membered ether ring should help lead to newer synthetic methodology. The proposed total synthesis as well as work accomplished to date will be discussed. Several model reactions have been carried out and these results will be presented as well.

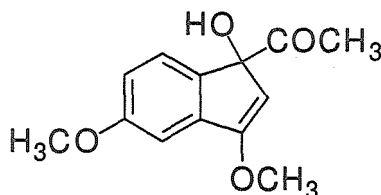


Poster Presentation 10

PROGRESS TOWARD THE TOTAL SYNTHESIS OF A NOVEL
ANTIMICROBIAL SUBSTANCE

Kostas Gavardinas and Ram S. Mohan*, Department of Chemistry, IWU

We are currently developing a short and efficient synthesis of a novel antibacterial compound, 1-acetyl-1-hydroxy-3,5-dimethoxy-1-*H*-inden **1**, which was isolated from etiolated seedlings of Adlay, a tall grass found in the Philippines. This substance shows antimicrobial activity against bacteria such as *Basillus subtilis*. In addition to providing access to larger quantities of the compound, the development of the total synthesis often results in new and useful synthetic methodology. The proposed total synthesis of the target molecule as well as progress to date will be discussed.



1

Poster Presentation 11

**THE EFFECTS OF AGE AND FRONTAL LOBE DAMAGE ON
PROSPECTIVE MEMORY**

Sara J. Russell and Johnna Shapiro*, Department of Psychology, IWU

Prospective memory can be defined as remembering an intention. This type of memory relies on storage of past knowledge or events to recall an action to be performed in the future. Examples of prospective memory would be remembering to take your medication with breakfast or remembering to pick up milk on your way home. Accumulating evidence suggests that the frontal lobe plays an intimate role in the mediation of prospective memory. However, there is a paucity of studies linking damage to the frontal lobe to reduced efficacy of prospective memory. The present study examines three types of participants who differ in the level of frontal lobe functioning. The participants consist of younger adults (17-22), older adults (55 and older), and individuals with specific frontal lobe damage determined by a CAT scan or MRI. All three groups are given a computer-based general knowledge quiz that has two types of prospective memory tasks enmeshed within it: a time-based, disembedded task and an event-based, embedded task. The latter is higher in attentional processing, requiring both retrieval and that the participant break attention from a previous task. The participants are given the Stroop test and the WCST which are implicated as successful predictors of frontal lobe damage. The participants are also given subtests of the Weschler Intelligence Test and the Kaufman Brief Intelligence Test to test retrospective memory ability and to ensure that there are no significant differences in the groups based on intelligence. The results and implications will be discussed at the conference.

Poster Presentation 12

**HARMONIC OSCILLATION IN THE PRESENCE OF
MULTIPLE DAMPING FORCES**

Chris Peltó, Keith Coates*, and Narendra Jaggi*, Departments of
Mathematics and Physics, IWU

The relatively mundane damped harmonic oscillator is found to exhibit interesting motion once under the influence of both a velocity dependent and Coulombic frictional damping force. Data for the decay of the amplitude as a function of time were collected on a specially prepared torsional oscillator with a variable electromagnetic damping mechanism. An analytical solution of the appropriate equation of motion was obtained by the method of Laplace transforms. In both the limits of zero Coulombic friction and zero velocity damping, the solution reduces to the well-known answers to the problem. The solution, when plotted with the correct parameters, fits the numerical solution very well and shows some quantitative agreement with the experimental data.

Scientists and engineers deal with damped oscillating systems on a regular basis. Damping in real world systems is understood in the limiting cases of dominant Coulombic friction and dominant velocity-dependent damping, but the regime encountered when both types of damping are present is not as well understood. The solution which we have found provides an analytic means of modelling a real world system in a regime previously requiring numerical methods of solution. This solution will be immediately useful to several types of scientists, because the harmonic oscillator is found in fields ranging from physics and engineering to chemistry. The solution is likely to be most useful in the field of mechanical engineering, because no electrical analog of Coulombic friction is known to exist. This solution also has significant pedagogical implications, since it addresses a problem which has been ignored in textbooks. All undergraduate texts include the familiar problem of a harmonic oscillator which is experiencing velocity damping, and a few level texts include the case of Coulombic friction damping. The case when both are present has been overlooked, presumably because an analytic solution was not available. The present work advances our understanding of a common physical phenomenon.

Poster Presentation 13

**THE VALIDITY OF THE B3R ENTRY-LEVEL EXAMINATION FOR
FIRE SERVICES AS A PREDICTOR FOR
FUTURE JOB PERFORMANCE**

Terrance W. Gaylord and Johnna Shapiro*, Department of Psychology, IWU

The use of aptitude tests by organizations within both the public and private sector has drawn attention from the scientific community as well as the courtroom. While theorists have argued that aptitude tests are not valid predictors of future job performance, several research studies have indicated otherwise. The current study focused on the B3R Entry-Level Examination for Fire Services, an aptitude test administered by a growing number of municipalities nationwide for selection purposes. To test the predictive ability of the exam, a criterion-related validation approach was initiated. A total of eight participants (members of the Normal Fire Department) were administered the B3R exam accompanied with a job performance evaluation completed by their direct supervisors. Results and implications of the correlation between the scores will be discussed when the statistical analysis is complete.

Poster Presentation 14

**CHANGEOVER DELAY AND TRAVEL TIME: A COMPARISON AND
LOOK AT THE USE OF COD AS A VALID ANALOG FOR TRAVEL
TIME IN BEHAVIORAL ECOLOGY**

Sarah M. Hansen and James Dougan*, Department of Psychology, IWU

The field of behavioral ecology operates on the assumption that the principles of Darwinian fitness can be applied to behavior as well as to biology. This implies that only the most optimal foraging strategies (which are biologically "wired") will ensure an animal's survival and subsequent reproduction and that poorer strategies will be selected for and lost from the gene pool. Therefore, animals ought to behave in the most advantageous manner in terms of energy loss and gain. In this experiment, we assumed that matching is an optimal foraging strategy. We looked at the cost-benefit analysis of changing patches (which are areas of abundant food that we assume to be analagous to VI schedules imposed in a Skinner box) of varying abundance in terms of travel time and opportunity cost. In addition, we compared the changeover delay to the imposition of physical barriers between variable interval schedules and their respective effects on behavior relative to the matching law.

Poster Presentation 15

**PROBING THE STRUCTURE OF ACTIVE GALAXIES
USING X-RAY SPECTROSCOPY**

Jeremy Kotter and Cynthia Hess*, Department of Physics, IWU

One class of astronomical objects whose geometries have only recently been explored are active galactic nuclei (AGN). These are galaxies in which massive black holes sit at the center and accrete matter. Along with Dr. Cynthia Hess, I have begun to study an unusual and dramatically-bright active galaxy, NGC 4258, in an attempt to learn about its internal structure. NGC 4258 is known to exhibit maser activity in the region surrounding its warped accretion disk, and it also emits jets of energetic radiation from its supermassive central black hole. In order to study this object, I use X-ray observations from the Roentgen satellite (ROSAT), obtained from NASA archives. I have extracted images and light curves which reveal the overall structure of the galaxy as well as time variability in the X-ray-emitting region. I have also extracted, fit, and analyzed spectra of NGC 4258, which provide insight into the global physical processes occurring within the galaxy. In the future, I will analyze the thermal stability of the X-ray-emitting gas in order to determine geometric information in unprecedented detail.

Poster Presentation 16

**ION PAIRING - A TECHNIQUE FOR
COCAINE METABOLITE DETECTION**

Debra J. Feger-Majewski and David N. Bailey*,
Department of Chemistry, IWU

An ion-pairing agent, Ammonium Tetrathiocyanato Diammine Chromate (III), commonly called Reinecke Salt, was used in an attempt to extract benzoylecgonine (BE) from an aqueous matrix. BE is one of the main metabolic products formed in the human body after cocaine use. This method involves the formation of ion pairs between BE and the inorganic complexing ion resulting in increased solubility of the ion pair in a non-aqueous solvent. This results in a greatly enhanced sensitivity for the detection of cocaine use. Ultraviolet-Visible spectrophotometry was used to detect optimal extraction conditions. Additional studies are being done to consider possible ionic strength effects and repeatability.

Poster Presentation 17

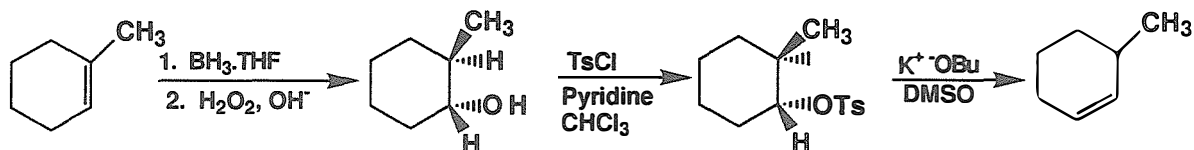
**THE DISCOVERY APPROACH TO ORGANIC CHEMISTRY:
STEREOCHEMISTRY OF HYDROBORATION-OXIDATION AND
E-2 ELIMINATION**

Jonathan T. Brockman, Marcus E. Cabay and Ram S. Mohan*,
Department of Chemistry, IWU

For years general and organic chemistry labs have in large part been organized into a ritualized set of procedures which students diligently and often mindlessly follow. While these labs may give the student valuable insight into modern laboratory techniques, many times the theory behind the lab work is completely ignored. We are currently attempting to overcome this problem by developing new lab experiments which would force students to critically analyze the results of the experiment, and thereby "rediscover" theories previously learned only in lecture or textbooks.

We have developed a new multi-step lab experiment which allows the student to determine the stereochemistry of two important reactions in organic chemistry: hydroboration-oxidation of alkenes and the E-2 elimination reaction (Equation 1).

Equation 1:



The experimental details as well as the logical analysis required to interpret the results will be discussed.

Poster Presentation 18

**ORGANOCHLORINE PESTICIDE CONTAMINATION IN
NEARTIC RESIDENT, NEOTROPICAL MIGRANT,
AND NEOTROPICAL RESIDENT PASSERINES**

T. A. Sager, J. A. Klemens, F. H. Hollingworth, J. A. Frick* and
R. G. Harper*, Departments of Chemistry and Biology, IWU

Organochlorine pesticide contaminants detrimentally affect wildlife in many ways, including lowered reproductive success, endocrine disruption, and embryonic defects. Most organochlorine pesticides have been banned in the United States after the recognition of such effects. However, these pesticides are still used in Central and South America, and little information is available concerning the levels of pesticide contamination in wildlife from these areas. Furthermore, little data exist regarding organochlorine pesticide contamination in passerines (songbirds). The purpose of our study was to determine the presence in passerines of 20 organochlorine pesticides that are of concern to the United States Environmental Protection Agency. Neotropical resident species (i.e. those living year-round in Central and South America) were collected from Argentina and Peru in 1996, Neotropical migrant species (i.e. those the winter in Central and South America and breed in North America) were collected in central Illinois from 1991-1996, and Neartic resident (i.e. those living year-round in North America) were collected in central Illinois in 1995 and 1996. Contamination levels were compared between each of the above geographic locations. Predominate pesticides found in Neartic resident and Neotropical migrant species included DDE, dieldrin and heptachlor epoxide. No significant levels of organochlorine pesticides were found in the Neotropical resident birds. We are currently analyzing the data in relation to age class, gender, and foraging guild within each geographic location.

Poster Presentation 19

TACTILE DEFENSIVENESS AND SOCIAL PATTERNS IN AUTISM

Cari Neal and Linda Kunce*, Department of Psychology, IWU

The expression of tactile defensiveness (TD) or aversion to tactile stimulation varies among individuals. Little research has been conducted evaluating predictors of this construct particularly in the arena of autism. Based on a review of past literature regarding touch and social development, it was hypothesized that social patterns in autism would be correlated with the expression of tactile defensiveness. Surveys were used in this present study to evaluate the relationship between social patterns and TD as well as correlations between variables such as severity of autistic characteristics, IQ, and chronological age. Results have implications for understanding and treating TD in persons with autism.

Poster Presentation 20

**THE EFFECTS OF MULTIPLE INJECTIONS OF
BETA-AMYLOID (25-35) INTO THE MEDIAL SEPTAL AREA ON
SPATIAL LEARNING IN THE MALE RAT**

James Bedrosian and Wayne Dornan*, Department of Psychology, IWU

Alzheimer's disease is a progressive, irreversible neurological disorder that has a profound effect on memory and personality. Alzheimer's disease currently afflicts over four million people in the United States, with roughly 100,000 new cases reported every year. The pathological hallmarks of Alzheimer's disease are the presence of neuritic plaques and the neurofibrillary tangles which are accompanied by the progressive deterioration of the cortex and septo-hippocampal pathway (brain areas involved in learning and memory function). Currently there is no effective treatment for the disease. While significant progress has been made toward an understanding of the etiology of Alzheimer's disease, development of effective drug therapies is hindered by the lack of a reliable animal model that mimics both the pathological and behavioral changes that characterize the disease. Accumulating evidence suggests that the major constituent of neuritic plaques, a Beta-Amyloid protein comprise of 39-42 amino acids, possesses neurotoxic properties. Conflicting evidence exists in the literature on the behavioral effects of different Beta-Amyloid fragments on learning and memory following injections into the brain areas afflicted in Alzheimer's disease. It was the goal of this study to expand on previous findings on the role of Beta-Amyloid on spatial learning in order to aid in the development of a viable animal model of this debilitating disease. In this study male rats received three injections of Beta-Amyloid (25-35) fragment into different depths of the Medial Septal Area. Spatial learning was then assessed using the Morris Water Maze and the Radial-Arm Maze. The results of this study will be presented at the conference.

Poster Presentation 21

**DIRECT REGULATION OF THE LOBSTER MANDIBULAR ORGAN
BY SINUS GLAND PEPTIDES.**

Amy Shaub, Department of Biology, IWU and David Borst*,
Department of Biology, ISU

Methyl farnesoate (MF) is a crustacean compound that is similar chemically to juvenile hormone, which regulates insect growth and reproduction. This similarity has led to the suggestion that MF may have juvenile hormone-like effects in crustaceans. If this is so, regulation of MF levels might be an important mechanism in the control of crustacean molting and reproduction. The understanding of, and ability to manipulate, the regulation of MF production could be a powerful tool in the aquaculture of economically important crustaceans.

In the lobster *Homarus americanus*, MF synthesis occurs in the mandibular organ (MO). *In vivo* studies have shown that MF synthesis is negatively regulated by the sinus gland (SG), a structure located in the crustacean eyestalk and known to produce neuropeptides. To determine the effect of these peptides on MF synthesis, fragments of MO tissue were incubated in DMEM culture medium supplemented with radiolabeled methionine (a precursor of MF). I used this *in vitro* bioassay to compare the activity of a crude SG extract with that of two peptides purified from the extract. The crude SG extract produced an 80% decrease in MF synthesis by MO fragments when compared with controls. One of the purified peptides also inhibited MF synthesis, but the other had no effect. The data suggest that the first peptide is the MOIH (mandibular organ inhibiting hormone) for the lobster. However, its inhibitory effect on MF production is not as complete as that of the crude SG extract, suggesting that this peptide may act synergistically with another compound from the SG to produce full inhibition. Attempts are being made in our lab to purify MOIH and to determine its sequence.

Poster Presentation 22

**EFFECTS OF PERSON VS. EVENT SCHEMATIC INFORMATION ON
PERCEPTIONS OF THE DEFENDANT AND VERDICTS
IN A MOCK JURY TRIAL**

Valerie Stachour and Johnna K. Shapiro*, Department of Psychology, IWU

In this experiment, participants viewed a mock jury trial consisting of opening statements, prosecution and defense evidence, and judge's instructions. Jurors viewed either a trial designed to elicit an event schema or a person schema with which to evaluate the defendant. During the trial, the mock jurors rated their perceptions of the defendant using seven adjective pairs. At the conclusion of the trial, jurors gave either individual or group verdicts regarding the defendant.

Three adjective pairs had significantly different ratings between the schema types and across time. These pairs are: helpful-unhelpful; kind-unkind; and honest-dishonest. Jurors who received personal information were more likely than those in the event condition to tie their perceptions of the defendant to the side that had just presented evidence.

There was also a significant difference between the verdicts that were rendered. Individuals with personal information were more likely to find the defendant guilty, while groups with personal information were more likely to find the defendant not guilty.

These results suggest that giving personal information about the defendant to members of a jury may cause their attitudes to vary and be swayed by opposing sides more often than jurors who receive information only about the event itself.

Poster Presentation 23

**DEVELOPING AN ANIMAL MODEL OF ALZHEIMER'S DISEASE:
MULTIPLE HIPPOCAMPAL INJECTIONS OF BETA-AMYLOID (1-42)
AND THE EFFECTS ON SPATIAL LEARNING AND MEMORY IN
THE MALE RAT.**

Gregory P. Tinkler and Wayne A. Dornan*, Department of Psychology, IWU

Alzheimer's Disease (AD) is a neurodegenerative disorder which affects approximately four million people in the United States alone. A diagnosis of AD can be made only by performing a postmortem examination of the brain and confirming the presence of high numbers of neuritic plaques and neurofibrillary tangles, the pathological hallmarks of the disease. The neuritic plaque is composed primarily of the 39- to 43- amino acid protein β -Amyloid (β A), and is found in large quantities in structures such as the hippocampus, which is intimately involved with learning and memory. β A has been hypothesized to play a role in the onset of AD, but studies which attempt to model the disease using single injections of the peptide fail to produce consistent behavioral impairments. A number of recent studies have suggested that chronic administration of β A or one of its fragments may be more pathologically relevant to AD than single injections, and may also produce more consistent impairments of spatial learning and memory. In addition, our lab has demonstrated that multiple injections of the neurotoxic fragment β A (25-35) into the septum, which projects to the hippocampus, produce a marginal impairment on a spatial task. A marginal depletion of cholinergic markers in the hippocampus was also produced. Since the β A fragment has different chemical properties than the full length peptide, it is conceivable that more profound behavioral and neurochemical impairments may result from the use of β A (1-42). It is also possible that injections into the hippocampus instead of the septum would produce a greater impairment on learning and memory. Therefore, this study examines the effects of multiple hippocampal injections of the full length β A (1-42) peptide on spatial learning and memory in the rat.

Poster Presentation 24

COMPETITION BETWEEN DIFFUSION AND SURFACE TENSION IN
POLYELECTROLYTE GELS

Nathan Mueggenburg, Narendra Jaggi*, and Gabriel Spalding*,
Department of Physics, IWU

It was recently observed that the process of swelling in gels can lead to complex three dimensional forms. Early stages of swelling are very different from the later stages. Specifically, we have experimentally shown that the late stages of expansion are governed by a power law with an exponent of -0.5 while the early stages are governed by a power law with an exponent of -1.0. We are now in the process of designing an algorithm which will simulate the expansion process. Presently my computer model represents the random walking of water particles into, out of, and around the gel. We model the complex expansion process as an interplay between inhomogeneous diffusion that causes swelling and surface tension which tends to smooth the resulting surfaces. The extent of swelling is determined by the concentration of water particles and the orientation of the surface of the gel. By observing similarities and differences between the model and the experimental observations, we hope to gain a better understanding of the underlying physics behind the expansion process.

Poster Presentation 25

**THE DISCOVERY APPROACH TO ORGANIC CHEMISTRY:
SELECTIVE OXIDATION OF ALCOHOLS**

Steven R. Shadwick and Ram S. Mohan*, Dept. of Chemistry, IWU

The discovery approach to organic chemistry involves lab experiments that allow students to arrive at conclusions based on their results through critical thinking. Most experiments found in current textbooks involve "cookbook" procedures that require minimal thinking. This new approach is designed to increase interest in the labs as well as promote critical thinking and learning. A frequently encountered problem in synthetic organic chemistry is the lack of selectivity of many reagents. Reagents that can selectively carry out a desired transformation have many industrial applications. Selectivity reduces the number of steps required to carry out a transformation by removing the protection-deprotection steps that are otherwise necessary to arrive at the desired product. Commercial bleach (NaOCl), a cheap, readily available oxidant, has been used in the selective oxidation of secondary alcohols. We wish to report the selective oxidation of 2-octanol in the presence of 1-octanol. By detailed NMR analysis of the product the student can determine the selectivity of the reagent; making this experiment well suited for learning through the discovery approach. The selective oxidation of some 1,2-diols will also be discussed.

Poster Presentation 26

CHEERIO-CHEERIO INTERACTIONS IN A MILK MATRIX

Thomas Davidsmeier, Matthew Dearing and Gabe Spalding*,
Department of Physics, IWU

The presence of an intervening medium can create or alter interactions between suspended objects. Super conducting metals are a perfect example of this type of behavior on the nanoscopic scale. The crystal lattice of the metal vibrates in such a way that a net attraction between electrons is created. Outside of the medium, these electrons would repel one another. This project studied a macroscopic model system consisting of two cheerios floating in milk. An interaction between cheerios in milk was well known to cereal eaters. Outside the milk, the cheerios experience no significant attraction. Attempts to determine the length scale of the cheerio-cheerio interaction were made, as well as attempts to describe how the interaction varies with distance. Theoretical explanations were found for the attractive interaction as well as torques on individual cheerios observed during the experiment.

Poster Presentation 27

WOMEN WHO BATTER: A COMPARISON TO MEN WHO BATTER

Treva Bogaerts and Linda Kunce*, Department of Psychology, IWU

A sample of 25 females and 25 males were drawn from the client files of a domestic violence agency in a medium-sized midwestern city. Clients were matched on ethnicity, income, age, and education so that comparisons could be made to determine whether distinctions exist between these batterer populations. The two groups were compared in terms of legal, family, mental, and social histories, as well as type of physical abuse used. The results have implications for adjustments in treatment procedures for female batterers.

Poster Presentation 28

**BIOGEOGRAPHIC CONGRUENCE ANALYSIS OF TEN SPECIES OF
BATS OF THE FAMILY EMBALLONURIDAE (CHIROPTERA)**

Jennifer Moyer and Thomas A. Griffiths*, Department of Biology, IWU

The biogeographical distribution of five bat species of the Family Emballonuridae, populating Africa, mainland Southeast Asia, Indonesia, the Solomon Islands, Fiji Islands, and smaller western Pacific islands were plotted. Data were combined with distributions of five additional emballonurid species from Mann (poster, this conference). The geographical distributions of the ten species were then used to test the validity of two rival phylogenies (a cladogram generated by Griffiths, Koopman, and Starrett, 1991 and a tree produced by Tate and Archbold, 1939). A congruence analysis was done to test which hypothesized phylogeny was better supported by the distributional data. The calculated congruency of the phylogenetic tree of Tate and Archbold (1939) is 0.75. The congruency of the cladogram of Griffiths et al. (1991) was 0.625. The Tate and Archbold phylogeny has a higher congruency value and we conclude that the Tate and Archbold phylogeny is slightly better supported by the data of this study.

Poster Presentation 29

**JAPANESE U.S. AUTO TRANSPLANT PRODUCTION:
AN ANALYSIS OF THE ROLES OF VERS
AND THE EXCHANGE RATE**

Michael R. Cornstubble and Margaret Chapman*,
Department of Economics, IWU

Since their introduction in 1982, Japanese auto transplants in the U.S. have skyrocketed in production, now producing many more cars than are imported. This study attempts to identify the main factors that are responsible for the introduction of Japanese auto transplants and their massive growth in production over the past 14 years. The author develops two hypotheses from theoretical analysis of the factors contributing to production decisions. The first is that the voluntary export restraints (VERs) imposed on the Japanese from 1981-1985 are responsible for bringing the transplants to the U.S. and for creating major growth in their production. The second hypothesis is that after 1985, a different factor was responsible for sustaining growth in transplant production, the exchange rate. The author relies mainly on theory and observations of quarterly time series data to support his first hypothesis, but supports the second hypothesis with both theoretical and empirical analyses, with strong results throughout.

Poster Presentation 30

YOUR CHILD HAS A WILMS' TUMOR

Mollie Haddigan, Susan Westlake*, and Donna Hartweg*,
School of Nursing, IWU

In the past decade, many advances have been made in the study of Wilms' tumors, with new genetic information changing the way these malignancies are viewed. While such tumors comprise only five to six percent of all pediatric cancers, Wilms' tumors are the fifth most common childhood malignancy. As a component of an internship at the St. Jude Midwest Affiliate in Peoria, IL, during fall, 1996, the learning needs of children diagnosed with Wilms' tumors and their parents were explored. A major concern for this population was the lack of parent teaching aids; the most recent informational pamphlet was dated 1985.

To create a parent educational tool, the following methods were initially used: a) comprehensive review of the literature on genetics, treatment, effective nursing care; b) assessment of necessary readability level; c) analysis of readability of pamphlet content using the Flesch Formula. The designed teaching pamphlet included basic human anatomy, the etiology and signs and symptoms, and treatment procedures for Wilms' tumors, as well as coping strategies for children and their parents. The utility of the initial pamphlet will be reviewed by parents of children with Wilms' tumor at St. Jude Midwest Affiliate for final refinement.

This pamphlet will supplement available information with current research for final distribution to Wilms' tumor patients and families at the St. Jude Clinic. The procedure for development and the parent education pamphlet has been submitted to the Association of Pediatric Oncology Nurses for presentation at the national convention in New York City in September.

Poster Presentation 31

**DEVELOPMENT OF A SIMPLE, INEXPENSIVE, AND RAPID
SCREENING METHOD FOR DETECTION OF COCAINE USE**

Jennifer A. Duke and David N. Bailey*, Department of Chemistry, IWU

A quick, inexpensive, and accurate method of analyzing urine to detect drug use is needed for the handling of large numbers of samples commonly encountered in screening applications. One method currently under investigation for the detection of cocaine derivatives in human urine is ion-ion pairing. A version of this technique, utilizing tetrakis (thiocyanato) cobalt II as the pairing agent, has been applied to facilitate extraction of the cocaine metabolite benzoylecgonine (BE) into an organic solvent. The efficiency of this procedure is dependent upon pH and ionic strength of the solution. The most favorable conditions for the extraction of BE into dichloromethane have been determined.

Poster Presentation 32

CROSS-PLATFORM COMMUNICATION AND DEVICE CONTROL

Darrin Thomason and Lon Shapiro*, Department of Computer Science, IWU

The Illinois Wesleyan Shelley Project was faced with the obstacle of communication between three IBM PC's, which each were connected to a Robix control box and a Sun Ultra SPARC, which would pass the commands to the PC's. The Ultra SPARC and the PC's are connected via a 10 Base-T hub and ethernet network cards in all the machines being used. The obstacle's solution lies in an application that would allow the Ultra SPARC to pass commands to the three PC's from three sockets on the Ultra SPARC to the socket and socket driver on each of the PC's. In reference to the Open Standards Interface (OSI) seven layer model, the program would include the traversal of all seven layers of the model, starting at the application layer on the Ultra SPARC and finally ending in the application layer on the PC level after traveling down and back up all seven layers. This was accomplished through the use of the Waterloo Transfer Control Protocol package and a Robix control software driver. An application was developed on the Ultra SPARC that opened three sockets and allowed connections from each of the three PC's. This would allow data to either be passed as a string of characters or from an input file across the network to the PC's. Once the Ultra SPARC determined where the data was to be sent, the corresponding PC would allow the data to be passed and executed as a Robix command. The basis for this project would allow for another program to calculate the coordinates for both 2D and 3D movement in space to be passed to the server program on the Ultra SPARC and thus moving the attached Robix motor on the corresponding PC. Further use of cross-platform would include the control of many types of machines including robots used for assembly of product or robots that are used in hazardous situations to eliminate the danger of human interaction.

Poster Presentation 33

MAPPING ROBOTIC MOVEMENT TO
A THREE-DIMENSIONAL COORDINATE SYSTEM

Craig A. Materick and Lon Shapiro*, Department of Computer Science, IWU

The Illinois Wesleyan Intelligence Network on Knowledge (I.W.I.N.K.) is a project to design and implement an artificial "person" named Shelley. Robotics, networking, and artificial intelligence will be the main topics of the preliminary work. For my research honors project, I designed the three-dimensional coordinate system in which the robotic arms move and interact with objects. The arms we have constructed are based on an arrangement of six servos, each of which rotate approximately 185 degrees. The program takes in data about the location of an object in three-dimensional coordinates and moves each of the six motors in the arm to arrive at that point. The mathematics involved is based on intersecting circles using the following equation:

$$(x - h)^2 + (y - k)^2 = r^2$$

Assuming the center of the circle is (h,k) and the radius is r ; (x,y) is a point on the circle – this is used for the intersection calculations

Poster Presentation 34

THE PHOTOCHEMISTRY OF NITROUS ACID

Michael Davis, and Tim Rettich*, Department of Chemistry, IWU

A model system of a photochemically active aerosol is proposed. The system includes a thin layer of aqueous nitrous acid over a solid silica gel surface. Benzene, a known radical scavenger, is added to the aqueous layer. Thermal and photochemical decomposition studies show the presence of one (or more) product(s) in the photolysate that is (are) not present in the thermal decomposition. The solid appears to influence the rate of both the destruction of nitrous acid and the formation of product(s) in the presence of a radical scavenger.

Poster Presentation 35

SUBSTITUTION EFFECTS ON THE CONSUMER DEMAND CURVE

Adrienne L. Parkhurst and James Dougan*, Department of Psychology, IWU

The substitution effects on the consumer demand curve was investigated. Our experiment was an extension of Dougan (1992) study finding that an inverse relationship exists between the price, or behavioral cost of a commodity, and the quantity (manipulated by the experimenter) of that commodity. The present research expanded this study to assess the effects of substitutes on this inverse relationship. Three experimental conditions were presented to the subjects (6 albino, Harlan-Sprague Dawley rats) with 10 minutes of freely available food prior to (pre-feeding), during (during-feeding), and after (post-feeding) one level of 30 minute variable interval experimental sessions. We expected to see an alteration in the demand curve with the presence of substitutes in our established open economy, in addition to the subjects' responses varying with the different temporal locations of the substitutes. Results have implications for behavior economic theory.

Poster Presentation 36

**DOES THE LOCATION OF PRE-FEEDING CHANGE THE TYPICAL
SHAPE OF THE VI RESPONSE CURVE?**

Jason A. Krebs, Cari D. Neal, Jason R. Dennis and James D. Dougan*,
Department of Psychology, IWU

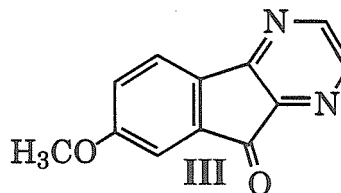
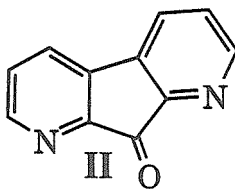
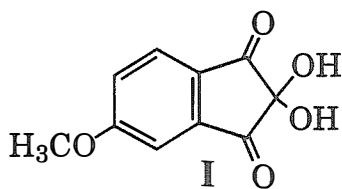
Investigations into the relationship between response rate and reinforcement rate have lead to an interest in the nature of pre-feedings and their effect on variable interval (VI) bar pressing in rats. Typically, response rates decrease when food is administered before VI sessions, especially when reinforcement rates are high in those sessions. However, Lionello and Dougan (1995) reported that this decrease in response rate was significantly diminished when reinforcement was temporally spaced and given in the experimental apparatus itself. The current study furthers the aforementioned results reported by Lionello and Dougan (1995). Rats were trained on four VI schedules (VI 7.5s, VI 15s, VI 30s, and VI 480s). The subjects were then exposed to two experimental conditions. In some sessions, the subjects were given their pre-feeding within the experimental apparatus. In the remaining sessions, the pre-feedings were given in a neutral environment, previously unfamiliar to the subjects. Response curves were then plotted to determine the environmental effects of pre-feeding on the typically observed pattern of suppressed response rates. These results from these studies will be used to create more sophisticated quantitative models of behavior.

Poster Presentation 37

**SYNTHESIS OF 5-METHOXYNINHYDRIN ANALOG
AS A POSSIBLE FINGERPRINT DETECTION AGENT**

Darin R. Skutt and Forrest J. Frank*, Department of Chemistry, IWU

In this high tech age of DNA fingerprinting, the latent (invisible) fingerprint remains the most highly regarded type of criminal evidence. Investigators want to find the best way to develop these latent fingerprints. One such developing agent is 5-methoxyninhydrin (I). When this reagent reacts with fingerprints and is sprayed with zinc chloride solution, the resulting complex fluoresces under laser light. The recently discovered compound DFO (II) reacts with fingerprints and fluoresces without zinc chloride. We are combining the structures of these two reagents into structure III. Will this new reagent (III) fluoresce stronger and without the need of the zinc chloride solution?



Poster Presentation 38

PHYLOGENETIC SYSTEMATICS OF THE PRIMATE GENUS *AOTUS*,
BASED ON HYOID MORPHOLOGY

Melissa S. Immel and Thomas A. Griffiths*, Department of Biology, IWU

Dissection of a specimen of the South American primate genus Aotus was performed, focussing on the morphology of the hyoid apparatus and surrounding musculature. Data collected from this dissection, along with data from published descriptions of primate genera from both suborders Haplorhini and Strepsirhini, were analyzed using the computer software program PAUP (Phylogenetic Analysis Using Parsimony). This analysis generates possible phylogenetic relationships of Aotus to other primates. Four equally probable phylogenetic trees (=cladograms) were obtained from this analysis. While the cladograms differ in minor detail, they all show that Aotus appears to be more closely related to the more advanced suborder Haplorhini than to the Strepsirhini, and that it is a relatively primitive member of the haplorhine group. This suggests that the ancestor of the New World monkeys arrived in South America very early, at about the time that haplorhine primates were beginning to diverge in the Old World.

Poster Presentation 39

THE EFFECT OF CANOPY DIRECTION ON
PLANT DISTRIBUTION WITHIN AN OAK SAVANNA

Jason M. Thomas, Keith Wrage* and R. Given Harper*,
Department of Biology, IWU

Oak savannas, which are prairies with scattered oak trees, were common in central North America in the early 1800's. However, they are now one of the most endangered ecosystems in North America. Determining limiting factors in plant distribution is an important aspect in efforts to restore oak savannas. The objective of this study was to determine if there was a relationship between canopy direction (i.e. north and south facing canopies) and plant distribution in oak savannas. Light penetration through canopies is important for agricultural crops by providing stronger lower branches and better fruit quality. Sun-shade gradients have also been demonstrated to be a major factor on plant distribution within oak savannas. The study was conducted in the Cedar Creek Natural History Area near Bethel, Minnesota during July - August, 1996. Nine north-south 200 m transects spaced 25 m apart were established in this oak savanna. Sample sites along these transects occurred every 5 m and were 1 m by .5 m in dimension. The presence of 29 plant species native to oak savannas was determined within the sample boundaries. In addition, two light measurements were taken at sample sites to determine the amount of light penetration from the north and from the south. Plant distributions will be compared in relation to light measurements using linear regression.

Poster Presentation 40

THE FRENCH WINE INDUSTRY AND ITS COMPETITION

Lecia Gordner and James Matthews*,
Department of Modern and Classical Languages and Literature, IWU

France has long enjoyed a top spot in the world wine industry. What are the reasons for this expertise in wine and will the French prominence in the wine industry last? New world wines (those from younger countries like those in the Americas) are slowly becoming more popular and gaining more shares in the world wine market. Napa Valley, California is one example of a region producing these new world wines. France (a producer of old world wines) is famous for its high quality wine production. Burgundy, France is the region used in this research to focus on the cultural and historical aspects associated with these old world wines. The project starts out by researching the background of each industry. Understanding how each industry came about leads to a much better understanding of the current industries. The next part of the project studies how culturally intertwined each industry is with its country's popular culture. Changes in cultural habits, especially those directly associated with wine drinking, are also examined. The current performance of each wine industry in the world market is reviewed and compared to previous trends in the market. Finally, the research points to the conclusion that France's wine industry is unique because of the history and culture associated with it and it's position in the world wine market is not threatened by the up and coming new world wines.

Sources for this research project include: interviews with French wine growers and connoisseurs, interviews with American connoisseurs and wine merchants, articles from both French and American journals, internet web pages, and scholarly books written by both French and American authors. The wide variety of sources leads to an unbiased conclusion.

Poster Presentation 41

SUBTYPING A BATTERER POPULATION

Melissa A. Sprowl and Linda Kunce*, Department of Psychology, IWU

Archival data from a local batterers' assessment and treatment program was gathered on approximately 75 males. The study describes this population on a number of variables including: frequency and severity of violence, alcohol/drug use, amount of violence witnessed and experienced during childhood, attitudes toward women and violence, and mental health. In addition, self reports and police reports of the violent incident which precipitated involvement with the police were compared in order to check the accuracy of the self report. These results are discussed in terms of implications for batterer treatment programs.

Poster Presentation 42

BIOCHEMICAL ANALYSIS OF THE BChP PROTEIN BELIEVED TO BE INVOLVED IN THE REDUCTIVE MATURATION OF BChl *agg* TO BChl *ap* IN *RHODOBACTER CAPUSLATUS*

Thaddeus R. Hoening and David W. Bollivar*, Department of Biology, IWU

Photosynthetic bacteria contain bacteriochlorophyll (BChl) which has two major portions, a magnesium tetrapyrrole and an esterifying alcohol. Bacteriochlorophyll plays a key role in photosynthesis which is necessary for converting radiant energy into energy that can be used in cellular processes. The esterifying alcohol portion affects the function of the BChl in photosynthesis, but its role is not well understood. *Rhodobacter capuslatus* typically produces BChl α that is esterified with phytol (BChl a_p), but site-directed mutational analysis has shown that a mutation in *bchP* results in the accumulation of a BChl α esterified with geranylgeraniol (BChl agg) indicating that the product of the *bchP* locus, the BchP polypeptide is necessary for the reductive maturation of BChl agg to BChl a_p . In order to determine if BchP is sufficient for this process, the gene has been amplified using polymerase chain reaction and restriction endonuclease sites have been created flanking the gene so that it can be cloned into a plasmid known as pT7-7 downstream of a promoter that can be regulated. This construct was then transformed into a strain of *E. coli* (C600) which contains the pGP1-2 plasmid with the gene for T7 RNA polymerase which is under the control of the λp_L promoter. When the strain containing both plasmids is incubated at 42°C, T7 RNA polymerase is produced which can transcribe *bchP* producing BchP. Future work will include *in vitro* assays to determine if BchP is sufficient for the maturation of BChl agg to BChl a_p .

Poster Presentation 43

**A BIOGEOGRAPHICAL ANALYSIS OF THE DISTRIBUTION OF
BATS OF THE FAMILY EMBALLONURIDAE**

Brandi Mann and Thomas A. Griffiths*, Department of Biology, IWU

This project examined the biogeographical distribution of the bat family Emballonuridae (Order Chiroptera). The distributions of five species populating Africa, Southeast Asia, and islands of the western Pacific were mapped and data were pooled with data of five species compiled by Moyer (poster in this conference). Data on the ten species were used in a congruence analysis to test the validity of two rival phylogenies. Such an analysis is done by looking at the general distributional patterns of the species, and then trying to reconstruct a possible biogeographic history to account for such a distribution (Crisp, Linder, and Weston, 1995). If the distribution can be explained scientifically by means such as continental drift or by an increase in sea level which submerged previously exposed land masses, or divided an original land mass into two (resulting in speciation via isolation), then the proposed evolutionary relationship being tested is thought valid. Alternatively, species may have actively dispersed via migration or been passively dispersed through human intervention or natural events (hurricanes etc.). The more incongruencies there are (or the more unusual events required to explain the biogeographic distribution observed) the greater the possibility that the evolutionary hypothesis being tested is invalid. A slightly higher congruence was found for the hypothesized phylogeny of Tate and Archbold, 1939 (0.75) over that of Griffiths et. al., 1991 (0.625), favoring very slightly the former phylogeny over the latter.

Poster Presentation 44

THE ECONOMIC RATIONALE OF A MULTI-STATE LOTTO

Brett Roush and Robert Leekley*, Department of Economics, IWU

State lotteries have existed in their modern form in America since 1963. Multi-state lotto games, however, are a relatively recent product development. This study seeks to explain how a multi-state lotto fits into a state's portfolio of lottery products. Past research has never focused specifically on what makes offering a multi-state product attractive from the state's perspective.

In order to economically rationalize this new product the author first develops a model of the consumer under risk, employing the Friedman-Savage utility model as a starting point. Using this model as well as past empirical findings, the author generates a number of specific hypotheses regarding what affects demand for a lotto. Standard regression analysis with data points from across the United States on both a single- and multi-state level allows the construction of a demand function for lotto products. The author then uses the estimated function to predict the future revenues of Illinois' lotto products as well as examine the state's decision to participate in the recently-commenced multi-state lotto known as "The Big Game."

Poster Presentation 45

**EXAMINING REPRODUCTIVE STRATEGIES IN AN ASEXUALLY
REPRODUCING ROTIFER (CLASS BDELLOIDEA)**

Kurt Galbreath, Elizabeth Balser*, Will Jaeckle*,
Department of Biology, IWU

Nearly all multicelled organisms exhibit sexual reproduction. Rotifers of the class Bdelloidea, however, seem to be a notable exception to this pattern. No male bdelloid individuals have ever been observed and females apparently reproduce entirely through parthenogenesis. In this study, *Philodina* sp. was examined with the intent of addressing the following: 1) are bdelloids truly completely asexual? 2) if so, does their reproductive cycle differ significantly from sexually reproducing rotifers (Class Monogononta)? 3) do any such differences suggest an adaptation to an asexual existence? To answer these questions, sibling individuals (clones) were raised with equal food amounts at 20°C and 30°C. Newly hatched offspring produced by these individuals were counted and removed every 12 hours until the parent died. Individuals exhibiting unusual characteristics were isolated as possible males and raised for closer examination. No males were positively identified. However, temperature greatly effected reproduction rates. At 30°C, individuals had a significantly greater rate of reproduction ($Q_{10} = 2.34$) and produced more offspring than those at 20°C. Furthermore, age at the start of reproduction was significantly earlier at 30°C than at 20°C. Analysis of rotifer lifespan, reproductive period, and reproduction rate indicate that there is no correlation between lifespan and rate of reproduction, and there is also no significant difference between the duration of the reproductive period in *Philodina* sp. in the different temperatures. These results are in contrast with previously reported results by Snell and King (1977) for *Asplanchna brightwelli* (Class Monogononta) which indicate an inverse relationship between lifespan and reproduction.

Poster Presentation 46

**THE CHARACTERIZATION OF A NUCLEAR LOCUS AFFECTING
THE FUNCTION OF PROTOCHLOROPHYLLIDE
OXIDOREDUCTASE**

Robert Graham, David Bollivar*, Department of Biology, IWU

Protochlorophyllide oxidoreductase, which catalyzes the conversion of protochlorophyllide to chlorophyllide, is a key enzyme in the biosynthetic pathway of chlorophyll. Currently there are seven known nuclear loci that affect function of the enzyme. The chloroplast itself contains three genes coding for catalytic subunits of protochlorophyllide oxidoreductase, yet disruption of the nuclear loci inhibits formation of the enzyme by the chloroplast. Completion of this project will provide a better understanding of nuclear-chloroplast communication, since the evidence suggests that the nuclear loci play a significant role in the regulation of cellular levels of chlorophyll, the molecule that harvests light in plants. To accomplish this goal, a mutant strain of the algae *Chlamydomonas reinhardtii* that contains a defective Arg 7 gene (phenotype Arg 7-) had a functional Arg 7 gene (phenotype Arg 7+) inserted randomly into the genome. In a certain percentage of transformed cells, the Arg 7+ gene becomes inserted such that it disrupts a nuclear locus affecting the expression of protochlorophyllide oxidoreductase. The disruption of the locus leads to a yellow phenotype in the dark. It is yellow only in the dark because the light-dependent biosynthetic pathway is not operating and the light independent pathway has been inhibited by the disruption of the locus. The strain TY 5, a strain where the Arg 7+ gene has inserted successfully, is being analyzed. The goals for the project include the determination of which nuclear locus was disrupted, followed by the cloning and sequencing of the locus. The project will contribute to the understanding of this vitally important gene. The determination of the disrupted locus is being conducted using allelism tests which cross the TY 5 strain with strains of a known mutation. The locus will be isolated by the creation of genomic library followed by the cloning of the locus using standard hybridization techniques. Finally, the disrupted locus will be sequenced.

Poster Presentation 47

JOHN RAWLS AND ANIMAL ETHICS

Charles Byrne, Charlotte Brown* and Lenny Clapp*,
Department of Philosophy, IWU

In my paper, I explore the place of animals in John Rawls influential political/ moral philosophy. I draw mainly from his later Political Liberalism and also from his A Theory of Justice. Other sources include Peter Carruthers The Animals Issue and Annette Baier's Knowing our place in the animal world.

Rawls development of his theory of justice over the twenty years spanning between his two books has been a source of controversy. He has redirected his focus from a more ethical-driven motive to find the best moral/ political theory for societies, to a strong declaration of the strictly political (rather than moral) nature of his Political Liberalism, which is designed, he claims, to simply find a way to compromise among multiple equally valid theories.

As Rawls work has been immensely influential, concern has grown for the place of animals in his theory. Uncertainty has arisen due to Rawls changing philosophy. Being a contractualist theory, and owing to its focus on rational agreement, it has in the been used to justify the exclusion of animals from moral consideration; Peter Carruthers attempts this line in his book. However, I try to show in my paper that this view is mistaken, my inspiration being drawn from Baier.

I believe that the inclusion of animals in Rawls theory is not only possible, but less discordant with Rawls own feelings.

Poster Presentation 48

**CHINESE NATIONAL ADMINISTRATIVE POLICY AS A CAUSALITY
OF INTERNAL RURAL-URBAN MIGRATION**

Jennifer Heskett and Michael Seeborg*, Department of Economics, IWU

Urbanization, the increase in the percentage of a country's total population residing in urban areas, represents one of the innumerable social, political and economic changes that occur within a developing nation. High city population growth rates cause urbanization to a degree; however, internal migration from rural to urban areas also induces this phenomenon. Economists John R. Harris and Michael P. Todaro have developed a model that attributes rural-urban migration to wage differentials. To be sure, differences in absolute rural and urban wages provide incentive for workers to migrate to urban areas within China. Recent Chinese national administrative policies, however, also indirectly encourage rural-urban migration by increasing the probability of finding urban employment. Administrative reform in the agricultural sector has led to the release of millions of surplus workers. The significant finding of this paper is that many of these workers look to the cities for employment opportunities because additional administrative reforms applying to foreign direct investment, state-owned enterprises and the proliferation of markets have all increased the probability of finding a job in an urban area.

Poster Presentation 49

**ZOOGEOGRAPHIC CONGRUENCE ANALYSIS OF THE PHYLOGENY
OF NYCTERID BAT SPECIES**

Scott Soderquist and Thomas Griffiths*, Department of Biology, IWU

Distributional data were obtained for six species of bats from the Family Nycteridae to attempt to test the validity of a previously published phylogeny (Griffiths, 1994, 1997) that was produced based on morphological data. Geographical data and localities from a number of primary scientific sources were used to establish the existing range of each species of nycterid bat. Apparently, dispersal of species in tropical Africa since their times of speciation has extended their ranges. Thus this analysis was impeded by the fact that most of the species in the study had overlapping ranges due to dispersal. Because of this difficulty, the congruence analysis performed here cannot be used to support the phylogeny of Griffiths (1994, 1997).

STUDENT PARTICIPANTS

Ayers, Leslie J. _____	P4	Klemens, J. A. _____	P18
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Cooper, William _____	O2.4	Nambudiripad, Krishnam _____	O1.5
Cornstubble, Michael R. _____	P29	Neal, Cari D. _____	P19, P36
Dadakas, Dimitrios _____	P7	Oesterlin, Dana _____	O2.1
Davidhmeier, Thomas _____	P26	Ogden, Amie _____	O2.1
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Immel, Melissa S. _____	P38	Webb, Catherine _____	O1.4
Joncich, Erica _____	O1.1	Whitcomb, Vicki _____	P5
Kevan, Mark A. _____	P9		