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To Recognize the Research Projects of IWU Students



NINTH ANNUAL

John Wesley Powell • IWU

# STUDENT RESEARCH CONFERENCE

April 18, 1998

Center for Natural Science

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Ninth Annual

John Wesley Powell • IWU

# Student Research Conference

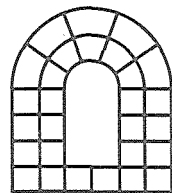
Science Commons

Center for Natural Science

Saturday, April 18, 1998

9:00 a.m. – 4:30 p.m.

*Official Program*



ILLINOIS  
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## SCHEDULE OF EVENTS

**Saturday, April 18, 1998**

9:00 a.m.	Continental Breakfast and Poster Session A	Science Commons
10:30 a.m.	Oral Presentations (Concurrent Sessions)	Beckman Auditorium Anderson Auditorium E103
12:00 p.m.	Lunch	Main Lounge
1:30 p.m.	Poster Session B	Science Commons
2:30 p.m.	Alumni Presentation Recognition of Phi Kappa Phi Initiates and Certificate Presentations	Anderson Auditorium
3:30 p.m.	Closing Remarks and Presentation of Certificates by Minor Myers jr., President, Illinois Wesleyan University	Anderson Auditorium

## STUDENT PARTICIPANTS

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**ORAL PRESENTATIONS - SESSION 1  
ANDERSON AUDITORIUM  
(C101)**

10:30-10:45	Diana Alame
10:45-11:00	Shailushi Baxi
11:00-11:15	Esther Condos
11:15-11:30	Kelly Crumrin
11:30-11:45	Ryan Keintz
11:45-12:00	Jim Toomey

**ORAL PRESENTATIONS - SESSION 2  
BECKMAN AUDITORIUM  
(C102)**

10:30-10:45	Margaret Bergin
10:45-11:00	Rob Mawyer
11:00-11:15	Brian Nowicki
11:15-11:30	Sarah VanSickle
11:30-11:45	Nicole Williams

**ORAL PRESENTATIONS - SESSION 3  
ROOM E103**

10:30-10:45	Anders Floor
10:45-11:00	Robert Graham
11:00-11:15	Katie Larsen
11:15-11:30	Jean Schoening
11:30-11:45	Christopher Tartaglia
11:45-12:00	Laura Warren

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

Oral Presentation 1.1

THE HOMERIC HERO: A LIFE OF GLORY AND TRAGEDY

Diana Alame and Nancy Sultan\*  
Classical Studies, Illinois Wesleyan University

It can be reasonably assumed that warriors and their ability to defend their own people were essential components for the survival of an ancient city, such as Troy or Mycenae. *The Iliad* and *The Odyssey* make it clear that it took amazing qualities in order for a man to be an effective warrior and therefore become a hero. He had to have strength, courage, and the ability to be a leader among men. Achilles, and other warriors such as Odysseus, Agamemnon, and Diomedes, are the ultimate heroes since they achieve *kleos* (glory) in their tragic lives through their lack of "seasonality" and their antagonistic relationships with a god.

Though the women in these cities have different qualities, they are no less important or effective. Lest we forget, the women whose praises are sung by Homer are also heroes. Mothers and wives have the responsibility of providing life, lamenting the dead, and of making sure destruction does not fall upon those she must care for. A faithful and loyal wife, such as Penelope can offer her warrior husband a successful *nostoi* (homecoming), unlike the sinister Clytaemestra who plans to kill her husband Agamemnon when he returns to his kingdom. Thus, heroic women also have the power to plot an event resulting in either happiness or doom. In fact, one of the most important functions these women serve is how they aid or how they hinder a warrior's progress towards a heroic status. In essence, through the exploration of individual actions and of the interaction between the warrior and the woman, a definition can be made of what makes a person a hero.

Oral Presentation 1.2

A FEMINIST ANALYSIS OF PRENATAL CARE IN THE U.S.

Shailushi Baxi and D.J. Waldman\*

Philosophy Department, Illinois Wesleyan University

The aim of this project is to analyze the U.S. system of prenatal care from a feminist point of view. I begin by investigating the connection between prenatal care and birth outcomes; studies indicate that adequate prenatal care is almost causally related to positive birth outcomes. However, certain women are likely to fail to receive proper care. A set of maternal characteristics describes women who are unlikely to receive adequate prenatal care. Since these same characteristics also describe women in poverty, I propose that poverty is the underlying cause of women's inability to receive proper health care. An examination of the dynamics of poverty reveals that the forces which place people in poverty affect women more than men. In addition, welfare, which is meant to assist the poor, actually prevents people- particularly women- from climbing out of poverty.

Using Ronald Dworkin's theory of social justice, I argue that because of the way welfare works, poverty effectively undermines women's equality as citizens. This theory, called the Equality of Resources theory, requires that each person has equal access to community resources and no person utilizes more than his/her share. In order to maintain women's equality, some type of welfare must therefore compensate for the inequalities in access to resources, including prenatal care. However, the present system of welfare does not compensate adequately for any inequalities; in particular, poor women are prevented from seeking adequate prenatal care. In order to restore women's equality as citizens, welfare must be reformed to include prenatal care for poor women.



Oral Presentation 1.3

THE SOCIO-LINGUISTICS OF ANCIENT GREEK IDENTITY: THE  
MEANING OF 'MYTH'

Esther Condos and Nancy Sultan\*  
Classical Studies, Illinois Wesleyan University

In Ancient Greece, myth and ritual served as methods by which people developed a sense of belonging. Myths were not merely fantastic stories, but they and their accompanying rituals were regarded as the speaking of ultimate truths by the Ancient Greeks. Indeed, myth and ritual formed the very basis for Greek religion. The linguistics of the word 'myth' itself provides a background that explains the origin of later sources of Greek identity. 'Myth', derived from the Greek verb *muō*, 'I have my eyes closed, I have my mouth shut', sets up the context of Greek religion by establishing a dichotomy of the sacred, or 'marked' sphere, versus the secular, or 'unmarked' sphere. The sacred sphere is one of exclusivity: a closed group within which there is a sanctity and openness vis-a-vis outsiders to the group. Initiates of this 'marked' sacred group are described as *mustes* in Ancient Greek. This concept provides the basis of the later ideology that inclusion and group identity are central to the Greek *polis* 'city-state' itself. Thus, the socio-linguistics of 'myth' actually serves as the basis of establishing how people identify themselves as a group.

Oral Presentation 1.4

**“WHAN THAT THEY WERE SEEKE”: BALANCE BETWEEN PHYSICAL  
AND SPIRITUAL IN THE PILGRIMS OF THE *CANTERBURY TALES***

Kelly Crumrin and Wes Chapman\*  
Department of English, Illinois Wesleyan University

When reading the Prologue to Chaucer's *Canterbury Tales*, one encounters many levels of meaning, both obvious and subtle. Chaucer has written into his description of the pilgrims' bodies many clues and signs by which to interpret their inner characters and motivations. High importance is placed on the theoretical balance between the physical and the spiritual needs of people, and conflict occurs constantly between the parts of them that are material and immaterial. In medieval medical thought, disease was caused by such imbalance, and was itself a sign of spiritual illness, a correlation which would have been familiar to Chaucer. Therefore, the bodily descriptions of Chaucer's pilgrims are key to understanding the health of their souls, and also to interpreting their motives for joining this voyage to Canterbury, to "holpen them whan that they were seeke" (GP 17). As we'll see, if all of them are journeying toward spiritual wellness, some of them have a much longer way to go than others.

Oral Presentation 1.5

**THE PIZZA HUT PHENOMENON: CULTURAL CONTRADICTIONS OF  
RUSSIAN CAPITALISM**

Ryan Keintz and Marina Balina\*

Department of Modern and Classical Languages and Literatures,  
Illinois Wesleyan University

In the West, our picture of struggling Russian capitalism is of a country full of enthusiastic “New Russians” who simply cannot get it right. Although the difficult transition from communism to capitalism has and will contain a series of stumbling blocks, it is superficial to assume that the struggles and mishaps are due primarily to lack of ability. While many Russians do embrace current reform efforts, a significant portion of the population does not welcome the new system or foreign influence. This is comically, yet accurately displayed in a recent Pizza Hut commercial featuring Mikhail Gorbachev and a group of Russians debating the transition to capitalism. The add illustrates an entity at the heart of Russian culture which has produced a love/hate reception to Western business culture. Despite the vast amount of analysis and forecasting of Russian capitalism, undertaken by various fields such as business, economics, and political science, the most important and basic principle has been relatively ignored: It is all irrelevant if the Russian people simply do not welcome the new system.

A melding of numerous areas of study, this project will explore the following: First will be an appeal in expressing the importance of this issue and this intangible perspective in general. Second, it will explore Russian folklore in effort to understand Russia’s traditional perception of the businessman. Using Russian literature and recent media examples, it will address modern implications for the prospects of capitalism in Russia. This project intends to illustrate how influential a role the West will play in Russia’s future, and how much damage Western blind-spots have already caused.

Oral Presentation 1.6

THE POETICS OF OLD AGE IN GRECO-ROMAN EPIC

Jim Toomey and Nancy Sultan\*  
Classical Studies, Illinois Wesleyan University

The following presentation will explore the respect given and the prejudices toward old men in ancient Greece and Rome through evidence given in its epic poetry, *The Iliad*, *The Odyssey*, and *The Aeneid*. By studying the characters in such works, it becomes apparent that while elderly men were held with high esteem by the populace for their wisdom and experiences, they were also seen as senile and physically incapacitated. Moreover, old age in itself was feared for its physical degradation and its imminence to death. We shall uncover such beliefs with respect to old men through the elderly characters in epic and their functions of wise counsel and family head, then by studying their physical weaknesses and general apathy toward life.

In the area of wise counsel, we shall peruse the gift of experience that the elderly give the younger generations, their interest for fulfilling the common good, and their connection to the past. In the next sub-topic, the family structure of Greco-Roman society will be touched upon to stress the importance of father figures in epic, both on the battlefield and at peace. Furthermore, the discussion will continue on the *pathos* or 'suffering' of old age in the areas of loss of heroic stature, the concept of the "threshold of old age," and the pity and loss of respect bestowed upon the elderly by the younger generations. The presentation will then end with a realization of the overall importance of old men in Greco-Roman society.

Oral Presentation 2.1

HEY BIG SPENDER: TESTING ALTERNATE THEORIES ON  
VARIANCE IN WELFARE "NATIONAL EFFORT"

Meg Bergin and Kathleen Montgomery\*  
Department of Political Science, Illinois Wesleyan University

Developed countries vary in their levels of social welfare expenditure or "national effort." Is this variance more a result of demographics—countries having different sized welfare-dependent populations? Or, do socio-cultural variables lead countries to have fundamentally different ideas about the government's role in alleviating poverty? This paper tests the demographic and socio-cultural schools across 16 advanced nations using data from the OECD and the *World Values Survey*, 1990-1993 wave.

Oral Presentation 2.2

THE IRISH FACE: IMAGES OF "THE HERO" IN MODERN IRISH  
DRAMA

Rob Mawyer and James McGowan\*  
Department of English, Illinois Wesleyan University

In May 1995, Irish poet/playwright Tom MacIntyre spoke to a group of students in a small village in Ireland called Allihies. The topic of discussion was Patrick Kavanagh's *The Great Hunger* and MacIntyre's stage adaptation. In the midst of this discussion, MacIntyre described *The Great Hunger*'s main character Paddy Maguire as having "the Irish face": a wandering, roving, near-crazed expression that hit at the core of being a man in Ireland.

In analyzing Paddy Maguire's character in *The Great Hunger*, the reader finds several qualities that I believe comprise the Irish face. First, there is the indication of an empty or meaningless existence. Second, the character is unable, even impotent, to change the direction or circumstances of his life. Third, there is the hint of madness that tempts the reader into passing the character off as simply a "crazy" or "brutish" Irishman. Finally, the character possesses an inner strength that protects him from his miseries and that ultimately redeems him as a character. I believe that the haunting Irish face consists of the combination of all these elements.

I argue in this paper that the Irish face is not unique to Paddy Maguire, but rather extends across Irish literature, specifically Modern Drama. Four famous plays are discussed in depth: J.M. Synge's *The Playboy of the Western World*, Sean O'Casey's *Juno and the Paycock*, Brian Friel's *Translations*, and John P. Keane's *The Field*. An analysis of each of these plays demonstrates that significant male characters from each possess the same or similar "faces" as Paddy Maguire in *The Great Hunger*.

Finally, I discuss the Irish face in terms of a famous and significant quote in Joyce's *Ulysses*: Stephen Dedalus says that history "is a nightmare from which I am trying to awake" (28). This notion of history as an important influence on the Irish is vital to my argument when it becomes clear that each of the characters being discussed must negotiate his life in terms of the forces, or "histories," that would try to define him. I believe that the impetus for the Irish face is not simply the misery of day-to-day life, but rather the need and desire to lead an existence in terms of or against these histories.

Oral Presentation 2.3

WANDERING ON HIS WAY: AN EXAMINATION OF KEROUAC'S  
SPIRITUAL PROGRESS THROUGH *THE SUBTERRANEANS*  
AND *THE DHARMA BUMS*

Brian Nowicki and Dan Terkla\*

Department of English, Illinois Wesleyan University

By writing from the "jewel center of interest...at the moment of writing," as described in Kerouac's "Essentials of Spontaneous Prose" (PBR 58), Kerouac constructs in *The Subterraneans* a brutally confessional and honest representation of Leo Percepied's emotional state following his breakup with Mardou Fox, the emotional effects of which Ray Smith seeks to reconcile in *The Dharma Bums*. The movement from Leo's emotional instability to Ray's meditative wanderings is best illustrated by looking to their complementary characters, Mardou Fox and Japhy Ryder, respectively. By examining the language and style of both narratives, one can uncover the needs of both Leo and Ray and find whether or not Ray represents the realization of Leo's needs.

Kerouac's "Essentials of Spontaneous Prose" lay the groundwork for the logic behind *The Subterraneans*. The guidelines call for focusing on a singular image, idea, or experience from which ideas, associations, and impressions flow uninterrupted by unnecessary punctuation, pauses, and formal structures. To preserve the free-flowing nature of the work and its spontaneity, there can be no revisions, no insertions, and no rethinking of the thought after the thought is complete. The unconscious must be free of "social, psychological, and grammatical restrictions...[in order to] free itself from its muteness and take verbal shape in the outside world" (DLB 292). The object of the exercise is to overcome the hindrance of language and formality which prevent the communication of essential meaning to the reader—the writing should ideally come from the unconscious and appeal to the reader's unconscious so that the reader experiences the text in a near "telepathic shock" (PBR 57). The characteristics of the narratives in question, *The Subterraneans* and *The Dharma Bums*, reflect Kerouac's personal approach to writing, which in this case serve to present-readers with an intensely confessional and provocative examination of the events of life.

Oral Presentation 2.4

TRADE AND COMMERCE AT SEPPHORIS, ISRAEL

Sarah VanSickle and Dennis Groh\*

Department of Anthropology, Illinois Wesleyan University

Conflicting material has been written regarding trade patterns in the Near East. Researchers debate whether Galilean cities utilized trade routes along the Sea of Galilee and the Mediterranean Sea or were self-sufficient, with little access to trade. An analysis of material culture found at specific sites can most efficiently determine the extent of trade in the region. A significant assemblage of foreign goods will be found if commerce is extensive; an overwhelming majority of provincial artifacts will suggest minimal trade.

This project will explore the trade patterns of one site, Sepphoris, located in the Lower Galilean region of Israel, near present-day Nazareth. The city sits on both the major North/South and East/West trade routes of Galilee. This particularly suits the region for trade and commerce. The following study will focus on the first through fourth centuries CE, a time of prosperity at Sepphoris.

Import routes at Sepphoris have not yet been studied in relation to one another—this report will begin such an examination. Through the analysis of both published and unpublished materials (the latter courtesy of James F. Strange, director of the University of South Florida's Excavations at Sepphoris) this study will assert that import routes to Sepphoris were neither irregular nor random. Rather, they remained relatively constant over time to provide Sepphoris's residents with goods manufactured outside of the city.



Oral Presentation 2.5

WHO IS'T CAN READ A WOMAN?:  
*CYMBELINE* AND THE RENAISSANCE WOMAN

Nicole Williams and Mary Ann Bushman\*  
Department of English, Illinois Wesleyan University

Critics have often described Shakespeare's plays as "mirrors" that reflect the society of Renaissance England. In my research for Shakespeare's play, *Cymbeline*, I plan to examine Renaissance marriage treatises to compare the model of marriage represented in these texts to the marriage Shakespeare presents in the play. I will argue that the marriage of Posthumus and Imogen in *Cymbeline* reverses many of the generalizations used in Renaissance texts. As a result, Shakespeare does not simply "reflect" the relationships described by Renaissance writers, but rather he examines the duties ascribed to husbands and wives and questions the gender stereotypes used to justify these duties.

The nature of womankind was a popular topic of debate in the Renaissance, and both male and female writers argued their point of view on the matter. However, as Constantia Munda observes in her response to a seventeenth-century misogynist tract, women are trapped by language. If a woman attempts to defend herself with language, the act of speaking is used as evidence against her. In other words, if a woman speaks her mind, it proves that she is a "nag" or a "shrew." Imogen, who clearly contradicts these stereotypes written by men about women, is created in the context of this dilemma between women and language. Comparing Imogen to the representations of women in Renaissance texts, I will examine Imogen's relationship to the texts and language used to define the "ideal" Renaissance woman.

Oral Presentation 3.1

THE CALCULUS ON MEASURE CHAINS

Anders Floor and Zahia Drici \*

Department of Mathematics, Illinois Wesleyan University

In this presentation a new calculus will be explicated. Developed by Bernd Aulbach and Stefan Hilger, this calculus is on measure chains, which are time scales (subsets of the real line) with certain basic restrictions. This calculus provides a unified approach which encompasses both discrete and continuous cases, as well as all cases possessing some combination of continuous and discrete intervals. Some fundamental theoretical results will be given, including an induction principle for measure chains.

Oral Presentation 3.2

THE CHARACTERIZATION OF THE TY5 STRAIN OF *Chlamydomonas reinhardtii*, A CHLOROPHYLL BIOSYNTHETIC MUTANT

Robert Graham and David Bollivar\*

Department of Biology, Illinois Wesleyan University

Currently, there are seven nuclear loci known to affect the function of protochlorophyllide oxidoreductase, the enzyme which catalyses the conversion of protochlorophyllide to chlorophyllide in the alga *Chlamydomonas reinhardtii*. The conversion of protochlorophyllide to chlorophyllide is one of the final steps in the biosynthetic pathway of chlorophyll, the light harvesting molecule for many photosynthetic organisms. The chloroplast genome of *C. reinhardtii* contains three genes coding for the catalytic subunits of protochlorophyllide oxidoreductase. Yet, disruption of the nuclear loci is believed to result in the inhibition of chloroplast production of the enzyme. This evidence suggests that nuclear loci play a vital role in the regulation of chlorophyll levels in the cell by regulating the products or expression of chloroplast genes, a possible example of nuclear-chloroplast communication.

The strain of the alga *C. reinhardtii* that was studied is a transformed strain, TY5. The TY5 strain probably contains a mutation in one of the seven known nuclear loci affecting protochlorophyllide oxidoreductase function and was formed by insertional mutagenesis. The insertion of a functional Arg7 gene causes a yellow phenotype in the dark that is indicative of the strain's inability to produce chlorophyll by light independent pathways. The inability to produce chlorophyll is most likely the result of the disruption of a nuclear encoded regulatory protein that affects the function of protochlorophyllide oxidoreductase.

The specific goals for the project included the determination of which nuclear locus was disrupted, followed by the isolation and sequencing of the gene disrupted in the TY5 strain. The determination of which nuclear locus is mutated in the TY5 strain was attempted by complementation mating tests. Preliminary evidence suggests the mutated locus in the TY5 strain is the y-6 locus.

The isolation of the y-6 locus will be accomplished by creating a size-selected genomic library of the TY5 strain. The size of the 1000 bp fragment which contains the functional Arg7 gene was determined using Southern Blot analysis. Since the DNA flanking the functional Arg7 gene is part of the y-6 locus, the isolated fragment of TY5 genomic DNA can be used to screen a genomic library of *C. reinhardtii*. This process will allow the isolation of a complete y-6 locus, making the sequencing and further analysis of this important locus possible.

It is suspected that the sequencing of the gene will lead to the identification of a regulatory protein important in chlorophyll biosynthesis, specifically affecting the function of protochlorophyllide oxidoreductase. Isolation of this protein may provide significant insight into how the nucleus regulates the chloroplast and the mechanism by which the cell regulates levels of chlorophyll. This information will help our understanding of the complex process of nuclear-chloroplast communication.

Oral Presentation 3.3

**AN ANALYSIS OF THE RELATIONSHIP BETWEEN  
ATHEROSCLEROSIS AND ALZHEIMER'S DISEASE**

Katie Larsen and Wayne Dornan\*

Psychology Department, Illinois Wesleyan University

Several animal studies have brought the cholinergic hypothesis of Alzheimer's Disease (AD) into question. In addition, recent clinical studies have shown that the number of neuritic plaques and neurofibrillary tangles does not yield a conclusive diagnosis of AD. A reassessment of risk factors involved in AD development has led to finding that atherosclerosis is associated with dementia. The present study is a clinical analysis of the relationship between atherosclerosis severity, based on autopsy assessment, and severity of AD, based on scores from cognitive tests and functional assessments. Age at onset of AD occurring with atherosclerosis will be determined both through examination of medical records and interviews with family members.

## Oral Presentation 3.4

### EFFECTS OF THE *fa* MUTATION ON THE LEPTIN RECEPTOR

Jean Schoening, Yanping Wang, and Heinz Baumann\*  
Department of Biology, Illinois Wesleyan University and  
Department of Molecular and Cellular Biology,  
Roswell Park Cancer Institute

Leptin, a hormone released by adipocytes and involved in the regulation of energy, binds to the leptin receptor (OB-R).<sup>1</sup> The activated OB-R induces the phosphorylation of the receptor itself and Janus kinases (JAKs). The JAKs then activate Signal Transducer and Activator of Transcription (STAT) proteins which translocate to the nucleus to regulate genes. A result of a single amino acid substitution, the *fatty* mutation of OB-R (OB-R(*fa*)) is found in the extracellular domain of the receptor. This mutation leads to an obese phenotype in homozygous *falfa* rats.<sup>2</sup> Preliminary experiments suggest that the *fatty* mutation may cause deficiencies in the signal transducing capabilities of the receptor.<sup>3</sup> The goal of this study was to identify the precise signaling function of the OB-R(*fa*).

Human kidney 293 cells were generated that stably express either the wild type OB-R (OB-R(wt)) or OB-R(*fa*). These stable cells exhibited significantly increased ligand binding relative to the parental cell line. When treated with leptin, both OB-R(wt) and OB-R(*fa*) cells indicate an increase in STAT1 and STAT3 activity. The OB-R(*fa*) cells exhibit an increase in the basal level of DNA binding activity in the absence of leptin. The constitutive activity of OB-R(*fa*) was verified with gene induction experiments. In addition, leptin treatment also activates the SHP-2 protein tyrosine phosphatase, which is predicted to down-regulate OB-R signaling. This finding is in contrast to the previous report that suggested SHP-2 is not part of OB-R signaling.<sup>4</sup> These results demonstrate that OB-R(*fa*) alters the function of the receptor by introducing a ligand-independent signal transduction, suggesting that the *fatty* phenotype is mechanistically distinct from the *diabetes* mutation of OB-R which causes a signal incompetent receptor.<sup>1,7</sup>

#### References:

1. Tartaglia, L. (1997) *J. Biol. Chem.* **272**, 6093-6096.
2. Chua, S., et. al. (1996) *Diabetes*, **45**, 1141-1143.
3. Yamashita, T., et. al. (1997) *Diabetes*, **46**, 1077-1080.
4. Nakashima, K., et. al. (1997) *FEBS*, **401**, 49-52.
5. Wang, Y., et. al. (1997) *J. Biol. Chem.*, **272**, 16216-16223.
6. White, D., et. al. (1997) *J. Biol. Chem.*, **272**, 4065-4071.
7. Baumann, H., et. al. (1996) *Proc. Natl. Acad. Sci. U.S.A.*, **93**, 8374-8376.

Oral Presentation 3.5

BERNSTEIN-BEZIER POLYNOMIALS AND VERTEX SPLINES

Christopher Tartaglia and Tian-Xiao He\*

Department of Mathematics, Illinois Wesleyan University

This presentation will begin with a brief introduction of Barycentric coordinates. Then Bernstein-Bezier expressions of piecewise polynomials over simplexes will be presented. Several examples will be given. The smoothness and continuity of these Bernstein-Bezier expressions will also be shown. This will lead to the discussion of piecewise  $C^1$  quadratic interpolation and  $C^1$  quadratic vertex splines. Examples of a spline space will be examined. Finally the approximation to  $f(x,y)$  in terms of  $f(i, j)$ , where  $i,j$  is an element of  $z$  will be explained.

Oral Presentation 3.6

**SOCIOMETRIC STATUS AND AGGRESSION AS PREDICTIVE  
FACTORS OF CHILDHOOD CONFLICT**

Laura Warren and Doran French\*

Department of Psychology, Illinois Wesleyan University

Following recent trends in the study of children's conflict, researchers will attempt to compare relationship strength between conflict resolution style and the personal variables of aggression and sociometric status. Approximately 100 fourth- and fifth-grade students will complete assessments which measure sociometric status and aggression, as well as report both hypothetical and real-life conflict resolution styles. Researchers hypothesize that aggression levels will be more strongly associated with antisocial styles of conflict management. Researchers also postulate results which indicate higher use of compromising strategies in hypothetical conflict situation responses than in those answers involving real-life conflict. Results will have implications in methods of conflict management intervention with children.

**POSTER SESSION A**

**Poster Presentations 1 through 20**

**9:00 - 10:30 a.m.**

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

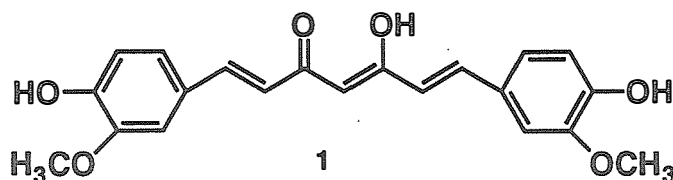


Poster Presentation 1

ISOLATION OF CURCUMIN FROM TURMERIC

Andrew M. Anderson and Ram S. Mohan \*  
Department of Chemistry, Illinois Wesleyan University

Turmeric (*Curcuma longa*) is a yellow coloring matter obtained from the rhizomes of *curcuma longa*, a plant that belongs to the ginger family. Turmeric gives curry dishes their characteristic yellowish color and is commonly used in Indian and Thai cooking. The active ingredient in turmeric is curcumin 1 which is 2% by weight of the root of turmeric. We have developed a simple procedure for isolation of curcumin from turmeric. This experiment which exposes the student to various simple laboratory techniques should make a new and interesting addition to the beginning organic chemistry lab. The experimental methods and the results will be discussed.



## Poster Presentation 2

SYNTHESIS OF A NEW FAMILY OF DIAMINES:  
COMPONENTS FOR SUPRAMOLECULAR ARCHITECTURESJonathan T. Brockman and Rebecca Roesner\*  
Department of Chemistry, Illinois Wesleyan University

The practical limits of manufacturing smaller and smaller electronic components is fast approaching, and scientists have been exploring the use of molecular and macromolecular electronic devices. Supramolecular systems have been designed and demonstrated to function as molecular switches, molecular wires or photoelectric devices. One supramolecular structure is the rotaxane which is composed of a linear molecular string (linker) threaded through a macrocyclic molecular ring with bulky blocking groups attached to the ends of the linker to prevent dethreading. The current goal is the synthesis of a family of diamine linkers of various lengths that can be attached to the bulky blocking group. Synthesis is being achieved through the reaction of *p*-hydroxyacetanilide with dibromoalkanes in basic media, followed by basic hydrolysis.<sup>1</sup> An example with dibromobutane is shown in Figure 1.

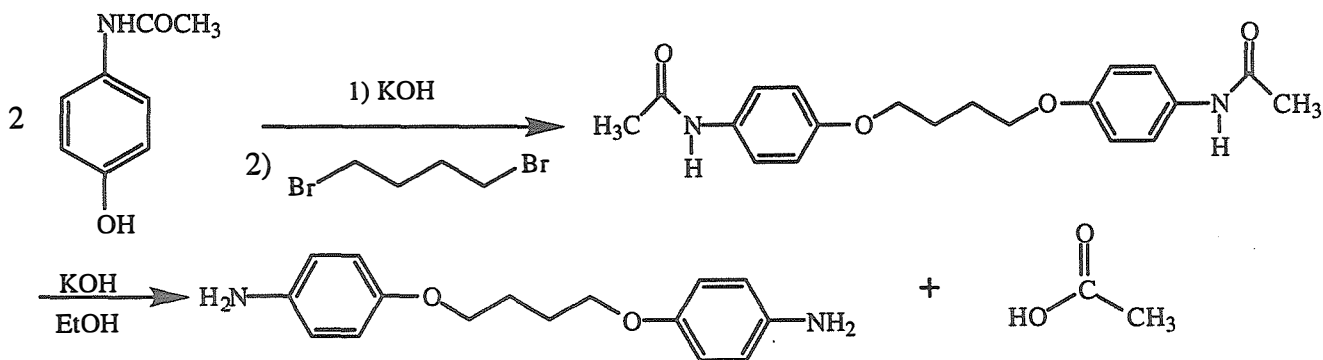


Figure 1

<sup>1</sup>Bartulin, J.; Ramos, M.L.; Rivas, B.L. *Polymer Bulletin* 15, 405-409 (1986).

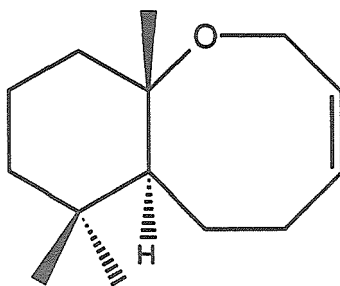
Poster Presentation 3

STRATEGIES FOR CONSTRUCTION OF EIGHT-MEMBERED CYCLIC ETHERS: APPLICATION TOWARDS SYNTHESIS OF ARENARAN A

Christopher R. Butler and Ram S. Mohan\*

Department of Chemistry, Illinois Wesleyan University

An increasing number of bio-active marine natural products are found to contain the eight-membered ether ring moiety. The synthesis of these units has been challenging due to entropy factors and transannular interactions. We wish to develop some general strategies for construction of eight-membered ethers and apply these to the synthesis of Arenaran A, 1. Arenaran A, a sesquiterpene isolated from the marine sponge *Dysidea* has been shown to possess anti-tumor activity. The synthetic methodology and progress to date will be discussed.



Poster Presentation 4

**CREATION OF CHLOROPHYLL BIOSYNTHETIC MUTANTS OF  
*Chlamydomonas reinhardtii* BY INSERTIONAL MUTAGENESIS**

Jason R. Dinges and David W. Bollivar\*  
Department of Biology, Illinois Wesleyan University

Nuclear transformation of the green alga *Chlamydomonas reinhardtii* is a useful technique for studying various cellular processes, including chlorophyll biosynthesis. The mutations resulting from the transformation occur because of the integration of foreign DNA into the nuclear genome, disrupting the function of the gene at the point of insertion. We are attempting to isolate chlorophyll biosynthesis mutants of *Chlamydomonas reinhardtii* using two separate selectable markers as inserting DNA. One DNA fragment contains an *A*, a prokaryotic antibiotic resistance gene, which makes chloroplast ribosomes resistant to spectinomycin. The other DNA fragment contains the *Arg7* gene, coding for the enzyme arginosuccinate lyase, allowing the organism to produce the amino acid arginine. Transformants are selected and screened for their ability to synthesize chlorophyll in the dark. Creation of the mutants in this manner allows for the analysis of the genes that were disrupted. The isolated genes, coding for proteins, enzymes, or subunits of enzymes important in light-independent chlorophyll biosynthesis can then be cloned and characterized, leading to a better understanding of the process of chlorophyll biosynthesis in *Chlamydomonas reinhardtii*.

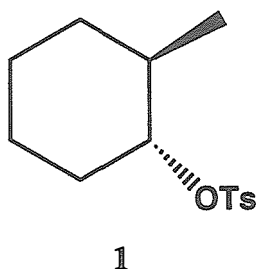
Poster Presentation 5

THE STUDY OF ELIMINATION REACTIONS OF 2-SUBSTITUTED  
CYCLOHEXYL SULFONATES

Brad J. Ettlie and Ram S. Mohan\*

Department of Chemistry, Illinois Wesleyan University

A number of important organic transformations follow the E-2 elimination pathway. E-2 elimination reactions are bimolecular in nature and have been carried out with a wide variety of bases. E-2 eliminations are favored with primary alkyl halides and sulfonates while E-1 elimination is the preferred path with tertiary halides and sulfonates. Secondary alkyl sulfonates and alkyl halides present a borderline case with either mechanism being a possibility. The elimination of 2-substituted cyclohexyl tosylates has been studied, but there is some discrepancy in the literature. The aim of this project is to study the reactions of *trans*-2-methylcyclohexyl tosylate **1** with a variety of bases. The results of the reactions and the mechanistic implications will be discussed.



Poster Presentation 6

**THE DEVELOPMENTAL RESPONSE TO VARYING GROWTH RATES  
IN *ROMALEA GUTTATA*, THE EASTERN LUBBER GRASSHOPPER**

Virginia L. Flanagan and Steven A. Juliano\*

Department of Biology, Illinois Wesleyan University and Illinois State University

Life history traits such as the size and relative age of an organism can greatly influence an individual's survival and reproductive success. These traits can vary between individuals in a species, due to environmental conditions during juvenile development. We examined how changes in food availability during juvenile stages of development can affect the size and timing of eclosion (i.e. adulthood) in *Romalea guttata*, the Eastern Lubber grasshopper. Hatchling *R. guttata* were raised on nine treatment groups consisting of a high food diet, a low food diet and switches from low to high food, high to low food, and high to no food diets. The switches were made at significant points in the insects development corresponding to different instars (i.e. stages of development). When food availability was high in the second through the fourth instars insects took significantly less time to reach adulthood than insects with low food availability in the middle three instars. The same trend occurred in the mass of the insects at eclosion; when high food availability occurred in the middle three instars, insects weighed significantly more than insects fed low food in the middle three instars. This suggests that both the time to and size at eclosion were determined in the middle of the nymphal life cycle, and that feeding in the first and last instar did not affect development. Other tests were done to examine whether insects with low food availability could increase their feeding efficiency, but our results did not support this hypothesis. Our results suggest that developmental cues are set at a particular developmental state, and proceed independently of feeding in the later instars. This suggests that development does not continuously adapt to changes in food availability, and there is strong evidence for biological cues which can cause development to proceed regardless of feeding. The concept of fixed or unresponsive development, in turn, may constrain an individual's ability to adapt to varying environments, resulting in a decrease in survival and reproductive success.

Poster Presentation 7

SYSTEMATIC RELATIONSHIPS OF RHINOLOPHID BATS, BASED ON  
HYOID MORPHOLOGY

Jennifer L. Garner and Thomas A. Griffiths\*  
Department of Biology, Illinois Wesleyan University

Using standard microdissection techniques, the morphology of the hyoid apparatus and musculature was examined in two species of rhinolophid bats. A cladistic analysis of the data revealed that there were thirteen derived characters which could be used in the study. As expected, hyoid data support the traditional grouping of the family Rhinolophidae with the bat families Hipposideridae, Megadermatidae and Nycteridae. However, the results show, surprisingly, that these four families were on a line at the base of the microchiropteran tree, with all other bat families grouped in a clade above them. This study is the first to suggest that the rhinolophid clade is the basal line of the microchiropteran tree.

Poster Presentation 8

**HIV-1-ASSOCIATED DEMENTIA: IS SUBCORTICAL DEMENTIA AN  
ACCURATE LABEL?**

Alex L. Goldfayn and Johnna Shapiro\*  
Department of Psychology, Illinois Wesleyan University

No abstract available.



Poster Presentation 9

THE CHARACTERIZATION OF THE TY5 STRAIN OF *Chlamydomonas reinhardtii*, A CHLOROPHYLL BIOSYNTHETIC MUTANT

Robert Graham and David Bollivar\*

Department of Biology, Illinois Wesleyan University

Currently, there are seven nuclear loci known to affect the function of protochlorophyllide oxidoreductase, the enzyme which catalyses the conversion of protochlorophyllide to chlorophyllide in the alga *Chlamydomonas reinhardtii*. The conversion of protochlorophyllide to chlorophyllide is one of the final steps in the biosynthetic pathway of chlorophyll, the light harvesting molecule for many photosynthetic organisms. The chloroplast genome of *C. reinhardtii* contains three genes coding for the catalytic subunits of protochlorophyllide oxidoreductase. Yet, disruption of the nuclear loci is believed to result in the inhibition of chloroplast production of the enzyme. This evidence suggests that nuclear loci play a vital role in the regulation of chlorophyll levels in the cell by regulating the products or expression of chloroplast genes, a possible example of nuclear-chloroplast communication.

The strain of the alga *C. reinhardtii* that was studied is a transformed strain, TY5. The TY5 strain probably contains a mutation in one of the seven known nuclear loci affecting protochlorophyllide oxidoreductase function and was formed by insertional mutagenesis. The insertion of a functional Arg7 gene causes a yellow phenotype in the dark that is indicative of the strain's inability to produce chlorophyll by light independent pathways. The inability to produce chlorophyll is most likely the result of the disruption of a nuclear encoded regulatory protein that affects the function of protochlorophyllide oxidoreductase.

The specific goals for the project included the determination of which nuclear locus was disrupted, followed by the isolation and sequencing of the gene disrupted in the TY5 strain. The determination of which nuclear locus is mutated in the TY5 strain was attempted by complementation mating tests. Preliminary evidence suggests the mutated locus in the TY5 strain is the y-6 locus.

The isolation of the y-6 locus will be accomplished by creating a size-selected genomic library of the TY5 strain. The size of the 1000 bp fragment which contains the functional Arg7 gene was determined using Southern Blot analysis. Since the DNA flanking the functional Arg7 gene is part of the y-6 locus, the isolated fragment of TY5 genomic DNA can be used to screen a genomic library of *C. reinhardtii*. This process will allow the isolation of a complete y-6 locus, making the sequencing and further analysis of this important locus possible.

It is suspected that the sequencing of the gene will lead to the identification of a regulatory protein important in chlorophyll biosynthesis, specifically affecting the function of protochlorophyllide oxidoreductase. Isolation of this protein may provide significant insight into how the nucleus regulates the chloroplast and the mechanism by which the cell regulates levels of chlorophyll. This information will help our understanding of the complex process of nuclear-chloroplast communication.

Poster Presentation 10

**DETERMINANTS OF DERIVATIVE USE BY COMMERCIAL BANKS**

Katie Hundman and Margaret Chapman\*  
Department of Economics, Illinois Wesleyan University

Banks use of financial derivatives has been growing rapidly in recent years due to regulatory changes concerning the amount of capital banks are required to hold as well as an increase in their market risk exposure. Derivatives, namely, futures, options and swaps, are off-balance sheet instruments that allow banks to transform the duration of their balance sheets in order to manage market risk without incurring additional capital requirements. However, it has been argued that federal deposit insurance held by banks provides an incentive for banks to speculate with derivatives in an attempt to increase the value of shareholder equity by expanding into activities that shift risk onto the deposit insurer. Speculating with derivatives involves gambling on the future performance of the assets underlying the derivatives in an attempt to reap trading profits. However, using derivatives in such a manner subjects banks to higher rather than lower risk exposure and can lead to significant financial losses. Therefore, it is important from a regulatory perspective to determine how banks are using derivatives. This paper argues that banks engage in derivative activities to reduce their exposure to interest rate risk rather than to increase risk exposure by speculating.

Poster Presentation 11

**DOES THE METHOD OF PREPARATION ALTER MEASUREMENTS OF  
ORGANOCHLORINE PESTICIDE LEVELS IN AVIAN CARCASSES?**

Klemens, Jeffrey A., J.A. Frick\*, R.G. Harper and A.P. Capparella  
Departments of Biology and Chemistry, Illinois Wesleyan University, and  
Department of Biological Sciences, Illinois State University

Concern has been raised that measurements of avian organochlorine pesticide contaminants obtained from carcass material removed during preparation as museum study specimens may underestimate actual pesticide levels due to exclusion of the skin. In order to assess this potential underestimation, carcasses of 30 ovenbirds (*Seiurus aurocapillus*) were randomly assigned to one of three treatment groups: (1) skinned birds in which the skinned carcass was analyzed; (2) plucked birds in which the entire carcass minus the feathers was analyzed; and (3) bisected birds in which one half of each specimen was skinned and the other half was plucked. There were no statistically significant differences in levels of the most frequently detected compound, p,p'-DDE in skinned versus plucked birds or within pairs in the bisected birds. These data suggest that using carcass material left over after preparation as museum skin specimens has little effect on measurements of organochlorine pesticide levels. These results are important because they justify using tissues from skinned specimens for pesticide analysis, allowing data from museum study specimens to enhance the understanding of pesticide contamination patterns.

Poster Presentation 12

**X-RAY SPECTROSCOPIC MAPPING OF THREE UNUSUAL ACTIVE GALAXIES**

Jeremy T. S. Kotter and Cynthia J. Hess\*  
Department of Physics, Illinois Wesleyan University

Active galactic nuclei (AGN) are galaxies in which massive black holes sit at the center and accrete matter. Along with Dr. Cynthia Hess, I have studied three unusual active galaxies labeled NGC 4258, NGC 1097, and NGC 1068 in an attempt to learn more about their structures. 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 black hole. NGC 1097 has observable emission jets, while NGC 1068 is a known source of maser activity. In order to probe the physical structures of the maser- and jet-producing regions of these objects, I used X-ray observations from the Advanced Satellite for Cosmology and Astrophysics (ASCA), obtained from NASA archives. I extracted images and spectra of NGC 4258, NGC 1097, and NGC 1068 and have fitted the spectra in order to probe the source of the X-ray continuum. I then used a computer code called xstar1 to determine the temperatures at which the emitting plasmas are thermally stable within the AGN. Using line emission models generated for those stable temperatures, I then refit the spectra in order to find at what temperature or temperatures the line emission arose. From these fits I then determined the gas density and location of the X-ray emitting gas.

Poster Presentation 13

SYNTHESIS OF A FULLY CONJUGATED LINEAR DIAMINE AS A  
POTENTIAL ROTAXANE COMPONENT

Matthew T. Lewellen and Rebecca A. Roesner\*  
Department of Chemistry, Illinois Wesleyan University

Steps toward the preparation of a fully conjugated linear diamine are described. This diamine will be used as a linear component in the preparation of larger supramolecular species called rotaxanes. Rotaxanes are composed of a ring shaped molecule threaded onto a linear molecule with bulky stoppering groups used to prevent dethreading of the ring (Figure 1). The target rotaxane will be composed of two hexamolybdate ions, a beta-cyclodextrin molecule, and a linear diamine. In the first step of the diamine synthesis, *p*-aminotrimethylsilyl ethynylbenzene was prepared from 4-iodoaniline and trimethylsilyl acetylene according to Figure 2. The trimethylsilyl protecting group allows substitution to occur at only one C-H terminus of the acetylene molecule. In a subsequent step (Figure 3) the trimethylsilyl protecting group was removed from the *p*-aminotrimethylsilyl ethynylbenzene by addition of aqueous potassium hydroxide. In a third step, two equivalents of the newly formed *p*-aminoethynylbenzene will be coupled together to form 4,4'-bis(amino)diphenylbutadiyne (Figure 4).

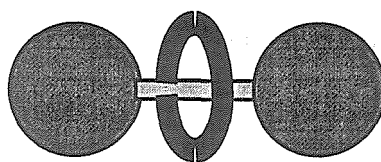


Figure 1

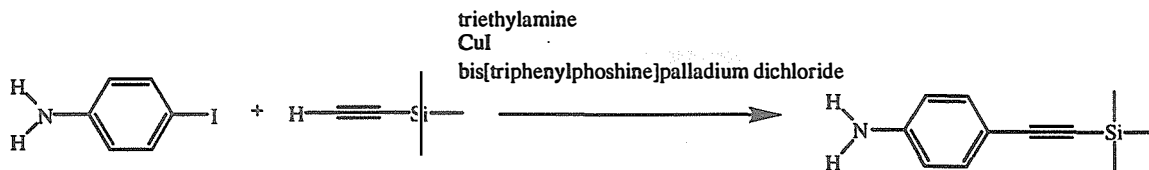


Figure 2

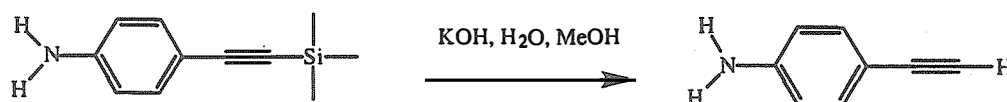


Figure 3

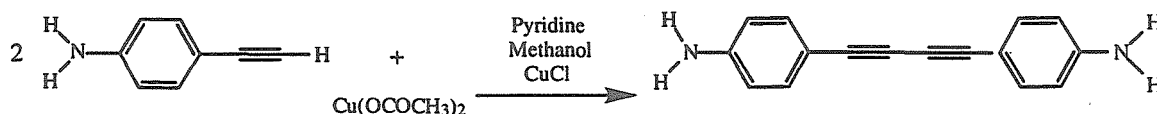


Figure 4

## Poster Presentation 14

## SUBSTITUTION CHEMISTRY OF THE HEXAMOLYBDATE ION: THE DEVELOPMENT OF REACTIONS FOR ROTAXANE PREPARATION

Sara C. McGrath and Rebecca A. Roesner\*  
 Department of Chemistry, Illinois Wesleyan University

Much interest has been generated lately in the synthesis of new materials to be used in the construction of molecular scale electronic devices and machinery. Rotaxanes have surfaced as potential building blocks for designing such structures. The simplest rotaxanes are dumbbell-shaped molecules consisting of a long chain linker unit threaded, non-covalently, through a ring-shaped unit and stoppered on each end with a large, bulky group. (Fig. 1) The object of this study is to synthesize a simple rotaxane, using various bifunctional organic molecules as the chain unit, a  $\beta$ -cyclodextrin molecule as the ring unit, and hexamolybdate ions as the stoppering groups. IR and  $^1\text{H}$  NMR analyses indicate that the hexamolybdate ion has been successfully synthesized from  $\text{Na}_2\text{MoO}_4$  and  $(n\text{-C}_4\text{H}_9)_4\text{NBr}$  (Inorganic Syntheses). The main focus of this project is to explore the substitution reactions between the hexamolybdate ion and various aromatic amines, and, by analogy, to understand the chemistry of the substitution reactions between the hexamolybdate ion and the potential rotaxane linkers. There has been some preliminary success with the substitution of *p*-anisidine and 1,4-phenylenediamine onto the hexamolybdate ion, using high pressure sealed tube reactions at elevated temperatures. Analyses performed using  $^1\text{H}$  NMR and FAB-MS suggest that the aromatic molecules have been successfully substituted onto the hexamolybdate ion. (Fig. 2)

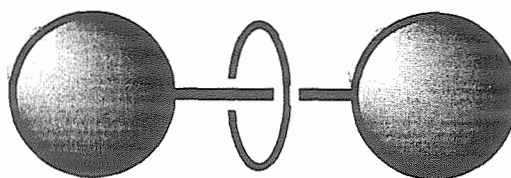


Fig. 1

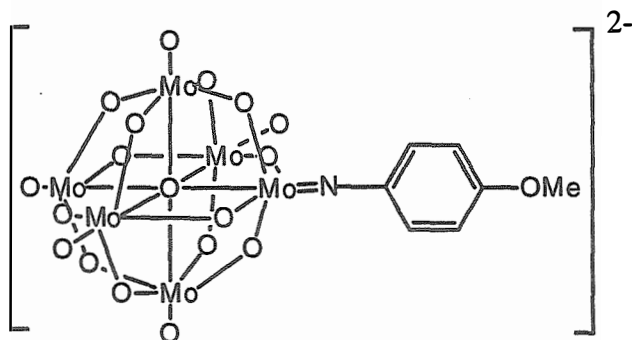


Fig. 2

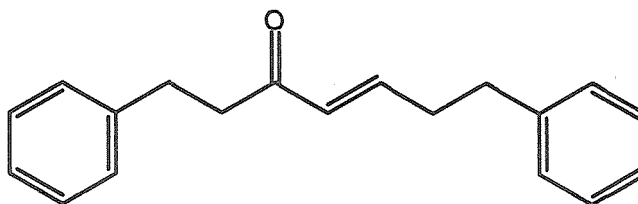
Poster Presentation 15

**SYNTHESIS OF 1,7-DIPHENYL-3,5-HEPTANEDIONE:  
A NEW DIARYLHEPTANOID**

Natalia K. Migal and Ram S. Mohan\*

Department of Chemistry, Illinois Wesleyan University

The title compound **1** has been isolated from the rhizomes of *Alnus Maximowiczii*, a plant used in traditional Thai medicine to relieve gastro-intestinal disorders. The aim of this project is to develop a simple synthesis of the title compound using an Aldol condensation reaction as the key step. The synthetic steps as well as progress to date will be discussed.



**1**

Poster Presentation 16

THE HOFMANN REARRANGEMENT OF NITRO SUBSTITUTED  
BENZAMIDES USING HOUSEHOLD BLEACH

Keith A. Monk, Jean A. Stamberger, and Ram S. Mohan\*  
Department of Chemistry, Illinois Wesleyan University

The Hofmann Rearrangement is a reaction of unsubstituted amides with sodium hypohalites to yield a primary amine that has one carbon fewer than the starting amide. The amide is typically treated with bromine or chlorine in the presence of sodium hydroxide. The reaction is tedious because of the difficulty encountered in handling the halogens bromine and chlorine. Ordinary household cleaners prove to be viable and economical substitutes for halogens. With nitro substituted benzamides, hydrolysis to the corresponding carboxylic acid is a serious competing side reaction. We have successfully carried out the Hofmann rearrangement of a series of nitro substituted benzamides using household bleach. The results of these experiments will be discussed.



Poster Presentation 17

SCANNING PROBE MICROSCOPY APPLICATIONS OF  
FERROELECTRIC MATERIALS

W.L. Murphy and G.C. Spalding\*

Department of Physics, Illinois Wesleyan University

Ferroelectric materials have recently gotten a great deal of attention due to their use as capacitors for integration into non-volatile ferroelectric random access memories (RAMs), and as high dielectric layers in compact capacitors for manufacturing planar dynamic RAMs. The superior piezoelectric property of ferroelectric ceramics also makes them ideal materials for microelectromechanical systems (MEMS). The strong piezoelectric effect allows electromechanical sensing and actuation. Thin films of Ferroelectric materials have been successfully used in a variety of MEMS applications, however, their advantageous properties of have not been fully utilized in scanning probe microscopy (SPM) applications. Furthermore, thin films have been used rather than single crystals due to the difficulty in micromachining single crystal ferroelectric samples. We present some creative device applications of single crystal ferroelectric materials in the context of SPM.

Poster Presentation 18

THE DISCOVERY APPROACH TO ORGANIC CHEMISTRY  
REARRANGEMENT OF *cis*- AND *trans*- STILBENE OXIDES WITH  
BORON TRIFLUORIDE ETHERATE

Erik A. Sgariglia, Regina J. Schopp, Kostas Gavardinas and Ram S. Mohan\*  
Department of Chemistry, Illinois Wesleyan University

The majority of the experiments currently used in organic chemistry teaching labs are cook book in nature. Students are required to follow instructions closely but there is little room for analysis of the results. Discovery oriented labs are designed to assist in the development of technical skills and encourage critical thinking and reasoning as well. We have developed a discovery oriented lab which involves the rearrangement of *cis*- and *trans*-stilbene oxides with boron trifluoride etherate. Product analysis by proton NMR spectroscopy and derivatization allows students to determine the course of the rearrangement. The experimental methods and results will be discussed.

Poster Presentation 19

**PREDICTION OF RECIDIVISM FROM BATTERER CHARACTERISTICS  
AND PRIOR ARREST RECORDS**

Denise Ukleja and Linda Kunce\*

Department of Psychology, Illinois Wesleyan University

A variety of batterer characteristics, such as witnessing parental violence as a child, alcohol/drug use, and a prior legal history, have been found to be correlated with domestic violence. Initial research on recidivism of domestic violence has also suggested that these characteristics are correlated with recidivism, and thus, may possibly be used as predictor variables.

This study explores the relationship between a number of batterer characteristics and recidivism, using a sample of both male and female batterers involved in a domestic violence treatment program. Legal histories, percentage of treatment sessions completed, batterer subtypes and gender will also be explored as possible predictors of recidivism.

Poster Presentation 20

PHOTOCHEMICAL REACTIONS OF MOLECULAR NITROUS ACID IN  
BENZENE

Ovette Villavicencio and Tim Rettich\*

Department of Chemistry, Illinois Wesleyan University

At the Earth's surface, radiation of wavelengths 290 nm and greater (actinic region) is available for inducing photochemical reactions. The term "photochemical" air pollution reflects the essential role of solar radiation in driving the chemistry. These photochemical reactions involve volatile organic compounds (VOCs) and nitrogen oxides ( $\text{NO}_x$ ). The complex chemistry of VOCs and oxides of nitrogen lead to the formation of various oxidizing species such as ozone,  $\text{O}_3$ , and the highly reactive hydroxyl radical. In this research, the photochemistry of molecular nitrous acid in the presence of benzene scavenger was studied. Nitrous acid is of special interest because it leads to the production of  $\text{O}_3$  and hydroxyl radical. Cox and Atkins<sup>1</sup> first studied the photochemical reactions of nitrous acid in 1973 using 330 nm to 380 nm light. However, in our research, by studying the photochemistry of nitrous acid in a matrix composed of 100% benzene scavenger, many side-reactions of nitrous acid such as equilibrium reactions with  $\text{NO}_2^-$  and  $\text{N}_2\text{O}_3$  that exist in aqueous solutions become inconsequential. This allows for a detailed study of the reactions between benzene, a VOC, and the photochemical products of nitrous acid. The results and data are reported here.

<sup>1</sup>Cox, R.A. and Atkins, D.H. *U.K. At. Energy Tes. Establ. Rep.*, 1973, AERE-R7615 as cited by Rettich, T.R in Ph.D. Thesis at Case Western Reserve University, Cleveland, OH, 1978.

**POSTER SESSION B**

**Poster Presentations 21 through 40**

**1:30 - 2:30 p.m.**

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

Poster Presentation 21

INVESTIGATION OF FORAGING STRATEGIES OF *XIPHOPHORUS*  
*HELLERI*: GROUP VERSUS SOLITARY FEEDING

Mark A. Bobofchak and Sheryl Swartz Soukup\*  
Department of Biology, Illinois Wesleyan University

In any foraging situation, an animal must determine if the benefits of continuing to forage in a particular manner exceed costs such as exposure to predators and lost reproductive opportunities. In addition to these costs, other factors exist which influence foraging decisions; including hunger level and competitive ability. Specifically, these conditions have been shown to have a significant effect on the choice of an organism to feed in a group or individually. Experiments were conducted using female green swordtail fish, *Xiphophorus helleri*, to determine which foraging situation (group or solitary) is chosen in four different treatment sets: normal diet/no predator present; reduced diet/no predator present; normal diet/predator present; reduced diet/predator present. Preliminary results suggest the fish subjects prefer the group environment to the solitary one in all cases.

Poster Presentation 22

REINFORCER ELASTICITY AND UNIT PRICE THEORY

Dorianne E. Cantrall and James Dougan\*

Department of Psychology, Illinois Wesleyan University

The assumption that laboratory behavioral experiments are economic systems allows the analysis of economic concepts in animal research. Among the economic theories that are studied in the laboratory is the unit price theory. According to unit price theory, the quantity which an animal consumes is related to the unit price of the commodity, where unit price equals (cost x effort/size x probability). The present experiment varied both cost and size, in an effort to test predictions of unit price theory. The results have implications for behavioral economics, and unit price theory in particular.

Poster Presentation 23

ANISOTROPIC ETCHING OF  $\text{SrTiO}_3$

Thomas Davidsmeier, William Murphy, Delara Godrej, and Gabriel Spalding\*  
Department of Physics, Illinois Wesleyan University

The anisotropic etching properties of silicon seem to gain ever more technological importance as we enter the age of microelectromechanical devices, but the anisotropic etching of more highly polarizable materials such as  $\text{SrTiO}_3$  has been relatively unstudied. We have reproducibly observed pyramidal pitting of single crystal  $\text{SrTiO}_3$  surfaces, which is indicative of anisotropy in the etch rates. For a variety of etch conditions (concentration, time of etch, initial crystallographic orientation of the sample surface), we measure the depth from unetched areas down to the bottoms of etch pits on  $\text{SrTiO}_3$  single crystals. By comparing these etch rates, along with the temporal evolution of the angles of the etch pit walls, we extract a measure of the anisotropy of etching. We present what we have learned of the kinetic bottlenecks in the etch process within a context supplied by our own theoretical calculations of lattice potentials for a variety of possible surface angles and surface terminations.



Poster Presentation 24

THE ROLE OF THE COMSTOCK-KELLOGG GLANDS IN EGG  
TANNING IN *ROMALEA GUTTATA*

Elizabeth Elsasser and Given Harper\*

Department of Biology, Illinois Wesleyan University

Freshly laid eggs of the Eastern Lubber grasshopper, *Romalea guttata*, are yellow and soft-shelled, but within several hours the eggs become hardened and dark brown. In a similar process, calyx and oviduct secretions, which form the egg pod, become frothy, darkened, hardened, and water insoluble during oviposition. It has been suggested that secretions from the paired Comstock-Kellogg glands accelerate tanning of both the eggs and egg pod foam. I investigated the effects of Comstock-Kellogg gland secretions on the rate of egg and egg pod tanning during egg pod production in the female Eastern Lubber grasshopper. Eggs streaked with CK gland secretions, macerated CK gland, macerated intersegmental membrane, or hemolymph took significantly less time to tan than eggs streaked with water or nothing. Females lacking CK glands laid eggs that took significantly longer to tan than eggs from sham-operated or unoperated females. These results suggest that the CK glands do serve to accelerate tanning, but the chemical composition of the CK secretions may be common to many grasshopper tissues.

Poster Presentation 25

**THE RELATIONSHIP BETWEEN CHILDREN'S AGGRESSION,  
THEIR SOCIOMETRIC STATUS, AND THE QUALITY OF  
THEIR FRIENDSHIPS**

Carrie Finch and Doran French\*

Department of Psychology, Illinois Wesleyan University

The purpose of the present study is to assess how children's aggression (relational and overt) and popularity affect the qualities of children's friendships. In addition, the present study explores the interaction effects of aggression and sociometric status on children's friendships. 136 fourth and fifth grade children completed several measures which included a sociometric measure, the aggression portion of the Pupil Evaluation Inventory with measures of relational aggression inserted (Pekarik, Prinz, Libert, Weintraub, & Neil, 1976), and the Friendship Quality Questionnaire (Parker & Asher, 1993). It is hypothesized that the positive features of children's friendships, such as intimate exchange, will correlate with sociometric status. In contrast, it is expected that the negative features of children's relationships, such as conflict and betrayal, will correlated with levels of aggression.

Poster Presentation 26

**A COMPARISON OF PROSPECTIVE MEMORY AND EXECUTIVE  
PROCESS IN PATIENTS WITH SUBCORTICAL ILLNESS**

Milan E. Folkers and Johnna Shapiro\*

Department of Psychology, Illinois Wesleyan University

Dementia is a common disorder affecting neuropsychological function in several spheres of mental activity including language memory, visuospatial function, and cognition. Studies into the cognitive deficits associated with dementia have allowed researchers to rank neurological disorders into two subclasses: cortical and subcortical dementia. Cortical dementias such as Alzheimer's disease have been the focus of a plethora of studies. Subcortical dementia, which is commonly found in Parkinson's disease, Huntington's disease, and acquired immunodeficiency syndrome (AIDS), is marked by bradyphrenia, visuospatial abnormalities, personality alterations, memory disturbances primarily involving recall but not recognition, and loss of executive functions. The differences between these two forms of dementia have been widely studied, but as to date there have been few studies comparing the cognitive differences between subcortical dementias. The current study examines similarities and differences in the cognitive functioning of patients with Huntington's disease, Parkinson's disease, AIDS, a group of age matched controls, and young adult controls in executive functioning, temporal memory, and attention processes using a battery of cognitive tests.

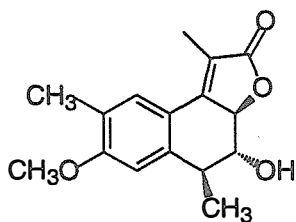
Poster Presentation 27

SYNTHESIS OF NOVEL SESQUITERPENE LACTONES: POTENTIAL BIODEGRADABLE PESTICIDES

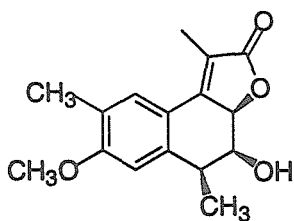
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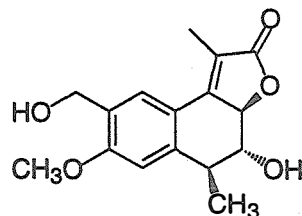
For decades considerable research has focused on improving the efficiency of crop protection. The increased resistance of pests to the currently available pesticides has made the development of newer pesticides even more urgent. Many naturally occurring biodegradable compounds have often been used as pesticides and with increased environmental concerns, the identification of biologically active natural products has assumed significant importance. Fish toxicity has often been used as a measure of pesticidal activity. Several Southeast Asian mangrove species have been shown to possess ichthyotoxic properties. A bioassay of the extracts obtained from *Heritiera littoralis*, a Philippine mangrove plant, indicated toxicity toward fish and thus suggests the possibility of their use as pesticides. Three sesquiterpene lactones, Heritanin, Vallapin and Vallapianin have been isolated from *H. littoralis*. The proposed synthesis of these lactones as well as progress to date will be discussed.



Heritanin



Vallapin



Vallapianin

Poster Presentation 28

**PARENT-REPORT VS. CHILD-REPORT OF SPECIFIC ANXIETY IN  
SIBLINGS OF CHILDREN WITH AUTISM: DO PARENTS KNOW WHAT  
THEIR CHILDREN WORRY ABOUT**

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This project explores anxiety and specific autism-related worries of children who have a sibling diagnosed with autism. There is clinical evidence pertinent to this topic but little published empirical research. In addition, this project explores whether or not the parent's perception of their child's fears is correlated with the fears reported by the child. Participants were recruited mainly through local support groups for parents of children with autism. The siblings studied are between the ages of six and thirteen. Each child was given a standardized measure of general anxiety in addition to a questionnaire created for this study and designed to measure fears specific to siblings of children with autism. Parents were asked to fill out an assessment of their child's general anxiety, autism worries, and internalizing/externalizing problems.

Poster Presentation 29

DETECTION OF COCAINE USE: EXTRACTION OF  
BENZOYLECGONINE BY  $\text{Co}(\text{SCN})_4^{2-}$

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Development of a method for the detection of benzoylecgonine (BE), the main metabolite of cocaine, is attempted here. An ion-pairing agent ( $\text{Co}(\text{SCN})_4^{2-}$ ) is employed to extract the BE from aqueous solution into dichloromethane. The extract can then be analyzed by HPLC. This method, if successful, promises to have many advantages over current testing methods in that it would be rapid, cheaper, and more efficient. The main obstacle encountered in developing the extraction procedure was repeatability. Studies were performed on the extraction conditions, including stability of the ion pairing solution, purity of the dichloromethane, and potential carryover of BE in the separatory funnels from extraction to extraction. The optimum pH was determined to be 7.0, which differs from previous studies. Linearity of absorbance v. concentration, however, was still not achieved. Continued studies of extraction conditions and, ultimately, an adaptation of an HPLC method remain for future work.

Poster Presentation 30

**PATTERNS OF ORGANOCHLORINE PESTICIDE CONTAMINATION IN  
NEOTROPICAL MIGRANT PASSERINES**

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Department of Biological Science, Illinois State University

Previous work by our group has consistently shown low-level pesticide contamination in Neotropical migrant passerines (those songbirds that breed in North America and winter in the West Indies, Central and South America). To further this work, chemical analysis of eleven Neotropical migrant passerine species was conducted. The birds were collected in Illinois along the Mississippi River in May, 1996 and tested for the presence of 17 organochlorine pesticides. The most prevalent pesticides detected were p,p'-DDE, dieldrin, and heptachlor epoxide. No statistically significant differences in pesticide levels were found between males and females or between winter habitats (forest and shrub). Birds wintering in Central America were significantly more contaminated than birds that winter in Northern South America. Insect gleaners (warblers and vireos) were significantly more contaminated than aerial insect feeders (flycatchers), which were significantly more contaminated than plant consumers (thrushes, buntings, and grosbeaks). These findings suggest that winter range and diet are larger determinants of contamination levels in Neotropical migrant passerines than other characteristics considered.

Poster Presentation 31

**COMPLEX SCIENTIFIC TESTIMONY: CAN EDUCATIONAL  
PSYCHOLOGY TURN JURORS INTO STUDENTS AND ATTORNEYS  
INTO TEACHERS?**

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As the world moves into the twenty-first century, science and technology is progressing at an exponential rate. More and more often, the court system is introducing expert witnesses to contend with the more difficult, technical explanations of complex testimony. Jurors are often required to both comprehend and apply complex testimony as they deliberate, though they may not have any background or extra assistance in areas where they lack expertise. In the following study, I examined ways in which the jurors' learning environment can be manipulated in order to facilitate memories of testimony, juror comprehension of the testimony, and attitudes of jurors toward attorneys and expert witnesses.

This study integrated schema theory, from cognitive psychology, and the idea of "meaningful learning", from educational psychology. A schema is a way of structuring previously existing knowledge to facilitate the learning of novel information. Schemas help people to better store and retrieve new information. David Ausubel, a pioneer of educational psychology theory, used schemas to formulate his concept of "meaningful learning". Ausubel believed that the key to meaningful learning was the activation of previously stored material, i.e. a schema. New information can be most effectively and efficiently stored if it is related to old information. To date, no other researcher has used David Ausubel's theory as a theoretical basis for jury learning in the courtroom.

Participants were divided into two groups. Group 1 observed a videotape in which the expert witness briefly outlined her testimony before giving the full deposition, while others saw a tape where the witness immediately delved into the bulk of her testimony. It was our hypothesis that those who got the outline first (i.e. advanced organizer) would better understand, comprehend, and use the information they were given when coming to a verdict. The experiment is a 2X2 factorial design with the independent variables (IVs) being level of expertise (psychology major/expert vs. non-psychology major/novice) and method of presentation (traditional vs. Ausubelian). There will be five dependent variables (DVs) measured. Memory of evidence will be evaluated by asking for a free recall of the information presented at trial. The total number of details vs. the number of accurate details will be calculated as a ratio to determine memory differences. Comprehension differences will be evaluated by a score on a multiple choice test created by the experimenters. The third and fourth DVs, attitudes toward witnesses and attorneys, will be evaluated according to Likert scales designed by the experimenters. The final DV, the basis for final verdict, will be evaluated by determining percentages of different influences attributed to the decision by each juror. Data will be analyzed using a MANOVA statistical manipulation for main effects and interactions.

Results have implications for the future of jury decision making processes and the ways in which jurors should be approached when verdicts are reliant on complex scientific areas of inquiry.



Poster Presentation 32

**FEDERAL TAXES AND CIGARETTE SMOKING: A MICRO ANALYSIS  
OF YOUTH SMOKING**

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The focus of this study is the effect of federal taxes on smoking. The Clinton Administration and others believe that an increase in federal taxes of between one dollar and one dollar and fifty cents per pack of cigarettes will substantially reduce the amount of youth smoking in the United States.

This research makes use of two schools of thought to describe the decision to smoke by both adults and youth. One theory states that people act myopically and consider past consumption and current influences but do not adequately consider future costs or benefits. The rational addiction theory says that a person makes smoking decisions rationally, taking into consideration past, present, and future costs, benefits, and influences in decision making. According to either theory youth with low levels of past consumption will be more sensitive to changes in price than adults with presumably more stock of addictive consumption.

This analysis will use a data set from the National Longitudinal Survey of Youth to estimate the overall consumption change in a federal tax increase and create a predictive regression model for youth's decision to start smoking. The model will be able to control for influences on a youth in the present and past and estimate influences on the decision to smoke.

Poster Presentation 33

THE TOTAL SYNTHESIS OF A CONFORMATIONALLY CONSTRAINED  
ORGANOPHOSPHORUS ANALOG OF ACETYLCHOLINE

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Acetylcholinesterase (AChE) is an important enzyme in the human nervous system. AChE helps nerves function by catalyzing the hydrolysis of acetylcholine (ACh) into choline and acetate. AChE has been targeted as having a potential role in the pathology of neurodegenerative diseases such as Alzheimer's disease. It is known that AChE is inhibited by organophosphorus compounds such as soman and sarin. Past research has focused on the use of different organophosphorus inhibitors to study the structure of AChE, the mechanism by which it catalyzes the hydrolysis of ACh, and the stereoselectivity of AChE phosphorylation. This research has yielded conflicting results about the stereoselectivity of the phosphorylation of AChE. We propose that a conformationally constrained analog of ACh may provide more definitive answers about the stereoselectivity of the mechanism of AChE phosphorylation. These answers could lead to a better understanding of how AChE catalysis works. We intend to synthesize a novel organophosphorus analog of ACh. Long term goals of the project include the synthesis of all four stereoisomers of this inhibitor followed by biological assays to determine the inhibitory potency of these compounds.

Poster Presentation 34

**PROSPECTIVE MEMORY: THE RELATION OF EXECUTIVE FUNCTION  
TO AGING**

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The executive functions of the frontal lobe seems to play an integral role in the mediation of prospective memory, as suggested by recent studies (Shallice & Burgess, 1991; Cockburn, 1995; Shapiro, Shapiro, Alper, & Russell, in press). Prospective memory requires the recall of an intention for performing a specific action in the future. The process of remembering to take medication epitomizes this construct; for many people (for instance, individuals with heart problems) taking medication is woven into their daily routines. Yet failure to remember to take medicine can often lead to serious medical complications, particularly for older adults. Research into the exact aspects of prospective memory failure in older adults has been inconclusive. The present study compared older adults (ages 65-80) and younger adults (ages 18-21) across four prospective memory tasks and tests of executive functioning. Both groups received each of four prospective memory tasks (an event-based, disembedded task; an event-based, embedded task; a time-based, disembedded task; and a time-based, embedded task) webbed within a general knowledge quiz. The participants also received the Stroop Test, the Wisconsin Card Sort Task, the Williams Inhibition Test, and an Immediate Recall Test, which have been acknowledged as measures of executive and frontal lobe functioning. Analyses were run to ascertain the exact aspects of memory failure and whether this failure was related to deficits in executive functioning.

Poster Presentation 35

INTERPARTICLE POTENTIAL IN A 1-D MANY-BODY COLLOID

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We present a study of the interparticle potential in a 1-dimensional colloid. Using a scanning optical tweezer we fabricate a line trap confining many silica spheres one-micron in diameter. Optical forces result from an interaction between induced dipoles within each sphere and scattered laser light from neighboring spheres<sup>1</sup>. These interactions create a potential which induces a preferred separation between spheres. Furthermore, many-body effects may alter the interactions in colloidal systems<sup>2</sup>. Brownian effects cause random motion of the particles within the trap allowing the system to exhibit a range of interparticle separations. Using statistical analysis we look at the distribution of separation distances as a means of exploring the interparticle potential in the 1-dimensional, many-body colloidal system.

<sup>1</sup>Burns, Michael M., *et al.* *Science*, **249**, 749 (1990).

<sup>2</sup>Larsen, Amy E. and Grier, David G. *Phys. Rev. Let.*, **76**, 3862 (1996).

Poster Presentation 36

THE ROLE OF SOCIAL SUPPORT IN MEDIATING STRESS AND  
ILLNESS

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Social support has shown to be one important factor in the link between stress and illness. In this study, the role of social support is examined in light of the two current hypotheses in the field: the main effect hypothesis which states that strong social support will correlate with both low stress and low illness levels, and the buffering hypothesis which states that strong social support will correlate only with low illness levels. The nature of the social support group is investigated by looking at the strength and proximity of the group. We expect that strong social support will be correlated with lower illness levels. We also expect that a physically closer social support group will be correlated with lower illness levels. Finally, we hypothesize that the strength of the social support group will correlate more with lowered illness levels than with the proximity of the social support group.

Poster Presentation 37

CASE STUDY OF A MALE WITH POLYDIPSIA AND SCHIZOPHRENIA

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Polydipsia involves excessive drinking of water, which can lead to mild weight gain, hyponatremia (water retention and loss of sodium), water intoxication (with electrolyte imbalances), coma, and even death. The polydipsia-hyponatremia syndrome and self-induced water intoxication is prevalent among the chronically mentally ill population, especially those who have schizophrenia. Therefore, professionals make considerable efforts to modify over drinking behavior. The current project presents a case study of a man with polydipsia and schizophrenia whose treatment consisted of fluid restriction and daily weigh-ins. The following data were gathered from monthly treatment records: average daily weight gain, greatest weight gain, and days above critical weight gain per month. Results indicate that the client's fluid consumption decreased following the implementation of treatment. Recommendations are made for further treatment and changes in some of the documentation.

Poster Presentation 38

EXTRACTION OF COCAINE METABOLITE USING REINECKE'S SALT

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Cocaine use and abuse is a major problem and there exists a need to develop a quick and efficient way of detecting cocaine use. This project attempted to accomplish this goal. The main metabolite of cocaine in urine, benzoylecgonine (BE), was extracted from the aqueous phase into an organic solvent using the ion-pairing agent Reinecke salt. The ionic strength of the BE samples was adjusted to 0.01 *M* using lithium nitrate, the pH was adjusted to 1.00 with nitric acid and the ion-pairing agent was added before extraction with dichloromethane. After extraction, the dichloromethane extracts were placed in a Ultraviolet-Visible spectrophotometer and the absorbance of the extracts was measured as a function of the concentration of the initial BE solution. A linear absorbance versus concentration curve was found for the 10-50  $\mu\text{g/mL}$  concentrations; however, at concentrations below 10  $\mu\text{g/mL}$  the results were very erratic and irreproducible. Future work might include adjusting conditions to obtain the greater sensitivity needed to make the technique useful at physiologically significant concentrations.

Poster Presentation 39

**SOCIOMETRIC STATUS AND AGGRESSION AS PREDICTIVE  
FACTORS OF CHILDHOOD CONFLICT**

Laura Warren and Doran French\*

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Following recent trends in the study of children's conflict, researchers will attempt to compare relationship strength between conflict resolution style and the personal variables of aggression and sociometric status. Approximately 100 fourth- and fifth-grade students will complete assessments which measure sociometric status and aggression, as well as report both hypothetical and real-life conflict resolution styles. Researchers hypothesize that aggression levels will be more strongly associated with antisocial styles of conflict management. Researchers also postulate results which indicate higher use of compromising strategies in hypothetical conflict situation responses than in those answers involving real-life conflict. Results will have implications in methods of conflict management intervention with children.



Poster Presentation 40

IS THE SOOT LAYER AT THE KT BOUNDARY REALLY GLOBAL?

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Significant quantities of elemental carbon and soot have been found in twelve Cretaceous-Tertiary (KT) boundary sites. Because of the wide geographic distribution of these sites, the data was interpreted to indicate that deposition of soot was a global phenomenon, coincident with the Ir-rich fallout layer. The likely source of the global soot deposit is eolian deposition from global wildfires directly associated with the KT impact event, estimated at  $2.2 \pm 0.7 \text{ mg/cm}^2$ . At 65 Ma, these sites were situated where fine-grained detritus from continental margins might be concentrated from run-off, so soot might not be representative of a global airfall deposit.

To test this, we measured soot in five KT boundary sites which were situated in the central portion of the paleoPacific basin at 65 Ma. Reduced carbon was isolated from sediments using HCl and HCl/HF. Elemental carbon was separated from organic carbon by acidic dichromate oxidation under controlled conditions. The elemental carbon was identified and characterized using SEM imaging and quantified by weighing and particle size analysis. Iridium concentrations were measured in splits of most of these samples.

The KT boundaries from four cores were from oxidized sediments and we considered it possible that soot might not be preserved at these sites. This proved to be correct as no soot or elemental carbon was recovered. Upper limits on soot ranged from  $<2$  to  $<18$  ppm in these samples.

However, in a fifth core, the KT boundary is marked by a thin, black, pyrite-rich clay that should contain a record of global soot fallout if such existed in the central North Pacific. This sample contained  $3600 \pm 400$  ppm elemental carbon and  $1800 \pm 200$  ppm soot, at least two orders-of-magnitude higher concentration than the upper limits measured in the oxidized KT boundaries. Seven additional samples from this core were analyzed to determine whether soot was abundant in lower Tertiary sediments. Soot was detected in three of these, the highest being  $500 \pm 70$  ppm, probably from very near the KT boundary. Because of severe drilling disturbance, we cannot rule out the possibility that these samples might have contained small fragments of boundary clay.

We conclude that the global wildfire hypothesis has passed this test. The only reduced KT boundary sediments known in the Pacific basin contain abundant elemental carbon and soot. An estimate of the carbon flux to this site was calculated to be  $3.6 \pm 0.7 \text{ mg/cm}^2$ , somewhat less than the  $11 \pm 3 \text{ mg/cm}^2$  average estimated from the continental sites, but close to some individual measured values. The calculated flux of soot to this site is  $1.8 \pm 0.3 \text{ mg/cm}^2$ , well within the average range of  $2.2 \pm 0.7 \text{ mg/cm}^2$  estimated from other sites. Since the soot is the more fine-grained component of wildfire smoke, it may be more likely to be globally dispersed and the close agreement of these estimates may be quite significant.

