

Proceedings of the Eighth Annual University of Wisconsin-Eau Claire Student Research Day



April 17-18, 2000

Contents

- **Arts and Humanities**
- **Behavioral and Social Sciences**
- **Business and Professional Studies**
- **Natural and Physical Sciences**
- **Graduate Entries**

Table of Contents

Proceedings of the Eighth Annual University of Wisconsin-Eau Claire Student Research Day	1
April 17-18, 2000	1
Contents.....	1
Table of Contents.....	2
Arts and Humanities	4
▲ Communication & Journalism.....	4
▲ English / American Indian Studies	4
▲ Foreign Languages.....	5
▲ Foundations of Education.....	5
▲ History.....	5
▲ Music & Theatre Arts.....	6
▲ Philosophy and Religious Studies.....	6
▲ Political Science.....	7
Behavioral and Social Sciences	7
▲ Computer Science	7
▲ Counseling Services / Psychology.....	8
▲ Economics	9
▲ Geography	10
▲ Physics and Astronomy	13
▲ Political Science.....	13
▲ Psychology.....	13
▲ Sociology and Anthropology	16
Business and Professional Studies.....	18
▲ Accounting and Finance.....	18
▲ Adult Health Nursing	19
▲ Business Communication /Art.....	19
▲ Communication Disorders.....	20
▲ Counseling Services / Psychology.....	21
▲ Family Health Nursing.....	21
▲ Foundations of Education.....	23
▲ Geology	23
▲ Human Development Center	24
▲ Kinesiology & Athletics.....	25
▲ Management & Marketing	25
▲ Mathematics	26

▲ Nursing Systems.....	27
▲ Psychology.....	27
▲ Special Education.....	28
Natural and Physical Sciences	28
▲ Biology.....	28
▲ Chemistry.....	34
▲ Computer Science.....	39
▲ Geography.....	40
▲ Geology.....	45
▲ Mathematics.....	53
▲ Physics & Astronomy.....	54
Graduate Entries	56
▲ Biology.....	56
▲ Communication Disorders.....	56
▲ Curriculum & Instruction / Foundations of Education.....	58
▲ English.....	58
▲ Management & Marketing.....	59

Arts and Humanities

Communication & Journalism

Liz Kuntz, Lori Kurtzman, Jessica Meier

Faculty Advisors/Collaborators: **Judy Sims** and **Joe Giordano**

A Content Analysis of Local Television News: Coverage of Controversial Issues and Diverse Populations in Eau Claire, WI

This study investigated the 6:00 p.m. newscast content broadcast by two Eau Claire television stations. The objectives were to explore how many stories covered issues defined as "controversial" by Eau Claire voters and how many stories addressed a population identified as "diverse." Researchers also examined types of "story content." The results of this research, which will be useful to the stations investigated, are consistent with previous findings suggesting that "crime" is the most frequently covered topic in local news. Researchers employed the methodologies of survey and textual analysis. A questionnaire was sent to a random sample of 1,036 Eau Claire registered voters to gather data to determine "current local controversial issues." Results were based on a response rate of 39% and a content-analysis of 150 stories from 18 evening newscasts broadcast between November 1-12, 1999. During the 18 newscasts broadcast by the two stations combined, approximately 36% of the 150 stories addressed issues identified by the public as "controversial." The "controversial issues" identified most frequently by the Eau Claire citizens were not covered by either station. Of the 150 stories addressed by both stations, only one story addressed a "diverse" population.

Lindsay Schroeder

Faculty Advisor/Collaborator: **Joseph Giordano**

The Print Media's Influence on Perceptions of Elizabeth Dole as a Presidential Candidate

This project is a content analysis of magazine and newspaper articles regarding Elizabeth Dole's campaign for her bid for the Republican nomination for President. The project will examine newspaper and magazine articles from her official campaign for the nomination between the dates of March 10, 1999 and October 20, 1999. This study primarily focuses on how print media, during the specified time, depicted Elizabeth Dole. Depictions include demographics, comparisons to other potential presidential candidates, her stance on specific issues, her personality traits and credentials, and many more.

English / American Indian Studies

Debbie L. Ledo-Anderl

Faculty Advisor/Collaborator: **Mary Ellen Alea**

Two Montana Families

The purpose of this project is to gain a deeper understanding of my family's experiences within the greater context of 19th century, regional history in Montana. During my preliminary research, I gathered vital statistics about forty-five ancestors from my immediate family, dating into the 1700s and restored family photographs while identifying people and places and confirming dates. I've transcribed twenty 90-minute tapes with my 89-year-old grandmother, the youngest female and last survivor of her family of origin, who were some of the first homesteaders in the Sage Creek/Bridger area. My grandfather's family, Landless Chippewa and Cree, lived in Big Timber and Pryor and held affiliations with the Crow Nation. The tapes contain stories about both

families, spanning across six generations. My research goes beyond a simple family narrative as I've gathered historical and societal data by retrieving archival records at Montana libraries and newspapers, Montana State universities and county records in Billings, Red Lodge and Bozeman. I've interviewed Crow tribal elders and sought additional information from the Bureau of Indian Affairs and tribal archives. All of the supporting evidence contributes to the overall intent. My research supplements American and American Indian history by contributing to our existing body of knowledge.

Foreign Languages

Nicholas Uthall

Faculty Advisor/Collaborator: **Johannes Strohschank**

Mapping German Settlement Patterns in Wisconsin, 1850-1860

Building on the results of a previous Summer Research Experiences for Undergraduates grant, this project is devoted to the creation of a detailed county-by-county map of German settlement in Wisconsin between 1850 and 1860. There are no other maps of this kind for this period, which coincides with the "2nd wave" of German immigration, registering the highest influx of Germans to Wisconsin in a given decade. We will consult census records for all Wisconsin counties for the years 1850 and 1860 in order to ascertain the origin of their residents. This research, involving the aid of a highly gifted undergraduate German major (and a volunteer Eau Claire community member deeply interested in the project), will enrich an existing Honors course on German immigration to Wisconsin and our research in general, resulting in at least one presentation and published article.

Foundations of Education

Andy Franko, Jeff Shurtleff, Ryan Stilp

Faculty Advisor/Collaborator: **Cynthia A. Gray-Mash**

Exploring Termespheres Using Video Documentary Processes

This project brings together the diverse perspectives of three UWEC students, one each from Communication and Journalism, Art Education and one specializing in educational technology. They participated in a pre-production phase of a video documentary about artist Dick Termes. Termes, an internationally known artist, paints abstract and realistic compositions on spheres-- "Termespheres"-- using six-point perspective. The students and advisor engaged in an analytical film documentary process which included interviewing, video documentation, search of relevant literature, and exploration of perspectives from the arts, sciences and education to conceptualize the documentary. The documentary will be completed this summer and entered into a film festival. We will present the results of our inquiry processes including an early-production version of the video documentary.

History

Eric Halleen

Faculty Advisor/Collaborator: **Jane Pedersen**

Women Serving Time for Murder-related Crimes at the Wisconsin State Prison

In this project I conducted research on various women who were sentenced to the Wisconsin State Prison for some type of murder-related crime. This research was to aid Dr. Pedersen in her work as well as further my research on the Wisconsin State Prison. I contacted the Prison Historian, Michael McNeil and visited him several times. He granted me access to certain records

the prison has kept throughout the years. I took the data that I had collected and created a spreadsheet in order to take a closer look at these women. The purpose of this research was not to make gross assumptions, but rather search for these women at a prison that primarily housed males. In many cases, the records of female inmates were incomplete.

Scott Omodth

Faculty Advisor/Collaborator: **Kate Lang**

The Anti-War Movement and SDS at Wisconsin State University - Eau Claire

During the summer of 1999, Kate Lang and I examined several document collections in the University Archives to determine the extent of student activism and protest on the Wisconsin State University - Eau Claire (WSU - EC) campus during the late 1960s and early 1970s. I focused in particular on the role of WSU-EC's unofficial chapter of Students for a Democratic Society (SDS) during these protests and examined one specific protest staged by this group. Having begun a paper on this protest, I hope to translate my findings to a poster format to share at Student Research Day.

Music & Theatre Arts

Matthew Pivec

Faculty Advisor/Collaborator: **Michael Cunningham**

New Music for Saxophone

This collaboration began with a successful recital performance with the composer, Dr. Michael Cunningham. Realizing that various Cunningham works had yet to be performed, we began the process of rehearsing and recording each of his major works for saxophone. As the compositions will be shown on a compact disc, it is our hope that many saxophonists will be exposed to this recital repertoire.

Philosophy and Religious Studies

Christina J. Chrouser, Nichole Weinfurter

Faculty Advisor/Collaborator: **Caroline Picart**

Exploiting Human Suffering: Representations of the Holocaust

The category we researched for our topic was very broad, so we narrowed down the category into two topics. The first topic looked at was the Nazi exploitation of both German and Jewish women during the Holocaust. The paper written on this subject describes the reproductive policies toward German women, who many believe were breeding machines during WWII, and the physical and emotional damage done to Jewish women who were in the Nazi concentration camps. The second topic was Film Representations of the Holocaust. The paper written on this subject is a reflective paper that argues that movie-makers have a special responsibility to their audiences in showing accurately what happened in the Holocaust and other atrocious events because many audience members will only experience films and did not encounter any first-hand experience with the Holocaust. This paper argues that this is not a truism because in many cases moviemakers feel that they have complete artistic license to portray events as they please, even if it is not an accurate portrayal.

Jennifer Hale

Faculty Advisor/Collaborator: **Lori Rowlett**

The New Historicism and Afro-Caribbean Religion in Louisiana

The New Historicism is methodology employed in literary and cultural criticism through the following principles:

- Every act is embedded in a network of practices
- No discourse gives access to unchanging truths or reveals inalterable human nature
- Every act of unmasking, critique, opposition, uses the tools it condemns
- A critical method and a language adequate to describe culture under capitalism participate in the economy used to describe.

Through the application of these principles I will discuss the nature of the relationship between the commerce of "Voodoo" in Louisiana and the spirituality of individual practitioners. Also how and why Afro-Caribbean religions have been commercialized and therefore, seemingly demystified through development of tourism in Louisiana. As a background to the discussion of New Historicism I will provide information on the development of Afro-Caribbean religion in the United States from Yoruba in West Africa, as well as the Loa and Catholic Saint comparisons that are central to this tradition. This will include photographs and some minor artifacts centering on the development of Afro-Caribbean religion in Louisiana and its modern practice. Photographic material includes Afro-Caribbean shrines from temples in New Orleans and the representation of Loas in church ironwork and cemeteries.

Political Science

James Hanke

Faculty Advisor/Collaborator: **Steven Majstorovic**

Ethnic Cleansing: Eastern Europe's Shortcut to Democracy

This project contends that despite the seeming success of some Eastern European states in the process of democratic transition over the past decade, there is an important qualitative difference between democracy in these states and Western European/American democracy. This difference is represented by the inability of Eastern states to adequately address the challenges of ethnocultural pluralism despite some impressive post-1989 reforms in political-institutional arrangements and the establishment of market-economic systems. Utilizing a cross-disciplinary approach that is informed by political, sociological, historical, and anthropological research, this project comparatively examines state policies and ethnonational minorities in Eastern Europe. It is established that, paradoxically, the most "democratic" Eastern European states are also those that have been the most successful in either marginalizing or, more often, completely expelling and demographically significant ethnic minority populations. The comparative aspect of this study is augmented by a close examination of the former Czechoslovakian and Yugoslavian cases. The conclusion suggests that a critical difference between East and West in the state's capacity to manage democratic transition in the context of ethnic politicization lies in the historical timing of state formation. State formation in the West was generally completed before the politicization of ethnic minorities, while in Eastern Europe the state was formed after the large-scale politicization of ethnic identity.

Behavioral and Social Sciences

Computer Science

Matthew Dorn

Faculty Advisor/Collaborator: **Dan Stevenson**

Reconstruction of 3D Motion from Cast Shadows

Psychological studies have shown that shadows are an important cue which humans use to determine 3D motion. Motion of an object's shadow can cause the perception of motion of the object, even when the object is actually stationary. Studies in perceptual psychology have also shown that correlated motion between an object and its shadow override other strong visual cues, such as light source placement, object shading, and object size constancy. This cross-discipline project examines a current human perceptual model using the techniques of computer vision. Specifically, given a 2D sequence of images, computer vision techniques are used to generate a 3D path for an object based on its shadows. We use this computational model in several ways. First, we use it to generate a "perceived" path of motion under the same conditions assumed by the human perceptual model (i.e. disregarding certain visual cues such as object shading and light source position). Second, we generate a path using all computationally inferable information from the 2D-image sequence. These generated paths are then compared and conclusions are drawn as to the accuracy of both the human perceptual and computation models.

Counseling Services / Psychology

Miranda Hellenbrand, Laura Parker, Angela Gross, Josh Kennedy, Ken Ortery

Faculty Advisors/Collaborators: **P.J. Kennedy and Allen Keniston**

The 2000 Counseling Needs Assessment

The purpose of the 2000 Counseling Needs Assessment is to assess the self-reported needs of University of Wisconsin-Eau Claire (UWEC) students for Counseling Services. A cover letter, the 2000 Counseling Needs Assessment, and a business reply envelope were sent to a 10% random sample of UWEC students (987 students). The data has been entered and analyzed and the results will be presented on our poster at Student Research Day. The results from the 2000 Counseling Needs Assessment will be used to take a in-depth look at how students have utilized Counseling Services in the past, what barriers they have faced in attempting to use Counseling Services, and what they expect from Counseling Services in the future. More specifically, the results of this study will be used to assist in focusing limited resources to address the counseling needs identified by the students surveyed.

Matthew C. Sorenson, Lana Kastern, Jennifer Hlava, April Henn, Tanya Wojtczak, Anna Volk, Tony Rudawski

Faculty Advisors/Collaborators: **P.J. Kennedy and Allen Keniston**

The University of Wisconsin-Eau Claire and Seasonal Affective Disorder: Incidence Rate and Effect on Academic Performance

This study will assess the prevalence of Seasonal Affective Disorder (SAD) by distributing the Beck Depression Inventory (BDI) and Rosenthal's Seasonal Patterns Assessment Questionnaire (SPAQ) to a 10% random sample of undergraduates at the University of Wisconsin-Eau Claire (UWEC). We will use responses to calculate the rate of SAD, sub-SAD, and mild/moderate/severe depression in this population. Self-report statements about academic success indicators will be utilized to assess the relationship between SAD scores and such factors as assignment completion, class attendance, and attentiveness levels. It is hypothesized that UWEC students will experience a prevalence of SAD symptoms higher than the national norm since previous research indicates that higher latitude experience increased seasonal depression. It is further predicted that SAD and BDI scores will show an inverse relationship with positive academic success indicators. Information derived from this study will expand the limited information available concerning the relationship between SAD and academic performance in college students. Additionally, we will assist the College of St. Scholastica (CSS) students and faculty conduct a mirror study to be done at a time table convenient for CSS. We will not be using the CSS data in our analysis.

Economics

Kwabena Awuah-Asamoah, Samuel Wairiri

Faculty Advisor/Collaborator: **Edward G. Young**

Economic Development Issues in Ghana and Kenya

This project is an examination of the economic development problems of Kenya and Ghana. Included in the research is as description of what has gone wrong in these economies and why. The research poster compares the economies of these two countries and lists a number of potential solutions the development problems. The policy recommendations are from the perspective of African students studying Western economic theory in the U.S.

Katerine Baumgart

Faculty Advisor/Collaborator: **Fredric Kolb**

A Comparison of Legislative Restrictions in the Determination of Wrongful Death Claims

Civil litigation claims made in cases of wrongful death are subject to the laws of the state in which the litigation is brought forward. A valuation of the damages is typically developed and then presented at trial by forensic economists. Because of the differences between statutes among the states, the size of a claim can vary considerably. In this study, we plan to evaluate the impact of the various statutes on the magnitude of a claim for the damages in the instances of several different death scenarios: young child, single worker, married worker, single non-worker, and retired individual.

Justin Hentges

Faculty Advisor/Collaborator: **Kristen Monaco**

Factors that Affect Truck Driver Fatigue

Each year roughly 5000 people are killed nationwide in truck related accidents (Sternberg, 1). Many of these crashes, about 30% as estimated by the National Transportation Safety Board, are related to fatigue (Woolley, 1). Because of these startling statistics, we feel that the study of fatigue and how it relates to the trucking industry is a worthwhile case. In this paper we attempt to explain the factors that affect a driver's ability to stay awake at the wheel, including money constraints on drivers, log book violations, and firm pressure. We used the University of Michigan Trucking Industry Program survey for the year 1997 as our data source. We took different variables and did a probit regression with them against sleeping or dozing at the wheel and a logit regression against sleep in the last 24 hours. We found many interesting results in the factors that affect driver fatigue. We found that gender and race matter. Education also matters except reverse of what we would expect.

Jonathan Holste

Faculty Advisor/Collaborator: **David L. Schaffer**

The Changing Effects of Education on Hourly Earnings in the U.S.

Recent economic research has shown that the distribution of wages in the U.S. has been widening over the last 30 years. The majority of workers, those with low or middle level wages, have seen a decline in the real value of their wages. A relatively small minority of workers, those with the highest wages, have seen a dramatic increase. There is already a large economics literature attempting to explain this phenomenon. However, the primary causes are still being debated. Our project focuses on the changing role of education in determining hourly earnings. We use a large data set on individuals in the U.S. economy that extends from 1970 through 1998 and that includes labor force and background data on over one million individuals. Using a variety of statistical and econometric methods we analyze the determinants of hourly earnings. We focus particular attention on the degree to which years of education has a different impact on the wage

rate of women than men. We also show how the returns to a high school diploma and to a bachelor's degree have changed over this 29-year period.

Kevin Neuman

Faculty Adviser/Collaborator: **Rose-Marie Avin**

Globalization and Women in Nicaragua: Trends and Patterns

Many empirical studies have examined the link between the internationalization of economies and the growing incorporation of women in the labor force. According to these studies, globalization and the transition to market economies have had a significant impact on the patterns of women's employment, earnings and their social welfare. These studies have shown that the impact is complex and sometimes associated with contradictory trends. Although globalization has given women more employment and wage-earning opportunities, it has not necessarily improved their status in society given their low wages, the poor and unhealthy working conditions, and the lack of labor rights. This project will analyze the trends and patterns of globalization within the context of Nicaragua and, more specifically, its differentiated impact on Nicaraguan women.

Josh Willmert

Faculty Adviser/Collaborator: **Kristen Monaco**

How Much do Truck Drivers Work? An Analysis Across Data Sets

The purpose of this research project is to analyze the 1997 Current Population Survey for the trucking sector. It is that the CPS underestimates the actual amount of hours that truck drivers work, because it only takes into account the amount of time spent on the road and not the time spent docking, loading, and maintaining the truck. Through the use of econometrics, I will analyze this data and develop an answer to how many hours truck drivers actually work.

Jinhong Zhang

Faculty Adviser/Collaborator: **Maria N. DaCosta** and **Wayne D. Carroll**

The Role of Financial Reform in China's Development

This project looks at China's effort to transform its financial system to one compatible with an emerging market economy, namely China's early financial reform efforts and the growth and development of China's capital markets. China's first serious effort to restructure its financial system from a planned government control system to one that is more compatible with a market economy began in 1984 with the separation of the People's Bank of China from other commercial banks. The People's Bank of China (PBC) was vested with role of the central bank. A framework of the financial system was also defined with the diversification of the Chinese financial institutions into state banks, commercial banks, financial trusts and investment companies, securities companies, finance companies, financial leasing companies, rural credit cooperatives and urban credit cooperatives. By 1991, China has moved from a unified banking system to a diversified financial institutions framework. The first capital markets were formed in 1990 and 1991 with the establishment of the Shanghai Stock Exchange and the Shenzhen Stock Exchange.

 **Geography**

Tim Connor, Evan Marshall, Josh Lahner, Peter Jacobson, Chris Koehnen

Faculty Adviser/Collaborator: **Brady Foust** and **Lisa Theo**

Ethnicity and Income In San Francisco

Abstract: The purpose of this project is to examine the relationship between ethnicity and income in the city of San Francisco. The hypothesis is that there is a negative relationship between

concentrations of wealth and ethnicity whereas higher values of income will be associated with predominately white neighborhoods. The underlying theme is that a racist landscape still exists in our cities and can be easily identified spatially. Analysis will be conducted at the block group level. Urban ghettos continue to exist and grow in our country amongst a robust economy. The relationship between both variables can be shown through the use of precise quantitative data. In this study housing value and median household income will be used to quantify wealth. Ethnicity will be defined as white and non-white neighborhoods. This study is necessary to spatially identify concentrations of poverty so that further research can be done in these areas to unveil the perpetuating themes of poverty. Future studies of identified neighborhoods will concentrate on the economics, educational opportunities, social atmospheres, and institutions of the identified neighborhoods.

Melissa Gray, Jennifer Duran, Amy Landis

Faculty Advisors/Collaborators: **Brady Foust** and **Lisa Theo**

The Relationship Between Restaurant Characteristics and Socioeconomic Characteristics in San Francisco, California

San Francisco, California has an estimated 3,500 restaurants. The mix of restaurants reflects the ethnic diversity of this region. The relationship between restaurant characteristics (locations, cuisine, and price) and socioeconomic characteristics (income, age/sex, and ethnicity) is investigated in this project. A primary hypothesis is that higher priced restaurants are located in higher income areas. A secondary hypothesis is that certain ethnic restaurants will be centralized in distinct income areas. For example, French, Greek, and Mediterranean restaurants may be located in the high-income areas, while Chinese, Spanish, Mexican, and African restaurants are located in lower income areas. The source for this project is all restaurants listed in the latest Access Guide to San Francisco and 1999 block group socioeconomic data from Easy Analytic Software, Inc.

Cory Klinge, Timothy Kinney, Robert Staves, Corrie Neuens, Mari Van de Ven

Faculty Advisors/Collaborators: **Brady Foust** and **Lisa Theo**

Proposition 22: Comparing San Francisco, California's Voting Results With Socio-Demographic Data of the City

The purpose of our research is to consider the relationship between socioeconomic variables and the vote on California Proposition 22 at the block group level in San Francisco. This proposition (scheduled for a vote on March 7, 2000) would mandate that the state recognize only marriages between men and women effectively invalidating gay/lesbian marriages even if legal in other states. Our study will use income, education, age/sex mix, and ethnicity as the independent variables predicting the outcome of Proposition 22. We will also consider the location of gay/lesbian/bisexual businesses (Damron's 2000 Travel Guide) in the city as a bellwether of potential support for the proposition. Our working hypothesis is that the vote opposing Proposition 22 will be highest in blockgroups with higher income, education, and gay/lesbian businesses. This hypothesis will be tested with basic map comparison and statistical and graphical analysis.

Mitch Stimers

Faculty Advisors/Collaborators: **Lisa Theo** and **Chris Theo**, Art Department

Simplifying Urban Theories and Concepts

Students in introductory-level classes often do not get the opportunity to design and conduct applied research projects. The purpose of this poster is to provide a practical example of the role fieldwork plays in explaining urban concepts. GPS is used to determine the location, number, and type of billboards along a stretch of Interstate Highway. The billboards are coded by location (driver's side or passenger side), type of establishment, and size of billboard. GIS is then used to determine the advertising range of each type of billboard, the distance to the advertised feature, and the size of the nearest urban center. In addition to witnessing concrete examples of urban

concepts such as threshold, range, intervening opportunities, and distance decay, real-world applications of central place theory and gravity models were observed. This presentation demonstrates how introductory students can learn basic urban theories and concepts using high-tech equipment and software programs.

Derek Sullivan, Jake Ciolkosz, Scott Bohrer

Faculty Advisor / Collaborator: **Brady Foust** and **Lisa Theo**

Income and Elevation in San Francisco

The purpose of this project is to examine the relationship between household income and elevation. The primary research hypothesis is that there will be a positive relationship between household income and elevation in that higher areas of elevation throughout the city will be associated with higher values of income. We will be attempting to prove this tendency through multiple correlation and mapping. The underlying concept is that high-income people have a greater propensity to reside in areas of high elevation because of a better scenic view and or a more private lifestyle. We will prove this by examining block group data for income, and relating it to elevation. In this study home value and industrial land use will be examined as contributing factors for where people of different incomes reside. In the field we plan to examine the anomalies of our data by looking at areas that don't fit the general pattern. The basic hypothesis will be analyzed and tested using thematic mapping, graphical analysis, and statistical analysis.

Ryan Douglas Weichet

Faculty Advisor/Collaborator: **Sean Hartnett**

Political Landscape of Eau Claire Neighborhoods

Political participation in any election, be it primary or presidential, is extremely difficult to gauge. The obvious question then becomes what is an appropriate and straightforward way to measure the political involvement of citizens? Banners, bumper stickers, and rallies are a few ways in which people have in the past professed their support for a particular candidate. What this project will be addressing is the distribution of signs in lawns throughout Eau Claire neighborhoods and if there is a direct correlation to position of lawns and number the of signs in particular regions across the city. Specifically, will there be more signs on the corners of two or more conjoining streets and also are there more signs on the periphery of neighborhoods that have access to higher human traffic? This then can correlate into determining which neighborhoods, by the use of signs, are more politically active in the election process than others. This project will map all politically oriented signs for the upcoming election on April 4th in Eau Claire. The impetus of this effort is directed with the use of a Global Positioning System (GPS), which uses satellites to map the exact location of any particular object. With the use of GPS a concise and easy to read map will develop that will support or reject my initial hypothesis.

Adam Wirtz, Andy Hahn, Jessie O'Neill, Greg Charles

Faculty Advisors/Collaborators: **Brady Foust** and **Lisa Theo**

Retail Structure and Socio-Economic Conditions: A Study of San Francisco Retail Clusters

The purpose of this project is to examine the relationship between retail structure and demographics in the retail clusters of San Francisco. The primary research hypothesis is that there will be a relationship between the mix of retail functions and income, education, gender, and ethnicity of the surrounding neighborhood. The underlying concept is that the types of businesses in each cluster should reflect the socio-economic conditions of the area in which it is located. All analysis will be conducted at the block group level. Data sources include SIC data, and various travel guides.

Physics and Astronomy

Leah Hooker

Faculty Advisor/Collaborator: **Paul Thomas**

Political Climate and Space Exploration: Why NASA Lost

At the Height of the Apollo program NASA's budget comprised nearly 4% of the total United States Budget. Since that time the NASA budget has become proportionally smaller every year. While there are many theories on the cause of these decreases there is no definite answer. This study attempts to analyze several of these possibilities by asking the following questions. 1. How did the different Presidential administrations affect the NASA program? 2. To what extent were the perceptions of NASA employees self-destructive to the organization? 3. What impact has the "Better, Faster, Cheaper" program had on NASA budget and perception? 4. How will the 2000 presidential elections affect NASA's future? In the answers to these questions we hope to discover the nature of NASA development and the path it will likely follow in the future.

Political Science

Marlin Hardinger

Faculty Advisor/Collaborator: **Ali Abootalebi**

Global Politics and Business

In my research for Global Politics and Business I will examine the affects of the Cold War on global politics and business. How global politics played a central role in the formation, organizational setup and decision-making procedures/process of Gatt, WTO, IMF, WB and the UN. To support the supremacy of politics over economics I will research historical facts and events of the mentioned international organizations. Their voting records on financial contributions to the developing world will be a significant area of research. The attachment of conditions to the majority of loans made to developing nations from the developed world has had a major political affect.

Amy Jacobson

Faculty Advisor/Collaborator: **Rodd Freitag**

The Impact of W2 on Community Service Providers in Eau Claire, Wisconsin

Welfare reform legislation passed by Congress in 1996 shifted much greater responsibility for the needy, working-age poor and their families to local communities. Wisconsin's version of welfare reform, W2, led the way in this change of policy. This research project explored more fully the implications of welfare reform for communities by conducting a case study of service providers in Eau Claire, Wisconsin. We identified and surveyed over 20 providers of health, food, counseling, shelter, education, and other services for low-income residents of Eau Claire. Most providers reported an increased demand for their services over the past five years. These providers attributed the increased demand, at least in part, to the new requirements of W2.

Psychology

Joseph Cermak

Faculty Advisor/Collaborator: **Gregory Madden**

Effects of Response Topography on Discounting Delayed Reinforcers in Pigeons

Delay discounting is the tendency for the subjective value of a reward delivered after a delay to decrease as the delay to that reward increases. In a choice situation between an immediate but

small reward and a larger delayed reward, an impulsive choice is defined as preference for the smaller, sooner reward, and the self-control choice is the preference for the larger, later reward. Previous studies using pigeons to study delay discounting find that they tend to show a high amount of impulsivity. However, there is research to indicate that the key pecking response that is typically employed to study delay discounting may be subject to classical conditioning, meaning the light may elicit the key pecking response involuntarily. The aim of the present study is to examine the effect that an alternate response topography, namely foot treading, has on delay discounting in pigeons given that foot treading is believed not to be as susceptible to classical conditioning. It is hypothesized that pigeons will show more self-control in foot treading phases than during key pecking phases of the experiment.

Jennifer Gross

Faculty Advisor/Collaborator: **Gregory Madden**

A Novel Test of the Behavioral Economic Concept of Unit Price

One of the fundamental principles of economics which has been frequently studied in behavioral economics is unit price. The unit price of a good, according to economic theory, is the ratio of costs divided by benefits. The present study was conducted to provide a stringent test of the predictions of unit price. In our experiment, unit price was manipulated across a 300-fold range by increasing the work requirement (costs) for each food reward (benefits) in three conditions. In condition one, the benefit was a standard amount of food available according to a fixed-ratio schedule. In condition two, the cost and benefits were doubled while leaving the unit-price ratio value unchanged. In condition three, a random-ratio schedule was arranged while the unit price of food was yoked to the prior sessions. Each session in this experiment was completed in two hours. Data collected thus far indicate no systematic differences in response output and consumption per session.

Alison Hart

Faculty Advisor/Collaborator: **Blaine Peden**

Cybertherapists: Pioneers in Ethical Purgatory

The California Telemedicine Development Act and the Comprehensive Telehealth Act legitimized online psychotherapy. An increasing number of individuals have established internet therapy sites that offer professional services. The actions of these cybertherapists has raised a number of ethical questions. To date no published studies have looked at the application of the American Psychological Associations code of ethics to internet therapy practice. This poster reports a content analysis of 50 cybertherapy sites. On average, compliance with ethical standards was only 35%, and many sites had 0% compliance. Discussion will focus on the implications of these results for practitioners.

Lana Kastern, Andrew Harris, Amanda Retzak, Andrea Gantz, Bethany Raiff

Faculty Advisor/Collaborator: **Gregory Madden**

A Comparison of the Effects of Real and Hypothetical Rewards on Delay Discounting and Impulsivity in College Students

Delay discounting has been proposed as a model for studying impulsivity. Rewards used in human delay discounting experiments have often been hypothetical (Madden, Petry, Badger, & Bickel, 1997). This study examines undergraduate students' responses to choice arrays backed by real and hypothetical rewards. The study consists of two experiments. In both, participants were given choices between monetary rewards ranging from \$.02 to \$20.00. Rewards were paired with different delays, ranging from no delay to 1 year. The first experiment presented choice arrays backed by real and hypothetical rewards, separated by a distracter task. In the second study, one participant group was presented with all hypothetical rewards. For the second group, participants received one of their choices. Preliminary results for the first study indicate no difference in delay discounting between real and hypothetical rewards. However, carryover

effects between conditions may present a confound. Preliminary results for the second study indicate a difference in responding. Finding no significant difference between delay discounting with hypothetical and real rewards would give greater certainty in the validity of human delay discounting studies. Finding a significant difference would require that the findings of delay discounting in humans would be reviewed with this in mind.

Cheri M. Ness, Jaclyn K. Rudebeck

Faculty Advisor/Collaborator: **William Douglas Woody**

Understanding burden of proof in civil damage cases with punitive damage award

Two hundred participants read two civil lawsuits and used one of three standards of proof ("by a preponderance of the evidence," "by clear and convincing evidence," or "beyond a reasonable doubt") to determine whether punitive damages are appropriate and, if so, to decide the amount of punitive damages. According to legal theory, the burden of proof in a given case should affect a juror's likelihood to award punitive damages; however, only the behavior of the defendant and not the burden of proof should affect the size of the punitive damage award. Jurors often struggle to separate conceptually similar tasks, and correctly using burden of proof is a challenge for jurors. Jurors were not able to appropriately use burden of proof to decide whether to award punitive damages. Such difficulties could lead to expensive inconsistencies in jury decisions. The discussion explores relationships between legal theory and capabilities of jurors. The three standards of proof may be difficult to understand or to use in their written legal form, and if changes in legal policy are necessary, results from the proposed research may be crucial in bringing about changes in the way jury instructions and standards of proof are communicated to civil jurors.

Carrie Peterson

Faculty Advisor/Collaborator: **Gregory Madden**

Assessing the Validity of an Animal Model of Human Impulsivity

Impulsivity is an important category of human behavior which includes societally important behaviors such as drug abuse and over-eating. Nonhuman impulsivity, in these experiments, is defined as choosing a smaller amount of food delivered now and forgoing a larger amount of food delivered after a brief delay. A potential problem for this area research is that impulsivity in pigeons may be different from impulsivity in humans due to involuntary responding from classical conditioning. Just as Pavlov's dog did not voluntarily choose to salivate at the sound of a bell, pigeons may not be choosing to behave impulsively. If this is true, then this species may be inappropriate for studying the determinants of human impulsivity. To evaluate this possibility, four pigeons will choose between smaller-sooner and larger-later food rewards in two conditions. In one condition, pigeons will make their choices by pecking keys (a response empirically known to be affected by classical conditioning); key pecking is the response used in all prior impulsivity research with pigeons. In a second condition, pigeons will respond by pressing a lever with their foot (prior research has shown that this response cannot be classically conditioned). Degree of impulsive behavior will be compared across these conditions.

Elisha Ann Poppitz, Davin Mikkonen

Faculty Advisor/Collaborator: **William Douglas Woody**

Vengeance: Effects of Gender, Age, and Religious Background

The proposed research is an collaborative effort between the faculty mentor, undergraduate students, and a colleague at the University of Tennessee to study attitudes toward vengeance. The objectives of the proposed research are to provide students with opportunities to participate in a multi-university social psychology research project and to examine various factors that influence an individual's likelihood to seek revenge (e.g., culture, relationship with the offending individual, and age). Participants read a series of scenarios, each of which could elicit revenge, and indicated whether they would act vengefully in that situation. Participants then completed a

survey of demographics, a religious conservatism scale, and the Vengeance Scale. Data from the proposed research were compared with a Southern sample collected concurrently at the University of Tennessee to evaluate the effects of culture. Southern participants differed from Midwestern participants in terms of willingness to seek vengeance in certain relationships. Data from the religious conservatism scale were used to investigate potential differences between Southern and Midwestern participants.

Jill M. Spaak, Kimberly A. Bateman

Faculty Advisor / Collaborator: **Blaine Peden** and **Allen Keniston**

The Effects of Rumination on Depression

This study will examine whether college students' depression is significantly affected by ruminative thought patterns. The Beck Depression Inventory (Beck, 1978) and Responses to Depression Scale (Nolen-Hoeksema, personal communication, spring 1998) will first be used to assess depression and rumination traits in 100 college students. From this sample individuals showing mild to moderate levels of depression (a score of 10 to 19 on the Beck Depression Inventory) will be subject to induced and distracted ruminative thought manipulations (Nolen-Hoeksema, personal communication, spring 1999). The Beck Depression Inventory and Responses to Depression Scale will then be administered to the selected participants again. The relationship between induced and distracted rumination and depression is hypothesized to be found significant, with findings of rumination directly influencing depression.

Paul A. Thomas, Jen Hanley, Nate Underwood, Chris Tukiendorf, Bob Losby

Faculty Advisor/Collaborator: **Allen Keniston**

A Study of the Effects of Exercise on Stress, Depression Levels, and Health Risk Factors

The adjustment that takes place for young adults leaving home as they begin their college years has been noted to be a difficult change. For a university it is becoming increasingly important to find ways to help students cope with this change in their life. It has been noted by Silvestri (1997) that physical activity can release stress and built up tension. The benefits of exercise have been noted in large populations beyond the college student age demographic. Paffenbarger, Jr., Hdy, and Wing (1986), reported that more active men had lower death rates. The need for exercise is certainly continuing to develop, as a person grows older. The question at hand is to look at exercise benefits earlier on in the life span of a person to see what implications regular exercise has on the levels of stress and depression in a college population. An experimental study tested the ability of exercise to buffer college students from depression, stress, and health risks. Twenty students exercised for three months. They were compared to yoked controls on measures of adjustment. Results are pertinent to recommendations that exercise programs be implemented to promote adaptation to college life.

Sociology and Anthropology

Lori Lustig, Amy Jordan

Faculty Advisors/Collaborators: **Melinda Miceli** and **Jacqueline Carrigan**

An Analysis of the Content of Anti-Harassment Policies and Programs in Wisconsin's Public Schools

Violence in American public schools has recently become a rather common newspaper headline and topic of television news shows. In all of these stories "experts" and average citizens alike are asked to offer their attempt at explaining the cause of these violent events. In these attempts to understand the cause there has been talk of the impact of violence in the media, access to firearms, and absentee parents, among other things. In these conversations that seek to explain these seemingly unexplainable episodes of violence, there has been occasional mention of a state of intolerance of difference in public schools which may leave some students feeling isolated,

angry, and prone to violence. While this relationship of an environment of intolerance and school violence has been suggested by some, it seems to have been left unresearched, or at least under researched. One of the troubling undercurrents of these discussions is a belief that children have a natural predisposition to ostracize and persecute other children who they perceive to be different from the socially accepted norms. If this belief is prevalent within the public school system, it may influence the policies and recommendations that are designed to alleviate student conflict. This leads to the following questions: How do the structure and policy of the public school system promote or discourage conflict among students? How do the practices of teachers, counselors, and administrators in public schools promote or discourage conflict among students? Our research seeks to answer these questions and explore the relationship between intolerance and harassment, discrimination, and violence in public schools. It will involve analyzing anti-harassment and anti-discrimination policies put forth by the Wisconsin Public School System, as well as less formal public school policies and suggestions for dealing with conflict among students. This data will be examined for any untested or biased assumptions about students' attitudes and behaviors. It is hoped that by revealing these assumptions we could help school officials develop better strategies for dealing with student conflict before it escalates to violence.

Mindy Meyer, Shoua Thao, Nou Yang

Faculty Advisor/Collaborator: **Jeremy Hein**

Hmong Americans' Perceptions and Experiences of Discrimination in Wisconsin

This research is based on a survey of 80 Hmong Americans in Eau Claire and Milwaukee and four focus groups of Hmong Americans in both cities. The survey data provides statistics on perceptions of discrimination. The results show significantly higher perceptions of employment and housing discrimination in Eau Claire compared to Milwaukee, but no difference for police discrimination and general prejudice. The focus group data are transcripts of discussions about actual experiences of discrimination and what Hmong Americans should do about this problem. Three methods are identified as possible techniques for analyzing the transcripts: quotations for qualitative analysis; counting the use of key words like racism for further statistical analysis; and frame analysis, which combines both qualitative and quantitative approaches. Examples of these three methods are provided. Participants at the UW-EC Student Research Day will be encouraged to "vote" their preference for one of these three methods.

Girts Racko

Faculty Advisor/Collaborator: **Jeff Erger**

The Comparative Analysis of the Changes in Value Orientations Among International Students in the University of Wisconsin- Eau Claire and Harvard University

Understanding the experiences that international students go through during education in American universities is important in shaping programs that benefit both those students and the institutions they attend. This research takes Geert Hofstede's research on value orientations (social, power, uncertainty, and goal) in work settings and applies it to the educational setting in order to gain a fuller understanding of how international students adapt to American institutions and values. By employing surveys, information on international students' experiences during their experience in the USA and their value orientations was gathered. Findings show a complex relationship between country of origin, value orientations, personality, academic setting, and social and academic experiences. These findings suggest several ways that International Education can be improved in general and at the University of Wisconsin-Eau Claire specifically.

Business and Professional Studies

Accounting and Finance

Kelli Brown

Faculty Advisor/Collaborator: **D'Arcy Becker**
Self Efficacy and Student Accounting Grades

Self efficacy is a judgment of task-specific expected performance; it is a judgment of how well you think you will perform a task. This study examines the relationship between student self efficacy for an accounting course and student grade; it extends prior research that examined student grade expectations. Self efficacy for an introductory financial accounting course was measured by student predictions of their course grades several times during the course. The two experiments conducted showed that self efficacy was a significant determinant of actual course grades in the second half of the course but not early in the course. In addition, students showed overconfidence in their expected grades both at the start and the end of the course although this phenomenon decreased as the course progressed.

Stephanie Gilles

Faculty Advisor/Collaborator: **Mehdi Sheikholeslami**
Do Foreign Bidders Outbid U.S. Bidders? - An Empirical Analysis

The domestic mergers and acquisitions literature suggests that synergy is the primary reason for takeovers. However, empirical research documents that bidding firms, on the average, suffer from acquisitions due to overpayment. But, in the case of foreign bidders, access to U.S. markets may result in diversification benefits, synergistic gains and other advantages that are not available to domestic bidders; hence justification for overpayment. Thus to the extent foreign bidders perceive synergies not available to domestic bidders, we hypothesize that in an acquisition of U.S. targets, foreign bidders pay a higher premium than U.S. bidders. All mergers and acquisitions we studied took place during 1997 - 1998. Our sample consisted of 68 foreign bidding companies and a matching sample of 68 domestic bidding companies. Our study results did not support our hypothesis.

Cynthia L. Tryba

Faculty Advisor/Collaborator: **D'Arcy Becker**
Student Effort and Attitude and its Relationship with Student Grades

Previous theory suggests that a student's grade in a class is related to the expectations set by their teachers. In this study, we investigate effort and attitude and how they are related to the student's grade.

Carrie Walz

Faculty Advisor/Collaborator: **Ingrid Ulstad**
Accounting Success: What is it? Who's got it?

The American Institute of CPAs recently published Focus on the Horizon--The CPA Vision Project 2011 and Beyond. The Vision Statement speaks to the new competencies necessary for a successful future in the profession. We believe that many of the old and new competencies can be categorized according to brain dominance. The concept of brain dominance suggests that one hemisphere of the brain is more efficient, hence dominant, at a given task. This dominance determines a person's preferences, strengths, learning styles, and approaches to problem solving. Many of the accounting skills needed in the past appear to fall primarily within the left hemisphere, whereas the proposed accounting skills appear to fall within the right hemisphere.

We surveyed business majors and asked for both their perceived personal characteristics and characteristics they felt were necessary for success in accounting. Our goal was to determine whether accounting majors' perceived personal characteristics relate more closely to the new competencies described in the Vision Statement than do those of other business majors.

Adult Health Nursing

Rachel Brown

Faculty Advisor/Collaborator: **Rosemary Jadack**

Social networks and sexually transmitted diseases: A gender comparison

Prevention of sexually transmitted diseases (STDs) is considered a key national health promotion objective. Nationwide, individual interventions have not resulted in an impressive decline in STD infection rates. A promising new approach in the study of sexual behavior is social network analysis, which focuses on patterns of behaviors among friends, relatives and acquaintances in social networks. However, little research has been done that compares sexual risk behaviors and network characteristics between men and women. This descriptive study asked the following questions: 1) What are the social network characteristics of individuals at risk for contracting or transmitting an STD?, and 2) What is the relationship between sexual risk-taking patterns between men and women? A convenience sample of 50 clients accessing an STD clinic were recruited. Personal social networks, types of support provided by members of the networks, and risk behaviors (drug/alcohol use, sexual risk behaviors) were assessed. Overall, respondents reported a mean of 6 people (SD=2.7) in their social networks. Analyses revealed significant differences in network density and patterns of sexual risk taking between men and women. These data provide important information about the factors and interpersonal influences that contribute to STD transmission among vulnerable clients accessing inner city STD clinics.

Lori Wicklund, Holly Steimig, Sheila Hlavka, Julie Meyer, Kristin Paschke, Linda Huelsbeck, and Teresa Granum

Faculty Advisor/Collaborator: **Rita Sperstad**

Cultural Care: Meaning described by Faculty and Students with Mexican-Americans during labor, birth, and after birth

This poster presentation will combine the results of two faculty-student research collaboration projects done in the spring of 1999 and spring 2000. These projects were a replication of initial faculty-student research collaboration done in spring 1998. This was a descriptive interpretive qualitative research study. An immersion method is used during this project. For a week, the students and faculty live and practice nursing care at a freestanding birthcenter managed by certified nurse midwives and registered nurses, located in Texas, approximately 10 miles from the border of Mexico. The birthcenter provides comprehensive services during pregnancy, labor, birth, and after birth, including well baby care to low income Mexican-Americans, as well as non-US citizens. Written journaling is the primary method of data collection, followed by small group critical reflection seminars. Faculty and student groups identify significant themes that describe the meaning of cultural care during this experience.

Business Communication /Art

Keeley Becker, Sean Kirwan, Tim Vonderloh, Jeff Szpac, Jennifer Walde

Faculty Advisors/Collaborators: **Jack Hoggatt** and **Christos Theo**, Graphic Design Program
Development of Effective Communication Training Seminars and Support Graphics

Students from Bcom 405/605, (Advanced Business Communications), and the Art/Graphic Design 476, (Advanced Graphic Communications) courses, researched in-depth applications of

written, oral, non-verbal communication, and support visual communications. This collaborative research project simulated business organizations involved with preparing, organizing, and delivering communication training seminars. Considerable emphasis was placed on interpersonal, organizational, and visual communications within business.

Communication Disorders

Leslie Egan, Erica Serflek

Faculty Advisor/Collaborator: **Linda J. Carpenter**

Learning English as a Non Native Language: Learners' Perspective

Non native English speakers' perspectives of their English learning were examined. A questionnaire was designed to gather information about language background, English instructional experiences, ease of initial learning of spoken and written English, and areas of English needing improvement. It was completed by 17 international students enrolled at UWEC during the fall 1999 semester. All subjects were bilingual (i.e., native language + English), and more than half were multilingual. On average, they began English instruction before age 10 and have had eight years of English education. Mean English proficiency self-ratings indicated skills between survival and conversational ability, and subjects were confident in their current English skills. Subjects were initially motivated to learn English primarily because it was a school requirement; current interest is motivated by personal reasons and employment opportunities. Significant differences were not found between ease of learning spoken and written English. All aspects of English were relatively easy to learn initially, but spoken content was the most difficult aspect to learn initially. It is also the area perceived as most in need of improvement. Subjects believed starting instruction at an early age and practicing spoken English frequently, particularly with native speakers, are the best conditions for learning.

Heather Gjerseth, Jonathan Schmitz

Faculty Advisor/Collaborator: **Larry Solberg**

Laryngeal Configuration and Constriction During Breathily Phonation and Whisper

Video endoscopy was used to compare glottal configuration (vocal fold closure pattern) and supraglottic constriction (laryngeal muscle hyperfunction) during normal phonation (control condition), breathy phonation, soft whisper, and loud whisper in 14 males and 14 females with normal voices. Data regarding the physiology of breathy phonation and whisper are limited, and gender differences have not been investigated. After brief training in producing the three experimental production modes, subjects underwent rigid oral endoscopy to image their larynges during normal phonation and the three experimental production modes. The order of the experimental production modes was randomized. The samples were coded while simultaneously viewing the normal phonation condition (control) on one monitor and viewing the experimental modes on a second monitor. The experimental samples were identified only by number, and the monitor volume was turned off to eliminate coding bias. The majority of samples for all three experimental modes demonstrated glottal configurations reported previously in the literature; i.e., a small posterior glottal space with incomplete vocal fold closure in breathy phonation, a small posterior glottal space in soft whisper, and a larger posterior glottal space in forced whisper. More subjects exhibited supraglottic muscle hyperfunction during whisper than during breathy phonation. Glottal configurations differed by gender during breathy phonation and loud whisper. Implications are discussed.

Zena Olsen, Kristy Osborne, and John Schmitz

Faculty Adviser/Collaborator: **Linda Carpenter**

ADHD and Stimulant Medication: A Speech-Language Pathology Cohort

School-based speech-language pathologists' (SLPs) knowledge and opinions about attention deficit hyperactivity disorder (ADHD) as well as their experiences working with students diagnosed with the disorder were examined. Surveys were sent to a nationwide random sample of 800 school-based SLPs, with 400 drawn from Wisconsin and 400 drawn from all other states. The Wisconsin sample yielded a 50.5% response rate; the national sample yielded a 26.5% response rate. Because few differences were found between the state and national samples, data were collapsed across groups and analyzed descriptively. Results showed that respondents had limited knowledge of documented facts about ADHD and its treatment with stimulant medications, and their opinions adhered to stereotypical views. Although approximately 12% of children on respondents' caseloads were diagnosed with ADHD, other than direct language intervention, respondents reported limited involvement in school-based management of these children.

Counseling Services / Psychology

Marisa Hoogenakker, Christy Tomczak

Faculty Advisors/Collaborators: **Judy Blackstone** and **Blaine Peden**
Counseling Clientele Characteristics

This study analyzes characteristics of students using Counseling Services on the university campus during the Fall, 1999 semester. The scientific outcome will be a descriptive or statistical profile of the clientele sample that can be compared with existing profiles of the undergraduate population. In particular, the goal is to determine whether the Counseling Services sample differs systematically from the UWEC student body at large. The practical objective is to identify populations who may be under served by Counseling Services, and improve delivery of services to all students at UWEC. Contrary to the popular belief that people seeking counseling services are academically less competent than the larger student population, we hypothesize that there will be no statistically significant difference. However, we do expect to find female use of services to be disproportionate to their percentage in the larger student body, as found in a previous study by Altmaier and Rapaport (1984). The findings of this study could be used to evaluate the widespread belief that the university's ability to recruit increasingly "better" students will result in a diminished need for counseling services. This study may dispel the perception that better students have fewer problems, and therefore a lesser need for Counseling Services. Findings may also be used to help counselors provide services to underrepresented segments of the student population. In addition, this demographic database may permit comparisons with other universities and may be useful in developing more effective programs.

Family Health Nursing

Julia Allen

Faculty Advisor/Collaborator: **Anna Alexander-Doelle**
Parish Nurse Development Project: Phase III

The Parish Nurse (PN) Development Project was undertaken to foster development of parish nursing in faith communities through the provision of PN resources, professional development opportunities, a pilot demonstration program and a PN Council for networking and support. The project has been instrumental in initiating PN programs. At the PN demonstration site, utilization and evaluation data was collected and summarized. Overall, congregational satisfaction with the program was reflected in this data. Fiscal responsibility remains a concern for development decisions. Cost, benefits and other supporting data was collected, analyzed and summarized. Preliminary data from cost/benefit research suggests that parish nursing results in sizable cost savings of health care dollars for those utilizing its services. Health promotion, early identification and continued reinforcement of lifestyle changes provided projected cost saving of

\$22,000/person (hypertension), \$35,000/person (hip fracture), \$29,000 (COPD or lung cancer). Examples of PN programs and cost saving impact are provided.

Laurie Hibray, Erin Ruehle, Angela Blau

Faculty Advisor/Collaborator: **Audrey Bryan**

Relationship Patters in Follow Up Study of Families with 5 Year Olds

This research collaboration begins a new data collection that follows up on couples and their five year old children as part of a longitudinal study, Growing as a Couple and Family (GCF). In the initial GCF study, treatment couples participated in a 3-session class series on couple relationship issues during pregnancy, and were compared to a control group in childbirth preparation classes. This study follows-up these families at 5 years after birth to identify long term effects of prenatal intervention on the couple relationship, parent child relationships and child outcomes. It further examines whether prenatal and post-birth indicators predict long term adjustment and the relationship of stress to parent and child outcomes. Students assisted in identification of appropriate tools, compiling questionnaire packets, and mailing questionnaires to up to 143 couples. Questionnaires addressed couple relationship, parenting stress, life stress, developmental outcomes and other health and lifestyle data. Student follow up with subjects included post cards and phone calls. Data was entered in SPSS for Windows. Data is being analyzed in comparison with data from prenatal and first year post-birth phases of this longitudinal study. Implications for transition to parenthood and child development will be presented.

PollyAnn Scholze, Rebecca Holtz

Faculty Advisor/Collaborator: **L. Elaine Wendt**

School Nurses' Attitudes, Knowledge and Experiences Regarding the Use of Stimulant Medication for the Treatment of Attention-Deficit/Hyperactivity Disorder

The intent of this study is to identify school nurses' attitudes, knowledge and experiences regarding Attention-Deficit/Hyperactivity Disorder (ADHD) and the use of stimulant medication for its treatment. All school nurses in the state of Wisconsin received a mailed questionnaire. Forty-eight per cent of the surveys were completed and returned. The attitudes, knowledge and experiences of school nurses will be described and compared to selected demographic and background variables. The school nurse's role in the diagnosis of ADHD and the follow-up of students treated with stimulant medication will be described. In addition, the role of the school nurse as a member of the interdisciplinary student services team will be presented. In a separated presentation, the results will be integrated with the attitudes, knowledge and experiences of speech-language pathologists, special and regular educators and school psychologists. This collaborative effort was funded by the National Conferences on Undergraduate Research.

Katie Stephan

Faculty Advisor/Collaborator: **Janice Berry**

Comparison of Student Learning Outcomes in Two Distance Education Nutrition Classes

The purpose of this study was to determine the effectiveness of a student teaching apprentice at a distance education site as measured by student outcomes. FMHN 211: Food for Fitness is a one-credit wellness course offered via distance education through the School of Nursing. The majority of the students are located at the main campus. A student apprentice facilitated the course on the main campus and collaborated with the students to enhance their learning. Student grades on a computer based nutrition analysis assignment and overall grades from the fall 1998 distance education course will be compared to the same grades from the fall 1999 course. The student apprentice assisted in the fall 1999 classroom. An independent t test will be utilized to compare the mean score on the computer based nutrition analysis and overall grades between

the two classes. Along with this, a survey tool will be distributed to the fall 1999 class to determine their perceptions on the usefulness of a student apprentice in the classroom.

Heather Tinder

Faculty Advisors/Collaborators: **Audrey Bryan**

Growing as a Couple and Family: Integration of Findings into Clinical Practice

The Growing as a Couple and Family Project (GCF) is a longitudinal intervention study of a nonrandomized convenience sample addressing couple and parent-infant relationships over the transition to parenthood. In Phase 1, prenatal treatment group couples who received a three-class intervention were compared to control group couples in childbirth classes. In Phase 11, data at 6-20 months post birth looked at the couple relationship post birth and its interrelationship with parent-child interaction. Findings showed higher parent-child interaction scores in treatment group couples and a strong correlation between the couple relationship and parent/infant interaction. This poster will show the integration of the results of this study with new nationally available knowledge on infant brain development, which highlights the importance of parent child interaction. The findings in this study show enhanced parent-child interaction in couples participating in the treatment group. The resulting presentation shows the practice application of these results.

Foundations of Education

Reid Baerenwald, Jayna Peterson

Faculty Advisors/Collaborators: **Bonnie McCarty**

The Effect of Feedback on the Development of Accessible Web Pages on the UECW Campus

The project analyzed existing web pages on the UECW campus using Bobby 3.1.1 approved standards for accessibility for individuals with disabilities. Each web page developer was provided with written feedback concerning web page accessibility. Areas of greatest strength and weakness in relation to national accessibility standards were generated. Results will be shared with University Computing and Networking Services in an effort to be responsive to the needs of an increasingly diverse student and faculty population. The project represents the first step in an ongoing effort focusing on the effect of feedback on revision of web pages for better accessibility.

Amy Peterson

Faculty Advisors/Collaborators: **Jill Prushiek and Katherine Rhoades**

Unraveling Multicultural Field Experiences: State Regulations and Student Reflections

This collaborative project explores the effects of multicultural field experiences required by the Department of Public instruction for all preservice education students in Wisconsin. Although this requirement has been in effect since 1980s, no systematic research has investigated the effects of these experiences on the students who participate. By qualitatively analyzing 300 randomly selected narrative logs collected from UECW preservice education students from 1997-1999, analyzing DPI archives, and interviewing DPI personnel responsible for this requirement, we will take a first step toward addressing this research gap.

Geology

Karen Anthony

Faculty Advisor/Collaborator: **Karen Havholm**

Building Stone of Eau Claire: Curriculum Enrichment

The purpose of this project was to produce a teacher resource to be used primarily at the third and fourth grade level showing the relationship between geology and the use of building stone in Eau Claire. Teachers and students can use this pamphlet to answer the inquiry question of, "What kind of rock is used in architecture in Eau Claire?". The pamphlet also relates skills and concepts included in this unit to the Eau Claire Area Schools Curriculum and to the State Standards and shows how it could be used as an enrichment tool. Buildings were selected to show the variety of building stone used. Through personal interviews with local geologists, historians, and specialists in the field, and looking at building and state historical plans, the source of each stone was identified. Many came from Wisconsin and Minnesota but others from further afield. The final product is a pamphlet including geological, historical and architectural information for teachers. This basic introduction will help in planning and conducting classroom lessons. Activities are included to guide students in their inquiry of the types and characteristics of building stone in use in Eau Claire. Visual aids such as maps and posters are included to help teachers and students in their learning.

Human Development Center

Gwen Kalina

Faculty Advisor/Collaborator: **William Frankenberger**
Assessment of Multicultural Experience at Lac du Flambeau

Over one hundred undergraduate and graduate students from UW-EC attended a two-day orientation seminar held Lac du Flambeau community. The students came from the disciplines of Communication Disorders, Psychology, School Psychology, Social Work, Nursing, Special Education, and Education. The orientation program began with a tour of the Lac du Flambeau museum to provide an understanding of Ojibwe history and culture. The tour was followed by a discussion of family and child needs in the community to provide further context for student experiences. In addition, specific discussions were held to help students learn about the history and focus of Headstart and strategies for designing and implementing instructional lessons for the children. Finally, students toured Headstart, Lac du Flambeau school, Peter Christiansen Health Center, the Family Resource Center, and the Youth Center to see the facilities and to meet the staff they would be working with during their second trip after the orientation.

Laura A. Parker , Linda Arrowood, Tracey Busch, Joseph Cermak, Carey Farmer, Rebecca Holtz, Zena Olsen, Kristy Osborne, Polly Scholze, Jon Scmitz

Faculty Advisor/Collaborator: **William Frankenberger**
Professionals' Attitudes, Knowledge and Experience Regarding the Use of Stimulant Medication for the Treatment of Attention-Deficit / Hyperactivity Disorder

The intent of this study is to identify school nurses', school psychologists', special and general educators', and speech and language pathologists' (SLPs) attitudes, knowledge and experience regarding the use of stimulant medication for the treatment of Attention-Deficit/Hyperactivity Disorder. A random sample of 400 school psychologists, 400 teachers, 400 SLPs, and all school nurses in Wisconsin were surveyed. The return rate ranged from 30% to 52%. The data was entered and is being analyzed. The results of this study will compare the attitudes, knowledge and experiences of the various disciplines and will be presented on our poster. This collaborative effort has been funded by a National Conference on Undergraduate Research/Lancy Foundation Grant.

Laura Parker, Joseph Cermak, Carey Farmer

Faculty Advisor/Collaborator: **William Frankenberger**
School Psychologists' Attitudes and Knowledge Regarding the Use of Stimulant Medication for the Treatment of Attention-Deficit/Hyperactivity Disorder

The intent of this study is to identify school psychologists' attitudes, knowledge and experience regarding the use of stimulant medication for the treatment of Attention-Deficit/Hyperactivity Disorder. The researchers surveyed a random sample of school psychologists from the United States, and from the state of Wisconsin. Fifty-two percent of the Wisconsin surveys and 45% of the National surveys have been completed and returned. We are now in the process of entering and analyzing the data. The results of this study will compare the attitudes and knowledge of school psychologists to those of speech-language pathologists, school nurses, and special education teachers. Further, the authors intend to assess school psychologists' role in the diagnosis of Attention-Deficit/Hyperactivity Disorder, and the follow-up of students treated with stimulant medication. The results of this current study will be presented on the poster. This collaborative effort has been funded by a National Conference on Undergraduate Research/Lancy Foundation grant.

Kinesiology & Athletics

Katie Berglund, Jennifer Klobassa, Jennifer Wagner
Faculty Advisor/Collaborator: **Toni Poll-Sorensen**
The Book of Ruth

"The Book of Ruth" is a student/faculty collaborative research project designed to promote awareness of domestic violence through the medium of movement. Student researchers prepared a 45-minute dance concert based on the novel, "Book of Ruth," by Jane Hamilton. The concert was presented as a benefit concert for Bolton Refuge House and The Bridge to Hope (Menomonie, WI) to promote awareness and raise money for their cause. The researchers also created a series of twelve lesson plans (lecture and laboratory) that constitute a movement-based curriculum. The concert and curriculum were combined to teach area-wide high school students about domestic violence and the art of movement. Researchers presented 9-12 grade students with a pretest that measured attitudes and knowledge of domestic violence. High school teachers and student researchers were responsible for delivering the movement intervention. At the completion of the project, students took a posttest to assess the effectiveness of the intervention. The curriculum was used at North High School in Eau Claire.

Shane Smith
Faculty Advisor/Collaborator: **Don Bredle**
The Effects of Cardiopulmonary Rehabilitation Participation on Long Term Positive Lifestyle Choices

Previous studies have shown variable success rates in the longterm follow-up of patients who have completed hospital cardiac rehabilitation programs. Our objective in this study is to determine the extent to which cardiopulmonary patients continue healthy lifestyle habits after a formal rehabilitation program. We will survey the patients by mail from a subject list compiled from the Luther Midelfort Hospital program. The focus is whether the recommended exercise has been maintained along with basic dietary and smoking recommendations. This study will assist Luther Hospital in their follow-up procedure, as well as the patients involved.

Management & Marketing

Lori Christians
Faculty Advisor/Collaborator: **Chuck Tomkovick**
Super Bowl Advertising Effectiveness in the 1990s

The Super Bowl is the biggest day of the year for American advertisers. Indeed it has become a pop culture event. In this study, the researchers track the amazing growth of Super Bowl

advertising in the 1990s and explain why national advertisers are willing to pay nearly two million dollars to run a 30 second ad during the game. Ads from Super Bowl games broadcast during the 1990s are categorized and subsequently reviewed. The study then goes on to examine Super Bowl advertising effectiveness by analyzing one particular product category, Hollywood movies. When revenues generated by these movies are compared with the promotion costs associated with Super Bowl advertising, it is apparent that Super Bowl ad investments have helped Hollywood studios successfully market their films, particularly in recent years.

Elizabeth A. Gardner

Faculty Advisor/Collaborator: **Rama Yelkur**

An Assessment of the Effectiveness of the Federal Trade Commission in Limiting Unfair Marketing Practices

The purpose of this study is to assess the effectiveness of the Federal Trade Commission (FTC) in limiting deceptive marketing practices by U.S. businesses. In specific, we will focus on the cases that fell under FTC's jurisdiction for deceptive advertising or deceptive labeling over the last ten years to determine the impact of the FTC in reducing unfair marketing practices. We will use historical data to examine all the cases that came under the scrutiny of the FTC from 1990-1999 for either deceptive advertising or labeling to determine (1) the product categories these cases fell in (2) the impact on the companies that were prosecuted (or the settlement/agreement) and (3) any additional actions taken by the FTC.

Nancy Holm

Faculty Advisor/Collaborator: **Rama Yelkur**

Impact of NAFTA on US Business

The project consists of many different stages with the first being an in depth literature review. Information was collected through database searches of past and current journal articles, government publications, and various internet sources. The information found through this search was used to determine which industries have been affected the most by the changes incurred by the implementation of NAFTA. After identifying these industries further research was done on these specific industries which included agriculture, computer equipment, automobiles, auto parts, telecommunications, textiles, and apparel. The next stage was a collection of secondary data, namely statistics produced by various governmental agencies. This information was obtained by internet searches of sights put out by these agencies and also direct contact with persons employed by these agencies. I collected data about the trade of the various industries between the US, Canada, and Mexico from the last ten years (1989-1998). I also gathered information concerning the wage levels, unemployment rates, and production levels of these industries from the same years. The data has been sorted, analyzed and made in to graphs in order to give a clearer picture of the situation. Dr. Yelkur and I are now working on refining the details and presenting our findings.

 **Mathematics**

Malinda Eichelberger, Molly White, Elizabeth Whitney

Faculty Advisors/Collaborators: **Shyam Chadha** and **Veena Chadha**

Inventory Model for Car Dealership

In this fast-paced business economy, the optimization of inventory levels is essential. By asking questions and collecting hard data, one can determine the optimal inventory level of a company by a simple mathematical model. We wanted to find a local car dealership that would allow us to use their data to construct such a model. The car dealership collaborating in our research is Ken Vance Motors, Inc. of Eau Claire. In our research, we will be using an economics order quantity (EOQ) model to determine the optimum inventory level for one type of automobile. We will have

an answer/question session with Jason Vance and David Klinkhammer to assign parameters. The parameters will be used to construct the EOQ model. We will then use the model to conclude how many cars Ken Vance Motors, Inc. should order and when to order those cars. The poster will discuss our procedure, model and findings.

Nursing Systems

Sarah Dresang, Kris Vetsch

Faculty Advisor/Collaborator: **Cathy Cooper**

Student Nurses' Inferences of Patient Suffering

Suffering is one of life's most common and universal experiences and is defined for this project as physical pain and psychological distress. In clinical practice, nurses encounter patients who are suffering in various ways. Helping alleviate patient suffering is an essential component of professional nursing practice. First, nurses must recognize the assessment of suffering is a complex inferential process that depends on multiple underlying assumptions concerning how suffering is typically manifested. Just as patients' perceptions and manifestations of suffering are influenced by psycho-social factors, nurses' inferences of patient suffering are influenced by their own characteristics and acquired beliefs (Johnson, 1977). The purpose of this project is to conduct a pilot study of baccalaureate student nurses' inferences of patient suffering using the "Standard Measure of Inferences of Suffering Questionnaire" (Davitz & Davitz, 1981). Questionnaire data will be analyzed using descriptive and inferential statistics. Socio-demographic data will be summarized using descriptive statistics. On-going research is needed to build the knowledge base regarding how to optimally educate nurses to assess and intervene to relieve patient suffering.

Josephine M. Arriola, Linda Huelsbeck

Faculty Advisor/Collaborator: **Marjorie Oleson**

Enhancing Registered Nurses' Spiritual Care of Patients and Families

Nurses have traditionally used a holistic approach to providing care, including recognition of the importance of addressing the spiritual needs of patients and families challenged by health problems. However, nurses have also expressed anxiety and concern when dealing with persons' spiritual needs. The purpose of this descriptive, quasi-experimental study was to a) explore registered nurses' (RNs') perspectives of spiritual care of patients and families, and b) determine the effectiveness of an in service program designed to enhance RNs' knowledge of and attitude toward addressing patients' and families' spiritual needs. Nine RNs from northern Wisconsin attended a three-hour spiritual nursing care inservice program conducted by the graduate student researcher. Participants responded to pre- and post-program questionnaires and a sociodemographic questionnaire. Response data were analyzed using descriptive and inferential statistics and content analysis methods. Compared to pre-program, after the program, participants reported an increase in their knowledge regarding spiritual nursing care and in their willingness to intervene to help meet persons' spiritual needs. Continuing education programs such as the one in this study may be a means of enhancing nurses' ability to assess and intervene to help achieve the outcome of meeting patients' and families' spiritual needs.

Psychology

Aubrey Drew

Faculty Advisor/Collaborator: **Kimberly Knesting**

Violence Prevention & Crisis Intervention: Training Issues for School Psychologists

As the profession of school psychology continues to expand its role in schools through the provision of services in addition to their traditional assessments, school psychologists are playing an increasingly active role in assuring students a safe school experience (Morrison, Furlong, & Morrison, 1994). Yet, because this area is outside of the traditional domain of school psychology training, school psychologists often feel unprepared to develop and implement crisis prevention and intervention strategies in their schools (Poland et al., 1995; Smead, 1985). While the need for additional training on the part of practitioners is being met by attendance at workshops, symposiums, and conference presentations (Poland et al., 1995), no attention has been given in the current literature regarding the training provided to future practitioners in their graduate school programs. This research project developed a survey to gather this information and initiate a dialogue on best practices in training school psychologists to provide violence prevention and crisis intervention services in our schools. Surveys were sent to the program directors of the 127 specialist and/or doctoral level training programs in the United States which are accredited by the National Association of School Psychologists (NASP). Survey responses will describe the type of training being provided, perceptions of the quality of this training, and perceptions of the need for additional training. along with potential roadblocks to implementing program changes.

Special Education

Linda Arrowood, Tracey Busch

Faculty Advisor / Collaborator: **Vicki Snider**

Teachers' Knowledge and Beliefs Regarding the Use of Stimulant Medication for Treatment of Students with ADHD

The purpose of this study was to identify special and general educator's knowledge, opinion, and experience regarding the use of stimulant medication for the treatment of Attention-Deficit/Hyperactivity Disorder (AD/HD). A random sample of 200 special and 200 general educators from Wisconsin were surveyed. Forty-three percent of the special education and 30% of the general education surveys were completed and returned. Results indicated that teachers did not know the answers to factual questions about AD/HD. Their opinions about the effect of stimulant medication on students' behavior were generally positive, although special education teachers had a more positive response on some items than general educators. Special educators tended to be more involved in the referral and diagnosis of AD/HD, and 67% of the respondents indicated that teachers recommend children for assessment of AD/HD more often than other professionals. This project is one component of a larger interdisciplinary study funded by a National Conference on Undergraduate Research/Lancy Foundation grant.

Natural and Physical Sciences

Biology

Matthew Allen, Craig Miesbauer

Faculty Advisors/Collaborators: **Paula Kleintjes** and **David Lonzarich**

A comparison of foraging behavior between initial and terminal phase stoplight parrotfish, Sparisoma viride, San Salvador, Bahamas

We observed the foraging behaviors of initial and terminal phase stoplight parrotfish, *Sparisoma viride*, on two coral reefs off San Salvador Island, Bahamas (January 2000). Our hypothesis was that initial and terminal phase fish would forage on different species of coral or algae. We were interested in whether potential differences in foraging substrate preference might indicate partitioning of resources within the observed population. We collected observations by snorkeling. Once a fish was found, we waited one minute before recording data to allow the fish to adjust to our presence. We then recorded variables associated with the first foraging act of the fish. These

included the species of coral or algae foraged upon, the angle of attack, the number of bites and the depth of the fish from the ocean floor. Observations were alternated between initial and terminal phases for each sample. Our results indicate that white scroll algae, *Padina jamaicensis*, was the most common foraging substrate for both phases. There was no difference in foraging behavior between the two phases.

Heidi Bergstrom, Aaron Emerson, Michael Johansen

Faculty Advisors/Collaborators: **Daniel Janik** and **Daniel Conklin**

Role of M1-muscarinic receptors in the isolated crop-gizzard of the earthworm

The crop-gizzard of the earthworm *Lumbricus terrestris* contracts rhythmically about four to six times per minute. We are trying to understand how this rhythmic process is regulated. The neurotransmitter acetylcholine (ACh) stimulates increases in both the rate and strength of contraction. Previous work has shown that ACh acts through a particular type of receptor called a cholinergic receptor. Cholinergic receptors are divided into five known subtypes that have been characterized in mammalian tissues: M1, M2, M3, M4, and M5. We asked which subtype of receptor mediates the effect of ACh on the crop-gizzard. Because M1 receptors are often found in muscle tissue, we focused on these. We applied McN-A-343, a drug that mimics the effect of ACh at M1 receptors. At concentrations of 10^{-9} to 10^{-3} molar it had no effect on either the rate or the strength of contraction. However, pretreatment with pirenzepine (10^{-6} molar), a drug that block M1 receptors, significantly reduced the effects of ACh (10^{-8} M) on rate and strength of contraction. Our results suggest that the cholinergic receptors found in the earthworm crop-gizzard have some properties of M1 muscarinic receptors characterized in mammalian tissues, but may not be the same.

Valerie Boyarski, Julie Christian, Katie Ditter

Faculty Advisors/Collaborators: **David Lonzarich** and **Paula Kleintjes**

Characteristics of Thalassoma bifasciatum harems on coral reefs of San Salvador, Bahamas

We observed the harem behaviors of the terminal male bluehead wrasse, *Thalassoma bifasciatum*, and their harems on coral reef and sand flat habitats of San Salvador, Bahamas (January 2000). We hypothesized intra and interspecific interactions would be greater on the reef due to its greater structural complexity and species richness while territory size would be smaller. We collected observations by snorkeling in teams of two or more observers per recording period. Once we located a terminal male and his harem we counted all his interactions with harem members and other species for total of ten minutes. We also counted the total number of intermediate blueheads in each harem and measured the approximate size of the harem area as denoted by the males' defensive behavior. Our results indicate that males spent a greater percentage of our mean observation time in interspecific interactions on the reef and a greater percentage of intraspecific interactions on the flats. Harem size was greater on the sand flats. Territory size was larger on the reef than on the flats. This study suggests that the loss of coral reefs and the structure they provide may affect bluehead wrasse behavior and survival.

Angie Bressler, Aarika Gearing, Jenny Meisel

Faculty Advisors/Collaborators: **Paula Kleintjes** and **Dave Lonzarich**

Invertebrate Distribution Along an Intertidal Gradient at Dump Reef, San Salvador, Bahamas

During January 2000, the distribution of invertebrate species along an intertidal gradient was studied at Dump reef, San Salvador. A randomized quadrat sampling method was used to count numbers of periwinkles (*Tectarius muricatus*, and *Nodilittorina tuberculata*), fuzzy chitons (*Acanthopleura granulata*), checkered nerites (*Nerita tessellata*), four tooth nerites (*Nerita versicolor*), and bleeding tooth nerites (*Nerita peloronta*) inhabiting tidepools along an upslope gradient originating from the low tide line. Data was collected along seven 50 meter transects that ran parallel to the shoreline at four meter intervals. Each transect consisted of ten 50cm² quadrat samples, located approximately three meters apart. For each sample the number of each species

was counted, the shell size of each nerite was determined, and the percent water cover, water temperature, and maximum water depth was measured. Results indicate that species richness was greatest at intermediate levels of distance from the low tide line. Periwinkles were found at the highest point from low tide. The nerites were clumped at intermediate areas and some high areas, chitons were distributed at intermediate levels, and none of the species were found at or near the low tide line. Water depth was greatest near the low tide line, and temperature was the lowest at the low tide line.

Robert Busby, Aaron M. Broege

Faculty Advisor/Collaborator: **Jon Scales**

Isolation and Characterization of Cis-Regulatory Element of TCK

TCK is an Eph-family receptor tyrosine kinase (RTK). Eph RTKs are known to be involved in regulating cell-cell interactions during embryogenesis. Our goal is to study the function of TCK using transgenic frogs which either mis-express the receptor or express mutated forms of the receptor during embryogenesis. Over- or mis-expression will allow us to study the function of TCK in cells that do not normally express the receptor. Conversely, by expressing a mutant form of receptor at the times and places during embryogenesis when the wildtype, endogenous gene is also being expressed, we can effectively inactivate the normal one. To successfully accomplish the latter line of investigation, we must place dominantnegative mutant versions of the receptor under the control of their homologous cis-regulatory sequences. The outcome of such manipulations would presumably be disruption in normal embryogenesis patterns. Our first step in this long range goal is to obtain the cis-regulatory sequences controlling the TCK gene. The six genomic clones we have so far isolated are being characterized by restriction mapping and DNA sequencing. Upon completion of this initial stage of characterization, we will generate the necessary expression constructs to begin our transgenic expression analysis

Ted M. Cummings

Faculty Advisor/Collaborator: **David Lonzarich**

A Fish Survey of the Proposed Lower Chippewa River State Natural Area

As part of a larger collaboration with state agency personnel, we conducted baseline fish surveys in a segment of the lower Chippewa River located in the proposed Lower Chippewa River State Natural Area (LCRSNA). The general focus of the study was to describe the structure of fish communities in waters surrounding Pasture Island. An important secondary goal was to determine the status of 13 state-listed rare species known to occur in this part of the drainage. With the aid of a newly purchased Zodiac (funded through UWEC Office of University Research), we sampled backwaters and main-channel habitats of the Chippewa River, and lower sections of nearby tributaries. This project was motivated in part by the alarming lack of knowledge on fishes, especially the rare species, in the Lower Chippewa River. Our goal is to begin the process of building a base of knowledge that will help to protect, within this area, hotspots of diversity and habitats important to the preservation of rare fishes at risk to extinction.

Katherine Hawkins

Faculty Advisor/Collaborator: **Evan Weiher**

Can large-scale Floristic Surveys be used to Predict Vascular Plant Biodiversity in Eastern North America?

In order to build a predictive model of vascular plant biodiversity, we have been collecting data from large-scale floristic surveys from areas east of the Rocky Mountains, representing as many different areas as possible. From each study we recorded the total area surveyed, longitude, latitude, and total vascular plant species found (S). We are currently collecting additional information on human population density and evapotranspiration. We used multiple linear regression in SPSS to model plant biodiversity as a function of the independent variables. A preliminary model, based on just 34 data points, explained 77.4% of the variation in species

richness (S). The equation was: $\log S = 3.75 + 0.158\log(\text{Area}) - .0136(\text{Latitude}) - .00868(\text{Longitude})$. Generally, as area increases so does species richness. As latitude and longitude decrease, species richness increases. This is consistent with the expected trend that richness increases to the south and east (lower latitude and longitude values), correlating with higher temperatures and precipitation. To our knowledge, this is the first large-scale model that accurately predicts vascular plant biodiversity.

David Heitmann, Michele Shaw

Faculty Advisor/Collaborator: **Christy Carello**

Biomechanics and Energetics of Uphill Running in Button Quail

The objective of our research is to understand the biomechanical reasons for the increase in the energetic cost of running on an incline. We will compare our results from small Button Quail (*Coturnix chinensis*) to larger bipeds, humans. We will accomplish this by analyzing the energetic cost of the quail running on an incline and a level surface. We will use an oxygen analyzer to determine how much oxygen the bird is using. Energetic cost, can then be calculated from oxygen consumption. We will then film the quail using a high-speed digital camera. The digitized images will be used to characterize the motion of the limbs. From this motion we will be able to quantify the potential for elastic energy storage. By understanding how the energetic cost is affected by the biomechanics of locomotion we will then be able to explain how energy was spent during running on the incline and level surface. We hypothesize that there will be a decrease in elastic energy storage capacity in the muscles and tendons of running quail as the treadmill is positioned on a steeper incline. This decrease in elastic energy storage will result in a increase in energetic cost for locomotion. This research will help us to understand the partitioning of energy expenditure of quail in the wild and may also contribute to the development of more efficient prostheses in humans.

Andy Hoenisch, Kathryn Schroeder

Faculty Advisor/Collaborator: **Daniel J. Conklin**

Shedding Some Light On Enzymes in Fish: Development of a Chemiluminescent Assay

The enzyme, semicarbazide-sensitive amine oxidase (SSAO; EC 1.4.3.6) is present in organisms from all five kingdoms, yet its function is unknown. The SSAO is plentiful in blood vessels, and is especially concentrated in the aorta of mammals and birds. We decided to determine if SSAO is also present in abundance in the cardiovascular system of a more basal vertebrate, the rainbow trout. The presence of SSAO in trout cardiovascular tissues (i.e., heart, blood vessels, and blood) would suggest SSAO has an important cardiovascular function in multiple vertebrate lineages. To measure SSAO activity in tissues, we developed a chemiluminescent assay for SSAO. We took advantage of the fact amine oxidase enzymes breakdown amines into equal amounts of an aldehyde, ammonia (NH₃), and hydrogen peroxide (H₂O₂). When H₂O₂ is bound to luminol in the presence of a catalyst, light is produced. Our preliminary findings suggest that: 1) the chemiluminescent assay can be used to detect SSAO in fish tissues, and 2) that rainbow trout possess SSAO in cardiovascular tissues.

Arno Lamm

Faculty Advisor/Collaborator: **Terry Balding**

Turtle Density and Community Composition in Selected Habitats of the Lower Chippewa River

This study was initiated because there have been no comprehensive surveys for turtles of the lower Chippewa River. A preliminary study was completed using twelve-foot long, double-throated hoop nets with three-inch stretch mesh; baited with various fish, clams, or chicken liver to lure the turtles. The preliminary study revealed nets should be set for nine days at a specific location, and spaced 300 yards apart. Using this information nets were set in a backwater or main river channel habitat. The trapping resulted in 172 turtles captured in the backwater and 48 in the

main river channel. The most numerous turtle was the Painted Turtle (*Chrysemys picta*), with 153 individuals captured.

Gina Liebsch, Dave Mans

Faculty Advisor/Collaborator: **Daniel J. Conklin**

Role of Reactive Oxygen Species in Amine-induced Blood Vessel Vasospasm

In a preliminary study, we showed that allylamine (AA), a cardiovascular toxin, induced vasospasm in isolated rat coronary artery and thoracic aorta. These data are the first to support a long-held hypothesis that AA causes myocardial necrosis via coronary artery vasospasm in vivo. We identified a two step process by which AA induces vasospasm in vitro: 1) AA is broken down by a blood vessel enzyme into acrolein, hydrogen peroxide (H₂O₂), and ammonia, and 2) the product(s) then injures the blood vessel causing vasospasm. To test which product is responsible for vasospasm, we assessed the role of two reactive oxygen species (ROS) in AA's vascular effects. First, we decreased or increased H₂O₂ levels in the isolated thoracic aorta by pretreatment with catalase or the catalase inhibitor, aminotriazole, respectively. Then, we tested whether the endothelial-derived ROS, nitric oxide (NO), was involved in AA effects by blocking NO formation. Our results suggest that, while ROS can modulate AA's vascular effects in vitro, acrolein appears to be the main culprit in inducing vasospasm.

Lindsay Pawluk, Chris Raebel

Faculty Advisor/Collaborator: **Paula Kleintjes**

Burning and Browsing: Effects on Butterfly Assemblages in Bandelier National Monument, New Mexico

The purpose of this study was to measure the response of butterfly assemblages to the effects of ungulate browsing and vegetation management in Bandelier National Monument (BAND), New Mexico. At BAND, studies have shown that overbrowsing of vegetation by elk is causing soil erosion and moisture loss, degrading archeological sites and inhibiting national fire regimes. We are using butterflies as indicator taxa for measuring how these changes and their management, are affecting biodiversity. We monitored adult butterflies in fenced ungulate exclosures (60x60m) and reference sites to measure their response to the absence of elk. These sites were replicated within three different types of habitat (pinyon-juniper woodlands, ponderosa pine grasslands, and mixed coniferous forests). In June of 1999, we found 10 species of butterflies in the pinyon-juniper woodland, 14 species in the ponderosa pine grassland, and 7 species in the mixed coniferous forests. Mean numbers of butterflies were significantly greater in the ponderosa grassland sites. Total number of species and mean number of species did not significantly differ between the exclosure and reference sites in all three habitats. These results are premature, given that the exclosures were established in 1998. We will continue studies in 2000 to examine the relationships between butterfly diversity and measurable changes in vegetation. This information will be used to establish a working knowledge of the diversity and species interactions of Lepidoptera in Bandelier, and to assist in the efforts to conserve and manage biodiversity in the great Bandelier-Jemez Mountain ecosystem.

Benjamin M. Schneeberger, Andrew Ehrhard

Faculty Advisor/Collaborator: **Daniel Janik**

Predictability of Exercised-Induced Circadian Clock Resetting in Hamsters

The circadian clock of a hamster can be reset if the animal exercises during its normal sleep period (during the day). We wanted to determine if exercise-induced clock resetting occurred in a reliable way in individual animals. Knowing this will allow us to select hamsters that undergo clock resetting so we can examine neural activity during clock resetting. We measured the clock resetting response of hamsters to exercise on two separate occasions under identical conditions, two weeks apart. Our results showed that a high percentage of hamsters that reset in response to exercise activity also reset following the second exercise pulse. In addition, we found that the

resetting responses of individuals were inversely correlated with body weight. The heavier an animal was, the less it exercised and the less likely it was to show clock resetting. Therefore, it may be possible predict whether a hamster will show exercise-induced resetting based on its past resetting responses or based on its body weight. Also, our data suggest the possibility of causal interaction between body weight, activity levels, and clock resetting.

Anissa Schryver, Allie Derrick

Faculty Advisor/Collaborator: **Jon Scales**

A Sticky Situation: The Role of Beta-Catenin in Cell Adhesion

During embryonic development regulation of cell adhesion is very important to cell migration and organization within the organism. Two proteins needed for cell adhesion are cadherin and catenin; these proteins are regulated by eph receptors and ephrin ligands. It is known that C-cadherin is involved, but the proteins associated with C-cadherin may also be important. Beta-catenin is one of these proteins. Our goal is to find out what, if any, role beta-catenin may be playing in mediated cell dissociation. Various engineered beta-catenin mutations have been made in an appropriate expression vector. These engineered vectors allow us to overexpress normal and mutant forms of beta-catenin in embryos during development. Test will be used to demonstrate how these constructs interact with Pag's regulation of cell adhesion.

Erin Shaw, Kyle Goepfert, Heidi Heizer

Faculty Advisors/Collaborators: **Paula Kleintjes and David Lonzarich**

A Comparison of Hermit Crab Density Between Two Different Intertidal Shorelines on San Salvador, Bahamas

We compared the density of hermit crab populations and empty shell availability between two different inter-tidal shorelines on San Salvador, Bahamas (January 2000). We hypothesized that Snap Shot Reef, located on the West side of the island would have more hermit crabs in inter-tidal pools compared to Dump Reef which was located on the North side of the Island. We collected data on the numbers of hermit crabs, snails and empty shells located along the shoreline during low tide at each site. Data was collected by counting the number of animals located within 50cm² quadrants (n=75) randomly placed along a 100m transect parallel to the shoreline. After compiling the data, we found that numbers of hermit crabs (n=889) were greater than snails (n=319) at Snap Shot Reef. We believe this was due, in part, to structural differences in the tidepools.

Regenia L. Smalley

Faculty Advisor/Collaborator: **Lloyd Turtinen**

Optimization of the Production, Purification, and Refolding of a Recombinant Viral Protein from a Bacterial Expression System

Our lab recently cloned the human cytomegalovirus gene, US29, in a bacterial expression vector. This US29 protein might be a tumor necrosis factor receptor (TNFR) and play an important role in the viral disease process. Because we made this recombinant protein in an unnatural bacterial expression system, we have explored conditions to express, purify, and refold this protein so we can determine if it is a TNFR. Bacteria grown in SOB medium were leaky and expressed this protein to nearly the same level whether IPTG inducer was added or not. Optimal conditions for expression were 5 hours at 35°C and 1mM IPTG. Optimal conditions for protein purification included sonication of bacterial cells in the presence of urea. Urea was an absolute requirement for binding of the US29 to a nickel affinity purification column. Removal of bound protein was successful with 100mM imidazole at pH 8.0 and yielded a fairly pure 30 kD protein. Various methods for refolding the US29 protein into its native or natural structure were tried. The ability of these refolded protein preparations to bind tumor necrosis factor in an enzyme linked immunosorbent assay are compared and discussed with regard to the possible biological role of US29.

Tony Swenson

Faculty Advisor/Collaborator: **Evan Weiher**

Nellie: An Ecological Null Model

Ecological null models are used to test for novel patterns in ecological communities. They use Monte Carlo statistical methods to compute the statistical probability that an observed ecological pattern is different from what would be expected from chance. We built a user-friendly windows-based null model for the pc. The program imports data as text files, allows for text editing, computes a battery of test statistics, outputs these statistics, and computes probabilities for the test statistics. The program allows the user to choose from several matrix randomization options for computing statistical probabilities. One of these methods (the checkerboard swap) was faster and more reliable than the others, including a new method developed for this program. The program will be made available on the www as a downloadable zip file. The use of ecological null models has largely been restricted because there was no easy and available software. This program will hopefully facilitate the use of these powerful tests.

Chemistry

Rachel M. Anderson, Pepè S. Maley

Faculty Advisor/Collaborator: **David E. Lewis**

Homoacyloin Cyclizations of Conjugated Carbonyl Compounds

The synthesis of C2-symmetric vanillin-based dialdehydes has been carried out in typical yields of 50-70% by the Williamson reaction between vanillin and a dibromide in acetone using potassium carbonate as base. Conversion of these dialdehydes to C2-symmetric cinnamic acid derivatives has been accomplished using the Knoevenagel condensation, heating the dialdehydes with malonic acid in pyridine with piperidine as catalyst. These highly insoluble products have been difficult to characterize. We have therefore begun work to develop syntheses of alternative cinnamic acid derivatives with more tractable solubility characteristics. The corresponding α -cyanocinnamalitriles, which are obtained as yellow solids by Knoevenagel condensation of the dialdehydes with malonitrile using ammonium acetate and acetic acid as catalysts, have proved to be much more tractable compounds. The synthesis of these compounds will be presented, and progress towards elucidating their chemistry will be discussed.

Lon T. Foree, Hilary Preis, Katie Kindt, Angela Scott, Emily Bauer

Faculty Advisor/Collaborator: **Scott Hartsel**

Differences in Activity and Serum Distribution of Heat Treated Fungizone

Amphotericin B is formulated as Fungizone, an antifungal agent used in treating systemic fungal infections. Fungal infections are often life threatening to immune compromised persons such as cancer and AIDS patients. The high toxicity of Fungizone often precludes its use, but with mild heat treating (70_C for 20 min) it develops dramatically reduced side effects. Bolard and Gaboriau have recently shown that heat-treated Fungizone has a higher therapeutic index in animal disease models. The reduction in toxicity is comparable to more expensive liposomal modifications. In the presence of Human Serum Albumin (HSA), Fungizone is rapidly destabilized to the protein-bound monomeric form whereas heat-treated Fungizone persists longer in a non-toxic aggregate form. In human plasma distribution studies, Amphotericin from Fungizone was found in significantly greater amounts in LDL (low density lipoproteins) as compared to heat-treated Fungizone. Association with LDL has been associated with higher toxicity. Heat-treated Fungizone is less active against model mammalian membranes but equally effective against model fungal membranes. In addition heat-treated Fungizone induces a smaller TNF-alpha response in cultured monocytes. These findings suggest that heat-treating Fungizone may directly and indirectly reduce toxicity in mammalian systems.

Lon T. Foree, Hilary Preis, Katie Kindt, Angela Scott, Emily Bauer

Faculty Advisor/Collaborator: **Scott Hartsel**

Evidence for a Stable and Beneficial Fungizone Preparation

Fungizone, a formulation of Amphotericin B, is an antifungal agent used in treating systemic fungal infections. AIDS and cancer patients often contract serious fungal infections but the high toxicity of Fungizone often precludes its use. When treated by mild heating (70_C for 20 minutes) Fungizone develops drastically reduced side effects similar to expensive new liposomal Amphotericin formulations such as Abelcet. Fungizone and heat-treated Fungizone exhibit different absorption and circular dichroism (CD) spectra. The distinct spectra suggest that heat-treated Fungizone has a new and different supramolecular structure. The focus of the study is to demonstrate that the new spectral features are not due to heat-induced chemical structure changes, but in fact reflect a stable new complex. Lyophilization and reconstitution and heat-treated Fungizone show that the unique CD spectrum of this form is persistent. Absorption spectra and HPLC demonstrate that there is no chemical degradation. These and other studies indicate that the heat-treated Fungizone may be a less toxic, equally effective and economical alternative to Fungizone and costly new drug preparations. Due to the ease of preparation, this drug may be especially attractive for treatment of AIDS patients in third world countries where liposomal preparations are unavailable.

Nicholas Gagnon

Faculty Advisor/Collaborator: **Stephen Drucker**

Assembly of a High-Resolution Laser Spectrometer

We have assembled a high-resolution laser spectrometer to be used for investigating photochemical properties of gas-phase molecules. The main component of the spectrometer is a dye laser (commercially obtained) which produces light in the 400-800 nm wavelength region with 0.002 nm or better resolution. The laser light has continuously tuneable wavelength over its working range. The dye laser is energized by a solid-state (Neodymium:YAG) laser (commercially obtained), which produces pulses of fixed-wavelength light at a rate of 10 Hz. The pulsed mode of operation permits very high peak powers (5 MW) in the tuneable dye laser output. The spectrometer has been equipped with a sample handling system and cell, and a computer-interfaced light detection system consisting of a photodiode and gated integrator. The spectrometer will be used to record absorption spectra of molecules. In these experiments, the laser light passes through the sample cell and then strikes the photodetector. The wavelength is varied while the photodetector signal is monitored. If the molecules absorb light at a certain wavelength, a diminished photodetector signal is recorded. The absorption wavelengths are analyzed by standard techniques to extract structural and dynamical properties of the molecule. We have tested the spectrometer by recording an absorption spectrum of iodine vapor near 560 nm. The observed spectrum agrees precisely with the standard reference atlas of iodine absorption wavelengths.

Erin Christine Gannon, Stacy L. Burich

Faculty Advisor/Collaborator: **Thao Yang**

RGD Peptide Synthesis

The RGD-peptide is a peptide fragment derived from a region of several types of extracellular matrix proteins, which contain the amino acid sequence Arginine-Glycine-Aspartate, or RGD for single amino acid symbols. The triplet sequence RGD is common in several extracellular matrix proteins such as, fibronectin, laminin, vitronectin, collagen and others. The native RGD-peptide found in fibronectin has the amino acid sequence Tyr-Gly-Arg-Gly-Asp-Ser-Pro. The amino acid sequence RGD was found to be an important recognition site for specific binding to a group of extracellular matrix protein receptors, integrins. The RGD sequence on extracellular matrix proteins are involved in important molecular interactions which are responsible for cell-to-cell adhesion, cell growth, cell shape, cell motility, and cell-to-extracellular matrix anchorage. Short

RGD-peptides are competitive inhibitors against the interactions between extracellular matrix proteins and integrins, which imply that they might have potential clinical values. This presentation will focus on the synthesis of a few RGD-peptides via the Solid Phase Peptide Synthesis Method using the Automatic PS3 Peptide Synthesizer, the purifications and characterizations of the peptides by a variety of techniques such as HPLC, NMR and Mass Spectrometry.

Collin Hagen, Monica Cea Plaza

Faculty Advisor/Collaborator: **Jason Halfen**

Copper-catalyzed Aziridination of Olefins by PhINTs: Synthetic and Mechanistic Studies

Metal catalyzed aziridinations of olefins by iminoiodinanes are becoming viable, single-step synthetic alternatives to traditional, multi-step routes to aziridines. Widespread application of this methodology will rely upon the development of new, highly selective and efficient aziridination catalysts. We recently prepared $[\text{LiPr}_3\text{Cu}(\text{O}_2\text{CCF}_3)_2]$ (below, $\text{LiPr}_3 = 1,4,7\text{-triisopropyl-}1,4,7\text{-triazacyclononane}$) and have found this new complex to be ten times more efficient than other reported copper-based catalysts, such that only 0.5 mol% catalyst is required to effect the quantitative aziridination of styrene by PhINTs in 18h. Reactivity studies have revealed broad substrate tolerance for this catalyst, and preliminary mechanistic investigations suggest a non-concerted mechanism for the aziridination reaction. Several additional new catalysts have been prepared, including $[(\text{py}_2\text{DACO})\text{Cu}](\text{ClO}_4)_2$ (below, $\text{py}_2\text{DACO} = \text{N,N}'\text{-bis}(2\text{-pyridylmethyl})\text{diazacyclooctane}$), and the efficacy of these complexes to catalyze the aziridination of styrene by PhINTs has been examined. Reactivity studies and mechanistic investigations using these and other copper-based aziridination catalysts will be discussed.

Andrea Halberg

Faculty Advisor/Collaborator: **Phil Chenier**

Second Top 50 Chemicals

Many industrial chemistry texts treat the manufacture and uses of the top 50 industrial chemicals, and some general chemistry texts include sections or supplementary readings on these chemicals. In 1988 we made the first attempt at developing a list of the second 50 chemicals arranged by U. S. production. It contains very interesting chemistry and can bring out many instructive features on the day-to-day importance of chemistry. The present paper updates this second 50 chemicals list and comments on trends of the last few years. A section on manufacture and uses of the new chemicals is included.

DeWayne T. Halfen

Faculty Advisor/Collaborator: **Jack R. Pladziewicz**

Electron Transfer Reorganization Energy For $[\text{CoW}_{12}\text{O}_{40}]^{5/-6}$

The chemistry of $[\text{CoW}_{12}\text{O}_{40}]^{5/-6}$ (hereafter $\text{CoW}^{5/-6}$) and related polyoxometalate (POM) anions have been the subject of recent extensive reviews. Weinstock's review (*Chem. Rev.* 1998, 98, 113) focused on $\text{CoW}^{5/-6}$ and the importance of its electron transfer reorganization energy, I . Interest in $\text{CoW}^{5/-6}$ is high because of its extensive use as an outer-sphere electron transfer probe, and the capacity of $\text{CoW}^{5/-6}$ to oxidize numerous organic molecules at significant rates. Its catalytic oxidation cycles utilizing oxygen show its potential as a replacement for chlorine as the bleaching agent in the paper pulping industry. However, there is a real dilemma in interpreting reactions of $\text{CoW}^{5/-6}$ that results in significant uncertainty for its reorganization energy and the related self-exchange rate constant. We have developed a database of 45 compounds of exceptionally wide reactivity and redox potential that can be used to determine I for new systems. This poster will report our results in the application of this database to the determination of I for $\text{CoW}^{5/-6}$.

Kristofer Lange, Keetra PleggeFaculty Advisor/Collaborator: **James Phillips***Spectral Intensities for OH Vibrational Bands: Fundamentals and Overtones*

Integrated absorption intensities of OH stretching bands, from the fundamental through the third overtone, have been measured for vapor-phase methanol, ethanol, isopropanol, n-propanol, 1,1,1-trifluoroethanol, tertiary butanol, and nitric acid. Several trends apparent in these data will be presented. For example, the fundamental OH band intensities are much more consistent than those in CH containing molecules. Furthermore, the overtone intensities are even more consistent, and appear to be essentially identical for the second overtone, at least among the compounds examined thus far. We have extracted dipole moment functions (bond polarity as a function of distance) from models of the intensity data, and these results will be compared to those obtained from purely computational approaches (molecular orbital calculations).

Jami RadlFaculty Advisor/Collaborator: **Marc McEllistrem***Does InN protect the GaN surface?*

We are interested in the chemistry of gallium nitride (GaN), a material pioneered by Nichia Chemical and others in fabricating laser diodes and light-emitting diodes, and which show promise for greater data storage density for compact discs, improved fiber-optic communication and finer resolution laser printing. The research required to study the surface chemistry of GaN requires that the sample surface be well ordered and clean. The problem is that once the material is exposed to air it becomes contaminated and surface order is lost as the atoms rearrange into clusters. The goal of our research is to find a way to protect the GaN surface upon being exposed to air. Our group has chosen a method called capping that has previously been successful in protecting other III-V semiconductors. An Indium Nitride (InN) cap is deposited on the GaN surface and later evaporated away to expose the clean, ordered surface. We are presently investigating if InN will serve as an acceptable capping agent, by analyzing the GaN surface composition after removing the cap.

Anthony RatkovichFaculty Advisor / Collaborator: **Marcus McEllistrem***Gallium Nitride Surface Chemistry: Reactions with Bromine*

Semiconductors are used in a variety of applications, from microelectronics to light-emitting diodes. Gallium nitride (GaN) is a semiconductor that has received much recent attention because it emits blue or violet light. This property of GaN is unique, since most semiconductors emit red or yellow light. In addition to providing a color not normally available, the shorter wavelength of blue light offers the possibility of improving technologies such as CD players, fiber optics and laser printers, which currently rely on red or infrared light to operate. Transferring technological know-how from the research lab to the market place is a long process. GaN-based devices would find ready markets, but these devices are in their infancy. One limitation imposed on current devices arises from the poor crystalline quality of GaN, which in turn is controlled by GaN film growth. Our goal is to better understand the chemistry occurring during GaN growth and how to protect GaN that is exposed to the atmosphere. One specific area of interest involves surface reactions of GaN with molecular bromine. Our motivation behind this experiment is to determine if etching the GaN surface with bromine removes contaminants, such as oxygen and carbon, from the surface. We are studying the GaN-bromine reaction by following the desorption of reaction products from the GaN surface using a mass spectrometer, and by analyzing the surface composition before and after reaction.

Catherine L. RenishFaculty Advisor/Collaborator: **David E. Lewis***3,3-Diarylpropionic Acid Derivatives*

The synthesis of 3,3-diarylpropanoic acid derivatives by the Fossé reaction requires the availability of suitably substituted electron-rich benzhydrols. The synthesis of these benzhydrols by Grignard synthesis and by sequential Friedel-Crafts acylation and reduction is under active investigation at this time. We have carried out the synthesis of 4-methoxybenzhydrol by the Grignard reaction between p-anisaldehyde and phenylmagnesium bromide. Experimental problems with this reaction have led us to investigate alternative approaches to this and similar compounds. The use of the alkoxyphenylmagnesium halide and benzaldehyde may provide an alternative approach to this reaction. We have prepared resorcinol dibenzyl ether and have studied its bromination. An alternative approach involves the Friedel-Crafts acylation of phenols by benzoyl chloride under zinc chloride or aluminum chloride catalysis. Our progress in preparing electron-rich benzhydrols will be discussed.

Thomas D. Tysver, Steven P. Carlson

Faculty Advisor/Collaborator: **David E. Lewis**

Towards the Hexacyclic Nor-Diterpenoid Alkaloids: A/E/F Model Studies

In the early years of the last decade, U.S. and British patents were issued describing the use of the hexacyclic nor-diterpenoid alkaloids for the treatment of withdrawal syndrome in opiate addicts. These compounds are a class of complex natural products whose total synthesis has been accomplished only once – by a sequence requiring over 50 steps giving an overall yield of less than 0.1%. Our proposed approach is to assemble the A, E and F rings by an intramolecular phenol coupling — Michael addition strategy, and to follow this by closure of the B ring and annulation of the C and D rings. Our approach to the construction of the precursors will be discussed, and the efficacy and limitations of the methods for the synthesis of similar complex molecules will be assessed.

Jennifer L. Vanderpoel

Faculty Advisor/Collaborator: **Cheryl Muller**

Study of the Intermediates of the Swern Oxidation By Means of a Chiral Sulfoxide

The intermediates of the Swern reaction were studied by low temperature NMR, molecular modeling, and X-ray crystallography. The Swern reaction is used to oxidize primary and secondary alcohols to their corresponding aldehydes or ketones. The intermediate chlorosulfonium salt was generated by means of a sulfoxide and oxalyl chloride. Alcohols were added to the chlorosulfonium mixture to form the alkoxy-sulfonium salts. NMR was used to observe formation of the intermediates at low temperature, and to study the equilibrium ratio of alkoxy-sulfonium salts where two alcohols were present. Integration of the NMR spectra showed that the equilibrium slightly favored the secondary alkoxy-sulfonium salts, which is in agreement with the DH calculations from Spartan for the alcohol/alkoxy-sulfonium exchange. X-ray crystallography was used to determine the alkoxy-sulfonium salt's structure and this was compared to structural predictions from Spartan. Generation of alkoxy-sulfonium salts from chiral sulfoxides showed that the sulfur had racemized by this step in the mechanism.

Nathan Wells, Theresa Hopp

Faculty Advisor/Collaborator: **James Phillips**

Shedding New Light on the Atmospheric Chemistry of SO₂ and SO₃: Photochemical Transformations of their Ammonia and Water Complexes

We are interested in new photochemical reactions involving H₂O-SO₃, H₂O-SO₂, H₃N-SO₃, H₃N-SO₂, and their potential impact on chemistry in the lower atmosphere. We will present some preliminary computational results aimed at gauging the concentration and distribution of these complexes in the atmosphere. We will also present solution-phase, UV absorption and fluorescence spectra of the ammonia complexes. While a solvent makes these data misleading as far as gas-phase, atmospheric chemistry is concerned, they do indicate that the complexes

are apt to absorb UV radiation. The fluorescence spectra display substantial solvent effects, and these reflect the sensitivity of the N-S bond to its chemical environment.

Kazuki Yoshioka

Faculty Advisor/Collaborator: **David E. Lewis**

A New Protecting Group for Alcohols and Phenols

The protection of reactive hydroxyl groups is an important part of many organic syntheses due to their potential for interference in the course of a wide variety of organic reactions. Of the common [protecting groups, the ethers offer the best stability, but are frequently difficult to use because the conditions required for their removal are vigorous enough to affect other functionality present in the molecule. Di-(1-naphthyl)methanol is reported to form ethers on heating with methanol and with phenol, and these ethers are formed under relatively mild conditions. We have investigated the synthesis and reactions of di-(1-naphthyl)methanol, and found them to be considerably more complex than the literature would suggest. The synthesis of the alcohol and the results of its reactions with other alcohols under a variety of conditions will be discussed.

Computer Science

Mike Betzel

Faculty Advisor/Collaborator: **Dan Stevenson**

Automated Separation of Layered Images

Many images found on the Web are "layered" images, composed of distinct layers of image data. For example, a particular image may consist of photographs, a solid border, and overlaid text. However, once these layers have been glued together and stored in JPEG format, they are not easily separable. The objective of this project is to find a way to separate Web JPEG images into their component layers. There are several major steps involved in this process. First, examples of layered images are gathered from the web to determine the types of layers found. Next, these layer types are analyzed to determine differences between them and determine which image processing methods will accurately separate them. Special attention is paid to using color histograms, size, and spatial information. These methods could then be implemented in a computer program that generates component layers for any JPEG image found on the Web.

Jared Heuschele

Faculty Advisor/Collaborator: **Andrew Phillips**

A Framework for Distributed Computation Over a Heterogeneous Beowulf Cluster

We present a problem independent "frameworks" software design that takes a description of some computational problem consisting of both the mathematical model and its data, and then performs the calculations in a distributed computing environment. The MPI standard for distributed computing over a network of heterogeneous workstations is used, but the software framework is fully application independent. Specific goals of the project were dynamic process control and load balancing and the development of a C++ object oriented framework that would take a description of the computational problem and its data and distribute the computations over a heterogeneous Beowulf cluster. That is, the distributed computing aspect of the calculation is completely separated from the problem and its description. We will demonstrate the success of the application framework for distributed computation, including dynamic load balancing and process management on a network of Linux and IRIX workstations, all in the context of a non-trivial application, namely the Protein Folding Problem.

Marcio Saban

Faculty Advisor/Collaborator: **Jack Tan**

Hybrid Mobile IP Consideration

The Mobile IP implementation considerations pose many challenges worth addressing. Implementing an object-oriented paradigm to the Mobile IP protocol allows maintainability for transparent routing of IP datagrams in the Internet. Regardless of its location every mobile node has a home address as an identifier. A care-of address is associated with every mobile node, while away from its home network giving information on its current location. The focus of this paper is on a methodology for obtaining a care-of address. Different methods based on care-of address acquisitions will be explored. Underlying this concept is a hybrid method. Finally some basic implementations and considerations along with algorithms are discussed.

Geography

Mark D. Aurit

Faculty Advisor/Collaborator: **Garry L. Running**

Using GPS, GIS, and Computer Cartography to Improve Archeological Site Mapping: A Case Study from Southwestern Manitoba

The purpose of this paper is to present research designed to determine if computer-generated topographic maps can replace hand-drafted maps generated by field archaeologists. Preparation of detailed topographic maps is a routine part of archaeological fieldwork in North America. Archeologists in the field survey points, and then maps are painstakingly hand-drafted in the laboratory "after the fact". Considerable time and effort better allocated to archaeological research is directed toward mapping production, and the maps are not available in a timely manner. We compared a hand-drafted topographic map with a computer-generated map. The computer-generated map was produced using Surfer. Map comparison was conducted in a GIS. Polygons of ".5 meter contour slices" were delineated from both maps, compared, and the percentage of polygon non-overlap was calculated. Though analysis is ongoing, the following can be reported: 1) computer-generated maps a far less time-consuming to produce; 2) archaeologists indicate both map adequately address their needs, but the hand-drafted map is more detailed; 3) discrepancies between maps do not reflect limitations inherent in computer cartography. Rather, they reveal a need for improvements in survey methods. We recommend: surveying more points, using more accurate range finders, and adding a GPS/GIS-trained geographer to archaeological research teams.

Valerie Boyarski , Mellina Hartnett, Jenny Meisel

Faculty Advisors/Collaborators: **Sean Hartnett**, and **Paula Kleintjes**, Biology

Mapping Winter Deer Habitat With GPS

This interdisciplinary project employs GPS technology to map deer habitat in the Lowes Creek Park. While radio-collars have been utilized to track deer movements, this methodology provides only 'ball-park' locations and is not effective for precisely locating deer habitat. Although it is not currently feasible to track individual deer with GPS collars, it is possible to use GPS to make very accurate maps of the network of deer tracks and activities. The methodology is quite simple – following a snowfall, student researchers would walk a GPS unit along the paths of recent deer tracks left in the snow. Paths are rated by the amount of deer traffic – from single tracks to heavily traveled 'deer interstates.' Other signs of deer activity such as browsing, watering, bedding, rutting, urination marks and scats are also located. The GPS data was exported to ArcView GIS and the trail networks were measured and appraised in respect to vegetation, topography, and proximity to streams. This trail and habitat information is then plotted on aerial photographs. This project brought together students from Biology and Psychology with little or no previous GPS experience, and demonstrates that GPS can be a valuable research tool to study deer behavior and habitat.

Angie BresslerFaculty Advisor/Collaborator: **Harry Jol***Vegetation Mapping and Geographic Information Systems: An Option for Mono Lake*

Vegetation maps play a very important role in real life applications. They can provide important indications of how plants respond to disturbances, act as a basis for studying succession, and help establish correlation between vegetation and other environmental influences. However, it is very important to have high quality, accurate, and easily understandable maps. The current vegetation maps for Mono Lake do not meet these criteria. This paper will examine the current vegetation at Mono Lake, provide an sample of ground truthing methods used for making vegetation maps using Rabbitbrush- *Chrysothamus nauseous* and Big Sagebrush-*Artemisia tridentata* as study species and explore how Geographic Information Systems techniques could be applied in creating vegetation maps for Mono Lake.

Bradley ChoppFaculty Advisor/Collaborator: **Harry Jol***GPS/GIS Data Integration for Lake Tahoe Area Data*

A geographic information system (GIS) is a tool that can be used for a variety of functions such as urban planning, forestry management, and site location. This study involved getting a real-life GIS project up and running in a field environment. The GIS platform used was ArcView version 3.1. The Lake Tahoe, Nevada area was used to collect the data. This area is generally considered one of the most beautiful and picturesque regions in the United States. It was formed millions of years ago when the last ice age swept through the western states. A global positioning system (GPS) was used with a Fujitsu 1200 Pen-Top computer to collect the data. Many different steps were performed to complete the study. First, the data had to be collected from an external source. Second, the data sets needed to be manipulated into a useable form. Third, the GPS collected the location data while we were in the Lake Tahoe region. And finally, the GPS data was integrated into ArcView. This study proved that gathering and interpreting geo-spatial data could be done more efficiently using a GIS, GPS and other technical equipment.

Brian Fuller, Colm O'Carrol, Joe StueckenFaculty Advisor/Collaborator: **Sean Hartnett***A Comparison of Bathymetric Mapping Techniques for Glacial Lakes and River Impoundments*

This project involved the production of two bathymetric maps -- a map of the Little Falls impoundment in Willow River State Park, and of Pine Lake in northern Chippewa County, home of UWEC's lake research station. The Willow River State Park project involves collaboration with Geography student Joe Steuken in the construction of an accurate lake map that can be used as a benchmark to gauge sedimentation associated with the removal of an upstream damn. The Pine Lake project involves collaboration with Biology students Colm O'Carrolin and Brian Fuller in the construction of a map of Pine Lake, a deep glacial lake located in a terminal moraine landscape. In combination, the two mapping projects illustrate how fundamental differences between fluvial and glacial lake structures, necessitates different strategies for the collection and interpolation of bathymetric data. Data collection for a lake survey involves the integration of GPS and sonar technologies that record lake depth at specific latitude/longitude positions. The next stage is the transformation (interpolation) of the point/depth data into linear depth contours. The final stage involves the preparation of a print quality map with lake depth data plotted over an aerial photograph.

Richard HagerFaculty Advisor/Collaborator: **Harry Jol***Bear Management in Yosemite National Park*

The long history of human-black bear interactions in Yosemite National Park (YNP) has compelled the National Park Service (NPS) to pursue a variety of management strategies to mitigate conflicts. A comprehensive human-bear management plan was enacted in 1975, but prior management or lack thereof, often resulted in an abundance of human food available to bears and numerous bears were killed in an effort to prevent damage and injuries. Present focus on proactive management strives to keep the many sources of food (garbage, campgrounds, backpackers, etc.) unavailable to bears through public education, facilities, and law enforcement. Reactive management in the form of capturing and relocating or killing aggressive bears is not recognized as a solution to the problem and has diminished in recent years. Recent high levels of bear incidents and damage, however, indicate that bears are still able to find much human food in developed areas despite extensive management efforts. Increased damage may also be the result of a reduction in the number of bears relocated or killed, but management efforts will continue to focus on closing "gaps" that allow bears to access to human food.

Rebecca Herriot

Faculty Advisor/Collaborator: **Harry M. Jol**

Desert Habitat: A Case Study

The Great Basin Desert is the largest North American desert, but it has the least amount of variety in habitat (Costello, 1972). The plants and animals that do survive here are plentiful because they have adapted to the arid and cold winter conditions (MacMahon, 1985). The Great Basin Desert also has a number of rivers and lakes which all have unique features. One hundred years ago, a movement known as reclamation, took place. Reclamation involved using the rivers and lakes to irrigate the land to be used for farming (www.gorp.com). The land farmed was habitat for a prolific species of sage, big sagebrush (*Artemisia tridentata*) (Smith et al. 1997). An understanding of *Artemisia tridentata* and its adaptations to the Great Basin are essential for learning more about desert ecology. This project specifically studied how the soil pH effects the distribution of *Artemisia tridentata*.

M. Brian Junck

Faculty Advisor/Collaborator: **Harry M. Jol**

Ground Penetrating Radar Investigation of an Eolian Sandstone Environment, Zion National Park

Ground penetrating radar (GPR) surveys were conducted in Zion National Park, Southwestern Utah. GPR is a relatively new geophysical field tool used to view near subsurface stratigraphy of geomorphic environments in a variety of settings. By shooting high frequency electromagnetic radar energy into the ground via transmitting and receiving antennae, subsurface profiles can be generated. The data collected is part of an ongoing project aimed at determining if GPR is an effective field technique for identifying the internal structure of aeolian environments. The research site is a lithified aeolian dune complex within the Navajo Sandstone consisting of three separate foreset packages stacked one atop another. Multiple GPR frequencies ranging from 50 MHz to 900 MHz were used to collect datasets. The GPR data was collected along a single 30 meter transect oriented parallel to the dip of the foreset beds. As well, a 200 MHz high-resolution grid was collected to provide a 3-D perspective. Radar stratigraphic analysis was used to compare and contrast the reflection patterns from the multiple frequencies. Results show continuous, dipping reflections of the dune bedsets (dm-cm scale) with greater resolution correlated with higher frequency antennae. Conversely, when the lower frequencies were used, up to 4 dune (foreset) packages were imaged - one more below those exposed.

Nichole B. Kloehn

Faculty Advisor/Collaborator: **Harry Jol** and **Garry Running**

Using Ground Penetrating Radar on Mound K: Is It a Burial Mound or Natural Landform?

A ground penetrating radar (GPR) investigation was carried out during the summer of 1999 on Mound K located in Fort McCoy, Wisconsin. Mound K is one of thirteen low, conical mounds that

comprise what remains of the West Prairie Mound Group. Historically, these mounds have been classified as burial mounds. This interpretation has been recently questioned because a) no archaeological material has been recovered from the mounds or adjacent area, b) ethnohistorical research identifies the mounds as natural landforms, c) geomorphic research illustrates the mounds are in a landscape setting where morphologically similar natural landforms are common, and d) a recent GPR investigation of Mound B revealed reflection patterns of aeolian and fluvial origin. A noninvasive GPR grid survey was conducted to determine the origin, internal structure, and stratigraphy of Mound K. The GPR data was analyzed in 3-D using specialized software. A topographic map of the mound was also created and incorporated into the GPR data to improve the analysis. The GPR profile showed continuous to semi-continuous horizontal to slightly dipping reflection patterns to depths greater than 4.5 m. The data analysis supports the hypothesis that Mound K was formed naturally (aeolian dunes) rather than created for burial purposes.

Amy Landis

Faculty Advisor/Collaborator: **Garry Running**

The Impact of Modern Land Use on Dune Stability and Erosion in the Oak Lake Sandhills of Southwestern Manitoba, Canada

The purpose of this paper is to present research conducted to identify relationships between land use and increased sand dune erosion and migration. The study area is located in the Oak Lake Sand Hills, southwestern Manitoba. Previous research, indicated parabolic dunes within the study area, mostly stabilized today, respond rapidly to changing environmental conditions. Land and resource managers are concerned that future changes will lead to increased dune erosion which will: destroy the archaeological record, increase sedimentation in interdunal wetlands, degrade wildlife habitat, and decrease grazing capacity of rangeland. We identify four land-use categories: crown-grazed, crown-ungrazed, private-grazed, private-cultivated. Orthophotographs were exported into ArcView for analysis and the percentage of active dunes was determined per land-use category. We can report the following: active blowouts are identifiable in each land-use category; there is a significant difference in percentage of land characterized by active dunes among land-use categories; and the highest percentages are in some crown-grazed and private-cultivated parcels. We recommend resource managers: maintain early successional habitats on already active parcels of crown-grazed land by allowing some dune activity to continue; reduce grazing rates or introducing rotational grazing on others, and implement traditional soil erosion control methods on highly active parcels of private-cultivated land.

Tim D. Morrell

Faculty Advisor/Collaborator: **Garry Running**

Mid-Holocene Paleoenvironment at the Flint Stone Hill Site, Oak Lake Sand Hills, Southwestern Manitoba: The Fossil Freshwater Ostracode and Gastropod Record

The Flint Stone Hill cutbank exposure is located along the Souris River where it flows through the Glacial Lake Hind basin in southeastern Manitoba. Terminal late-Pleistocene through recent deposits are exposed at the site. Previous studies at the site suggest that post-depositional carbonate-enrichment of sandsheet deposits (playa unit) indicate shallow wetlands and wet meadows developed when the sandsheet was saturated during the Mid-Holocene (1997 research). The purpose of this poster is to present additional paleoenvironmental and geomorphic information derived from analysis of microfossils. Microfossils were recovered from a mid-Holocene playa unit at the site. While analysis is in its preliminary stages the following conclusions can be made: 1) the fragile nature of the fossil shells, combined with strong cementation makes extracting them from playa unit sediments difficult; 2) fossil data supports the interpretation that shallow wetlands and wet meadows existed at the site and extended in a narrow band along the Souris River for at least 2.5 miles during the Mid-Holocene; and 3) there is sufficient fossil data to infer paleolake conditions (salinity, water depth, and temperature) and by extension, provide insight into local terrestrial paleohabitat and paleoenvironment over the glacial Lake Hind basin.

Chris Morton

Faculty Advisor/Collaborator: **Harry Jol**
Interpolation of Real Time GPS Data

The current use of GPS receivers and their collection of data are still being developed. The current setup requires a student, or Faculty member, to take a number of steps to collect GPS data, organize it, and put it into a finished product. One must first take a GPS receiver and data logger into the field and store all the GPS data into the hand held data logger. The data logger must be connected to a specific computer containing the Trimble PathFinder software. A special key must be placed in between the data logger and the computer so that the data can be loaded into PathFinder and then exported as a specific file type into a GIS program such as Arc-View where a finalized GIS product can be created. The steps become redundant and limit the user to a certain GPS receiver and the associated software package. With the recent purchase of a Fujitsu Stylistic 1200 Pen Top computer, and a software package called Field Notes32 by Pen Metrics, all the steps in collecting data and creating a finished product are reduced to nearly one step. The GPS receiver can be plugged directly into the Pen Top computer and a drawing and a database containing collected data are created and saved while the user is collecting the data in the field. The problem that arose, however, is that no one in this university had yet to figure out how to do it. The goal was to enable a user of a Pen computer and a Trimble GPS unit to create and maintain a database and layered drawings associated with the data from the database while in the field. Thus, when the data is finished being collected, a person would have a complete graphical representation of the data.

Mike Olig

Faculty Advisor/Collaborator: **Harry M. Jol**
Mobile Computer Networking Feasibility For Field Research in a University Environment

The University of Wisconsin–Eau Claire is presently engaged in numerous field-oriented research projects. This study is taking a look at the feasibility of extending the University's technology with the intent of allowing these field projects to remain in constant contact with the University and the University's servers. The study will explore the technological opportunities presently available to commercial and educational environments. This information will be evaluated by comparing the cost and effectiveness of today's technology. This information will be used to build one or more plausible scenarios. These scenarios could be taken under consideration and used to update or replace the equipment presently owned by the University in the hopes of improving contact between future trips and the University. Ideally, in the near future, classes at the University will be able to remain in contact with these trips for the purpose of extending the learning opportunities available to University of Wisconsin-Eau Claire students.

Joe Stueken

Faculty Advisor/Collaborator: **Harry Jol**
Yosemite National Park and Global Positioning Systems

The purpose of the project is to examine the cultural and geologic history of Yosemite National Park, and then map out areas of interest in the park using Global Positioning equipment. Yosemite National Park is renowned for its magnificent valley, great granite domes and peaks, waterfalls, giant sequoias, and spectacular high country. The cultural history of Yosemite National Park is as intriguing as the natural history of the Park. Starting with the original inhabitants (Native Americans), to the entrance of Europeans, to the designation of park status, Yosemite National Park has gone through a number of cultural changes. After the geologic and cultural histories of the park are examined, the next step in the project was to map out specific areas of interest in the Park. A Global Positioning System (GPS) was used to collect raw attribute data in the field. The collected data was then downloaded into a Geographic Information System (GIS), where a number of GIS functions (reclasses, overlays, etc.) would be performed to combine the collected data with existing maps of the park. Unfortunately, no data could be collected in the field using

GPS equipment. The towering cliffs and giant sequoias surrounding the valley caused too much interference with signals being sent between satellites and the GPS receiver. Since no GPS data could be collected, a final step was added to this project. The final step of this project was to determine ways, if any, to collect GPS data in areas of high interference.

Adam Wirtz, Joe Stueken, Katie Eberhardt

Faculty Advisor/Collaborator: **Sean Hartnett**

GPS Mapping Fluvial Processes on Lower Chippewa River

The purpose of this project is to use GPS technology to map river depths on the lower Chippewa River as a means of gauging fluvial processes. The initial stage of this research involved a detailed GPS survey of the Chippewa River surrounding Big Chippewa island near Meridean. This area is of particular interest in that the channel of the Chippewa River has undergone extensive and continuous changes over the past one hundred years; fluctuating from flow through the center of the island, to south of the island, and currently the main flow is shifting to the channel on the north side of the island. The GPS survey data allowed us to generate a detailed bathymetric map of channel depths around the island which illustrates fluvial processes associated with changing channel flow. The poster will include a detailed bathymetric map and historical photographs and maps depicting ever changing channel locations. This project demonstrates that despite a series of dams on the upper Chippewa, the lower Chippewa remains untamed with fluvial processes continuously re-shaping the river and its landforms.

Luke Zarins

Faculty Advisor/Collaborator: **Harry Jol** and **Garry Running**

Longitudinal or Barchanoid Dunes? A GPR Investigation at Fort McCoy, Wisconsin

Previous eolian studies at Fort McCoy, Wisconsin interpreted a number of sand ridges as longitudinal dunes based on surficial characteristics. The objective of this project is to investigate the subsurface stratigraphy of these landforms through the use of ground penetrating radar (GPR) to verify their classification. A pulseEKKO 1000 GPR system with 225 MHz antennae was used to record subsurface data (every 0.10 m) along two cross sections, which were 150 m and 65 m long, respectively. A common mid point survey revealed a velocity of 0.14 m/ns for the dune material. The GPR profiles were processed and plotted using pulseEKKO software. Signal penetration depth ranged from 5.25 to 10 m on the first cross section and 6 to 9 m on the second cross section. The lower portion of the profile exhibited horizontally oriented, continuous to semi-continuous reflections. These reflections are interpreted as local bedrock and sediment that was deposited prior to the dunes formation. Above the horizontal reflection pattern, continuously eastward dipping reflections (1-7m thick) occur. The dips are initially shallow (2-14°) on the westward section of the dune and become steeper (15 - 27°) as one moves eastward. Analysis of the GPR data indicates that the dune built up in a continuous eastward direction due to constant westerly winds. Hence, we believe this dune and others like it in the area are best classified as barchanoid ridge dunes rather than longitudinal dunes.

Geology

Jody Brandrup

Faculty Advisor/Collaborator: **J. Brian Mahoney**

Geochemical Analysis of Glaciofluvial Sedimentation, Puget Lowland, Washington: Constraints on Episodic Provenance Shifts

Quaternary sediments in the Puget Lowland comprise a complex succession of intercalated glacial, glaciofluvial, and glaciomarine sediments derived from two distinct source regions. Sedimentation patterns were alternately dominated by 1) the Puget Lobe of the Cordilleran Ice Sheet, which provided detritus rich in metamorphic and plutonic debris from southern British

Columbia, and 2) smaller alpine glaciers to the east, which provided detritus dominated by volcanic detritus from Tertiary to Recent volcanism in the Cascade Range. Each source region provided sediment with distinctive petrologic characteristics and heavy mineral composition, but the bimodal nature of sediment supply, complex interfingering and diachronous sedimentation make basinwide correlation and comprehensive basin analysis difficult. Geochemical analysis of fine-grained glaciofluvial sediments provides a rapid, semi-quantitative method of discriminating lateral and vertical variations in provenance, and, to a lesser degree, identifying episodic sediment mixing and/or recycling. Major and trace element geochemical analyses of sediments from throughout the Puget Lowland indicate that samples comprise two distinct geochemical groups: 1) low silica (<65% SiO₂) with relatively high levels of Al, Ti, Fe, K, and 2) high silica (>70% SiO₂) with corresponding low values of Al, Ti, Fe, and K. The most simplistic interpretations suggests that the low silica group corresponds to sediments derived from the Cascade volcanic carapice, whereas the high silica group represents sediment derived from the metamorphic/plutonic complexes in British Columbia. However, differences between major element values between proposed source rocks and the sediments, and anomalously high concentrations of some trace elements (Nb, Th, Y, V, Zr) in the low silica group suggests sediment composition is not controlled entirely by bedrock composition. We suggest that sediment composition is a function of both the composition of the source area and the intensity and duration of weathering in the source area prior to transport. Verification of this assumption is underway, and constraining the primary controls on the ultimate sediment geochemical signature will provide a powerful tool for analysis of Quaternary basin evolution in the Puget Lowland

Lauren Buchholz, Sarah Tietz

Faculty Advisor/Collaborator: **Bradford R. Burton**

Computer GIS-based Geologic Map of the Harrison Pass and Franklin Lake 7.5 Minute Quadrangles, Nevada

The spatial distribution and structural attitude of geologic units are the fundamental data used in geological interpretation. Accurate field mapping is vital to the scientific method in the geosciences. Recent advances in computer-based Geographic Information Systems are revolutionizing traditional mapping methods. Most government agencies and private publishers now require digital map submissions. This project tested the application of digital mapping methods to a complex geological terrane previously mapped by traditional methods. The Harrison Pass and Franklin Lake Southwest 7.5-Minute Quadrangles in northeast Nevada expose upper-crustal plutonic and metamorphic rocks in the footwall of a classic Cordilleran metamorphic core complex. Mylar base maps prepared following traditional US Geological Survey publication procedures were digitized using ArcView® GIS to produce digital geologic maps. The study shows that digital mapping methods produce a higher-quality map product than traditional drafting methods, and digital maps can be updated, as new data become available. However, the application of digital mapping methods to complex geological terranes is not yet optimized. Digital mapping methods are initially more time consuming and the computer-interface limits the geologist's ability to devise new map symbols to represent phenomena not anticipated by the software developers. The final maps will be published digitally by the Nevada Bureau of Mines and Geology as colored geologic quadrangles.

Justin Humenik

Faculty Advisor/Collaborator: **Bradford Burton**

Computer -based Mapping of Geochemical Data for Mineral Deposit Exploration, Northern Mongolia

Geochemical analysis of soil samples over an extensive grid sampling area is a proven exploration method for base and precious metals. We present new data from more than 3000 soil samples collected in two remote study areas in the Khentii Prefecture, Mongolia. The data were collected and provided for analysis by Uranerz U.S.A., Inc. during a 1998 exploration program. Computer mapping and spreadsheet analysis, coupled with geological interpretation of mapped

anomalies facilitated analysis of the large data set. The data were analyzed for indicator elements Au and Ag as well as common pathfinder elements As, Sb, Zn, Pb, Hg, Cu, Bi, and Te. The computer-mapping platform allows for rapid analysis of combinations of indicator and pathfinder elements, which predict the location of two ore deposits within the study areas. In the Namarjaa Uul area, coincidental anomalies of Cu, Zn, Hg, and Bi may indicate the presence of a copper porphyry deposit in the northeast part of the sample grid. Coincidental anomalies of Cu, Zn, Ag, and Pb indicate a possible kidney shaped copper porphyry deposit in the northeast portion of the Bayan Undur Uul area. The data do not indicate the presence of massive disseminated gold deposits, which were the focus of the exploration program.

Joel D. Hyzer

Faculty Advisor/Collaborator: **Kent Syverson**

Glacial Geology of the Huron and Colburn 7.5' Quadrangles, East-Central Chippewa County, Wisconsin

A 132-sq-km region on the Huron and Colburn 7.5' Quads was mapped during summer 1999 to determine the surficial glacial geology. Well logs, aerial photographs, the county soil survey, and topographic maps were used for two weeks to construct a preliminary surficial geologic map. Then six weeks were spent in the field describing sediment outcrops, boring with a hand auger, and drilling to depths of 20 m in three locations with the Wisconsin Geological and Natural History Survey drill rig. Most of the study area is located within the Chippewa Moraine, a Late Wisconsinan ice-disintegration moraine deposited by the Chippewa Lobe approximately 20,000-15,000 yrs ago. The hummocky Chippewa Moraine displays 4-12 m of relief and is underlain by diamicton of the Copper Falls Fm. The northwestern part of the map area displays a gently rolling surface with 2-4 m of relief underlain by Copper Falls Fm. diamicton. Four ice-walled-lake plains are present in the northern half of map area. Low areas in the southernmost part of the map area are underlain by proglacial lake sediment containing laminated sandy silt up to 10 m thick. During the earliest part of the Late Wisconsinan Glaciation, the Chippewa Lobe flowed from the north to an area 1 km north of Stanley, WI. This event deposited a small, ice-cored moraine, stabilized, and constructed the Chippewa Moraine. Southerly meltwater drainage was dammed by the earlier moraine near Stanley, and an extensive proglacial lake formed.

April D. Johnson

Faculty Advisor/Collaborator: **J. Brian Mahoney**

Testing Large Scale Terrane Translation: Geochemical Provenance Analysis of the Cretaceous Jackass Mountain Group, Methow Terrane, southern British Columbia

The southern Canadian Cordillera is composed of a number of allochthonous terranes assembled on the western edge of North America during Jurassic to Tertiary time. These terranes can be broadly grouped into larger superterranes based on the timing of terrane linkages. The Intermontane superterrane consists of smaller terranes amalgamated to North America by middle Jurassic time (ca. 180 Ma); the Insular superterrane to the west consists of terranes amalgamated by mid-Cretaceous time (ca. 100 Ma). One of the most significant tectonic problems in the Cordillera relates to the amount of relative displacement between the two superterranes. Paleomagnetic data suggests up to 2000 km relative displacement between the superterranes between the late Cretaceous and Eocene time (80-55 Ma). Conversely, geologic data suggests that the Insular and Intermontane superterranes were largely amalgamated by mid-Cretaceous time and subjected to less than 1000 km margin-parallel translation since that time. This investigation seeks to constrain the amount of displacement between the superterranes in southern British Columbia. Albion-Cenomanian (100-85 Ma) volcanic and chert-rich conglomerate of the Jackass Mountain Group occurs on the Methow terrane, which is firmly linked to the Insular superterrane by 90 Ma. The coarse-grained nature of these deposits indicates a limited transport distance, and geologic constraints suggest the clasts were derived from the Intermontane superterrane to the east. However, paleomagnetic data requires that the two superterranes were more than 2000 km apart during this time. If geochemical analysis of

conglomerate clasts of the Jackass Mountain Group allows them to be tied to plutons of the Intermontane superterrane, then large-scale translation between the terranes is not allowable.

Detailed examination of the conglomerate clast geochemistry is underway. Preliminary data suggests that the majority of clasts were derived from a single source. Trace element patterns suggests a calc-alkaline destructive plate margin source, similar to plutons on the Intermontane superterrane. However, definitive linkage of conglomerate clasts to their plutonic source will require multiple geochemical ties.

Melissa Klinger

Faculty Advisors/Collaborators: **J. Brian Mahoney** and **David L. Kimbrough** (SDSU)
Geochemical Provenance Analysis of Conglomerate Clasts from Valle Group Cretaceous Forearc Basin Strata, Baja California

The Cretaceous Valle Group (VG) is widely exposed across the Vizcaino Peninsula of Baja California and constitutes an important record of forearc basin tectonics and sedimentation associated with Mesozoic subduction beneath western North America. The presumed source of VG strata is the adjacent Peninsular Ranges batholith (PRB); a presumption based mostly on evidence from sandstone petrography, conglomerate clast compositions, and paleocurrent data. At its present erosional level, the PRB is divided into distinct western and eastern zones based on petrologic as well as age and geophysical parameters. The precise relationship between the unroofing of the arc and basin evolution is unclear. This investigation seeks to correlate lateral and vertical variations in conglomerate clast lithology and geochemistry with progressive uplift of the arc sequence in order to develop a comprehensive model of basin evolution.

Whole rock major and trace element X-ray fluorescence analyses are reported here from 38 representative plutonic VG conglomerate clasts as part of an effort to more critically test provenance models for VG strata. Major element chemistry indicates clasts may be subdivided into two rough groupings, including one with intermediate SiO₂ (~60-68%), with corresponding high values of Ti, Mg, Ca, Al, P, V (Group I) and one with higher SiO₂ values (>70%), with lower values of these elements (Group II). Segregation is also evident among trace elements. In particular, distinct high Sr (Group I) and low Sr (Group II) clast suites are distinguishable. The bimodal distribution of clast geochemistry corresponds to the distinct east-west geochemical zonation of the arc assemblage. High Sr values (Group I) correspond to the eastern arc assemblage, low Sr values (Group II) correspond to the western arc assemblage.

Joshua D. Kohn, Karl Beaster

Faculty Advisor/Collaborator: **Karen Havholm**
Wind or Water? Paleoenvironment of the Proterozoic Hinckley Sandstone, Northeast Minnesota

The Proterozoic Hinckley Sandstone is a fine-grained, mineralogically mature sandstone representing late stage Keweenawan rift fill sedimentation. Previous work (Tryhorn & Ojakangas, 1972) interpreted the Hinckley Sandstone as a shallow water lake deposit. Recent recognition of adhesion structures suggest it may be partially eolian (wind-deposited). The purpose of this project was to reevaluate the environment(s) of deposition of the Hinckley Sandstone. The study area is located in Pine County, MN where five sections were measured and described in detail along the Kettle River. Four major facies were identified: cross-stratified sandstone (CSS), trough cross-stratified sandstone (TCS), pebbly trough cross-stratified sandstone (PTS), and planar bedded sandstone (PS). Fine grain size, large set size, and details of stratification style indicate an eolian origin for CSS facies. Coarser grain size and characteristics of trough strata indicate a subaqueous origin for TCS and PTS facies. Planar beds (PS) include complexly interbedded crinkly and mottled (adhesion) strata, rippled (subaqueous) laminae, and pin-striped (wind-ripple) laminae, indicating a changing environment. Overall, Hinckley strata record a depositional environment that alternated between wet (subaqueous) and dry (eolian) conditions. Correlation

between measured sections was difficult because Hinckley Sandstone exposures are incomplete and widely separated. This limits regional paleoenvironmental interpretation.

Bjorn Lysne

Faculty Advisor/Collaborator: **J. Brian Mahoney**

Provenance of the Rosario Formation and late Cretaceous basin evolution in San Diego, CA

The Rosario Formation is a 120m thick succession of late Cretaceous coarse grained clast-supported conglomerate and fine-grained sandstone. It is discontinuously exposed along the Pacific coast of Southern California and Northern Baja California. These strata were deposited along the eastern side of the Peninsula Range Batholith (PRB) as turbidites into a submarine fan-valley-levee. A suite of 45 conglomerate clast samples was collected throughout the vertical and lateral extent of the Rosario Formation in San Diego. The vertical and lateral variation in conglomerate clast lithology and geochemistry will be documented in order to evaluate basin evolution and source area uplift through time. Major and minor element concentrations of the samples will be assessed to document the geochemical character and variability of the source area. The results will then be compared to the existing geochemical data of the PRB to determine individual source characteristics. Correlation of distinct groupings in conglomerate clasts with specific phases of the batholith will constrain the tectonic evolution of the region in the late Cretaceous. Preliminary trace element analysis suggests the presence of three distinct geochemical subpopulations, based on variations in Zr, Nb, Y, V and other trace elements, that may correlate with east-west variations in arc geochemistry.

Tyler W. Mace, Tim R. Cummings

Faculty Advisor/Collaborator: **Kent M. Syverson**

Computer Database to Analyze Glacial Till Samples in Western Wisconsin

Many county-scale glacial geology mapping projects have been conducted in western Wisconsin during the past 25 years, most samples having been analyzed at the UW-Madison Quaternary Geology Lab. We have collected till data from previous workers and analyzed approximately 200 new till samples from recent drilling in Chippewa County, Wisconsin. We have developed a database to organize the data in a standard format and conduct data searches by lithostratigraphic unit and sediment type. A user submits spreadsheet data files via a web interface form. Once submitted, a Perl script interprets the spreadsheet and adds the data to the database. Once information is in the database, a user accesses the database through a web interface, conducts searches using lithostratigraphic formation, member, sediment type and/or county key words, and generates a spreadsheet file with the results of the search. In addition, the user can connect to the database with a GIS program such as ArcView. This will allow a user to study how till properties change spatially over a region not limited by county boundaries. This database to more completely characterize the physical properties of till units is part of Syverson's glacial stratigraphy research project in western Wisconsin. This continuing study is funded by the Wisconsin Geological and Natural History Survey and the Chippewa County Land Conservation Dept.

Jean M. Morrison, Carrie E. Rowe

Faculty Advisors/Collaborators: **Robert L. Hooper** and **J. Brian Mahoney**

Sequential Extraction Applied to Heavily Contaminated Lead and Zinc Mine Tailings: What Really Happens During Sequential Extraction?

Sequential extraction is a step-by-step chemical procedure designed to mimic environmental conditions that may result in mobilization of heavy metals. Previous studies have shown that results are extremely dependant on laboratory technique. Sediments heavily contaminated with up to 10,000ppm lead and zinc were subjected to two different Sequential Extraction (SE) procedures to compare the results and effectiveness of metal removal. Samples from three distinctive redox environments were extracted using conventional (Tessier) and microwave

procedures that involve sequentially removing metals held in exchangeable, carbonate, oxide, sulfide/organic matter, and residual fractions. Solution extracts were analyzed using Atomic Absorption and samples from each extraction step were examined using SEM and x-ray spectroscopy to determine the impact of the treatments on the metals. Conventional and microwave techniques yield parallel results for the exchangeable, organic/sulfide, and residual fractions but provide different speciation predictions for both the carbonate and oxide fractions. The conventional SE procedure is less effective at removing carbonates and more effective at removing fine-grained oxides than the microwave method. SEM analysis indicates that in both extraction methods, Fe-Mg and Zn carbonates survive essentially intact after the carbonate step. Some small-cation detrital (Fe,Mg) carbonates even survive the sulfide/organic extraction step (pH 2.0) and therefore account for a significant increase in metals recorded from the residual step. In reduced samples with abundant microcrystalline authigenic sulfide there is a tendency for premature extraction of Pb and Zn beginning in the carbonate fraction. A few larger detrital Fe and Zn-sulfides persist through the organic/sulfide step, thereby releasing metals in the residual fraction.

Carrie Rowe

Faculty Advisors/Collaborators: **J. Brian Mahoney** and **Peter Mustard**

Clastic Dykes as Paleoslope Indicators in the Nanaimo Group, Hornby Island, British Columbia

The Upper Cretaceous (91-71 Ma) Nanaimo group on the western edge of the Canadian Cordillera is composed of eleven main stratigraphic units. Hornby and Denman Islands are the northernmost of British Columbia's Gulf Islands and provide excellent exposure of the upper two-thirds of the Nanaimo Group. Comprising more than two kilometers of clastic sedimentary strata, the Nanaimo Group on these islands consists of thick bedded conglomerate and sandstone dominated formations alternating with mudstone and thin-bedded turbidite sequences. The Northumberland Formation, a mudstone unit with thin sand interbeds, is exposed on the western side of Hornby Island. Near the top of this unit, on the southeastern side of Hornby, are numerous clastic sandstone dykes and synsedimentary folds. These dykes and sedimentary folds are formed from a partially lithified unit cracking and pulling apart as it slides down a slope. Orientations of these structures are good indicators of paleoslope direction. The synsedimentary fold axes trend shallowly to the northwest (19/336, n=27). The axial planes of the synsedimentary folds strike northwest and dip northeast (334/34, n=27). Fold axes and axial plane orientations suggest paleoslope is to the southwest. Dyke orientations, which are nearly vertical but have a general northeast strike (035/86, n=60), form perpendicular to the paleoslope suggesting that the slumping direction is to the northwest/southeast. This contrasting data indicates that either the use of axial planes or fold axes are unreliable in the interpretation of paleoslope direction. Comprehension of the formation of clastic dykes as paleoslope indicators will aid in constraining the geography and geometry of formation in the Nanaimo basin.

Carrie Rowe and Jean Morrison

Faculty Advisor / Collaborator: **J. Brian Mahoney, Robert Hooper**

Heavy Metal Partitioning and Transport in the Coeur d'Alene River Valley, Coeur d'Alene Idaho

The lower Coeur d'Alene River Valley has been widely contaminated with heavy metals from Ag-Pb-Zn sulfide minetailings. Contaminated mine tailings rapidly remobilize by surficial processes, primarily during flood events, and are deposited in subaerially exposed overbank levees and in adjacent wetlands. Lead and zinc levels exceed 10,000 ppm in the upper few meters of the lower river valley. Successful remediation in CDA and other sulfide mine districts requires understanding metal mobility and speciation processes during transport and remobilization. The river system is composed of three subenvironments: bedload, levee, and wetland. Oxidation/reduction conditions vary dramatically between the different subenvironments leading to a complicated system of metal migration and precipitation. The physical and chemical properties of the detrital grains are assessed by Scanning Electron Microscopy and x-ray spectroscopy. River bedload is a recurrent source of heavy metals during flood events. Flood

deposit lead is primarily found as carbonates, sulfides, or coatings on detrital grains. Zinc is transported primarily as sulfides, carbonates or as Fe-Mn oxide coatings. In subaerial oxidizing environments such as levee tops, Zn-Pb-Mn-Fe oxy-hydroxides and Pb-Zn-Fe carbonates are the dominant heavy metal particulates. Fine grained, subsurface overbank levee deposits can represent transitional redox environments where metals occur in a wide variety of phases including carbonates, sulfides and coatings. In organic-rich anoxic environments, such as marshes and lake sediments, Pb and Zn tend to concentrate in colloidal, bacterially-precipitated sulfides, which are readily bioavailable. SEM analysis indicates that microorganisms play a critical role in fixation of heavy metals especially in transitional redox and reducing environments.

Jared Schmidt, Sarah Tietz

Faculty Advisor/Collaborator: **Bradford R. Burton**

Structural Analysis of the Vinegar Fault Zone, Northcentral Washington

The Vinegar Fault in north-central Washington separates crystalline rocks of the Intermontane Belt, to the east, from sedimentary rocks of the Methow block, to the west. It is therefore interpreted as the southern segment of the regionally extensive Pasayten Fault Zone. Based on paleomagnetic pole reconstruction, previous authors maintained that the Pasayten Fault Zone accommodated large-magnitude translation of the Methow block, displacing it northward more than 10 degrees latitude along the North American continental margin during the Late Cretaceous. This hypothesis was tested by examining field and microstructural evidence of the kinematic history of the Vinegar Fault. Structural analysis of field data and microscopic textural analysis of samples from the fault zone show dip-slip displacement and do not support strike-slip movement on this fault. The fault evolved from early-stage greenschist-grade mylonitic and protomylonitic shear, to later-stage brittle mechanical behavior in response to fault exhumation and cooling. Structural fabrics consistent with large-magnitude strike-slip translation of the Methow Block relative to the Intermontane Belt and North America were not identified in this study. These observations support the hypothesis that the Vinegar/Pasayten faults are responsible for vertical exhumation of the Coast Belt.

Michael J. Schmidt

Faculty Advisors/Collaborators: **J. Brian Mahoney**

Comparative Geochemistry of the Spences Bridge Group and Coeval Volcanic Rocks: Potential Constraints on Large Scale Translation

The Canadian Cordillera is a complex melange of allochthonous terranes that are broadly grouped into the Insular and Intermontane superterrane. Controversy surrounds the timing and mechanism of superterrane juxtaposition. Paleomagnetic data indicates ~1100 +/- 500 km of northward translation of the Intermontane superterrane between 90-45 Ma and 3000 +/- 600 km northward translation of the Insular superterrane during the same period. Geologic constraints, including stratigraphic, structural and paleontologic data, suggest less than 500 km of relative displacement. The Spences Bridge Group, on the western edge of the Intermontane Superterrane, is ~104 Ma volcanic arc. The northwest edge of the Spences Bridge Group outcrop belt is truncated by the dextral Fraser fault system. On the west side of the fault, approximately 115 km to the northwest, an unnamed package of Albian volcanic rocks (104.1 +/- 0.3 Ma) lithologically identical to the Spences Bridge Group is unconformably overlain by the late Albian-Santonian Silverquick/Powell Creek succession, which is structurally and paleomagnetically linked to the Insular Superterrane. Paleomagnetic arguments therefore require the presence of a ~2000 km displacement transcurrent fault between the Spences Bridge Group and the unnamed Albian volcanic rocks. The purpose of this investigation is to geochemically compare the unnamed Albian volcanic rocks with the Spences Bridge Group to test potential linkages between the two. Both volcanic successions display a subalkalic calc-alkaline geochemical signature, indicative of a destructive margin plate setting. Major element data define colinear trends in both successions, suggesting a similar magmatic evolution. Incompatible trace element data display a significant degree of overlap between the two units. Rare earth element data from both units

display colinear trends with similar La/Yb ratios. Based on these geochemical similarities as well as lithologic, structural, and geochronologic data we feel the Albian volcanic rocks are a tectonically translated fragment of the Spences Bridge Group arc.

Michael J. Schmidt and Isaac J. Vandergon

Faculty Advisors/Collaborators: **Lori D. Snyder** and **J. Brian Mahoney**

Structural and Geochemical Characterization of Tertiary (?) Mafic Dikes in the Coast Belt and Western Bowser Basin, Nass River Area, British Columbia

The southern part of the Nass River area is predominantly underlain by Jurassic and Cretaceous sedimentary rocks of the Bowser Lake Group and Tertiary plutonic rocks of the Coast Belt. Abundant mafic dikes cut both of these units and are the focus of this study. During the summer of 1999, approximately 25 of these dikes were systematically described, measured and sampled for geochemical analysis. Distribution of mafic dikes varies throughout the area with the greatest abundance to the west and decreasing eastward. Most commonly, dikes occur as single bodies less than 1 meter wide although some are 2-6 meters; chilled margins are commonly observed. Thinner dikes are dark gray to green and aphanitic while thicker dikes often contain phenocrysts of plagioclase feldspar and minor pyroxene or pyrite. Locally in the west, dikes occur as swarms with cumulative thickness of up to 100 meters. Dikes show a consistent northeast to southwest orientation across the area and are steeply dipping. This pattern appears to be controlled by a preexisting fracture pattern in the plutonic rocks and bedding or cleavage in the adjacent sedimentary rocks. Preliminary geochemical analyses indicate that the mafic dikes are rich in Sr and appear to fall into at least two distinct groups. Ongoing analyses will be used to further investigate the characteristics of the source region(s), tectonic affinity and diversity within the dikes.

Katie Thornburg

Faculty Advisors/Collaborators: **Robert L. Hooper** and **Kent M. Syverson**

Clay Mineralogy of Pre-Late Wisconsin Till, Western Wisconsin

Semi-quantitative clay mineralogy of the <1m fraction from pre-Late Wisconsin till is being examined to determine if clay mineralogy can be used to differentiate the various till units in western Wisconsin. Clay minerals being quantified include illite (I), kaolinite (K), vermiculite (V), smectite (S), and mixed layer illite/smectite (I/S). Sixty-nine basal till samples have been processed thus far. The Pierce Fm. (n=13) typically displays narrow, symmetrical smectite peaks, significant kaolinite, and subordinate illite vermiculite. The Wausau (n=4) and Medford (n=2) Members of the Marathon Fm. have broad, irrational x-ray diffraction patterns typical of I/S, variable but significant vermiculite, and subordinate kaolinite. Clay mineralogy of samples assigned to the Edgar Member of the Marathon Fm. (n=3) show greater variability than the Wausau and Medford Members. Initial analyses of the River Falls Fm. (n=12) indicate this till is dominantly illite (29.4%±7.8), vermiculite (24.3%±6.1), and I/S (<10%) (31.5%±10.4), with sparse kaolinite (14.8%±6.1). The Lincoln Fm. contains substantial vermiculite, I/S, illite, and sparse kaolinite. Illite seems to increase toward the bottom of the formation. The Late Wisconsin Copper Falls Fm. (n=4) contains subequal illite, smectite, vermiculite and kaolinite. Semiquantitative analyses are currently being performed. Initial qualitative results indicate that a more rigorous statistical analysis of deconvoluted, integrated peak intensities for both pure minerals and mixed layer components will prove to be a reliable method for differentiating the till units.

Sarah Tietz, Jared Schmidt

Faculty Advisor/Collaborator: **Bradford R. Burton**

Structural and tectonic history of the Pasayten Fault Zone, Northcentral Washington

The Okanogan Range batholith (ORB) is a major plutonic complex exposed along the western edge of the Intermontane Belt in north central Washington and southern British Columbia. The

Pasayten fault zone (PFZ) separates the ORB from rocks of the Cretaceous Methow Basin to the west. Previous studies showed that the ORB was a major sediment source for the evolving Methow Basin, and document the kinematic history of the PFZ from ~113 to >80 Ma, but the structural history of the PFZ was not known from 80 Ma to 60 Ma. Other workers have proposed that during this time, the Methow Basin was translated ~1700 km northward along the western margin of North America. We present twelve new apatite fission track ages that document the thermal/structural history of the ORB during this controversial time. The ORB was uplifted as much as 6 km since the Late Cretaceous (69.6 Ma (+/-3.8 Ma)). Cooling of the ORB does not reflect simple block-uplift adjacent to the Pasayten Fault Zone. The data suggest that previously unidentified faults are present within the ORB. Limited data also show that uplift/exhumation of the adjacent Methow Basin may not have occurred until the Late Eocene. The data place limits on the time available for large-magnitude terrain translation to have occurred, and challenge the Baja-BC hypothesis.

Mathematics

Chandra Butterfield

Faculty Advisors/Collaborators: **Mohamed Elgindi** and **Robert Langer**

On the Numerical Computation of Maximal Regular (Stable) Subinterval Matrices

Many physical systems can be modeled by systems of differential equations of the form $X'=AX$, where X is a vector of unknown functions and A is a matrix of system parameters. For such a model one wants to know if a solution exists and, if so, what is the long-term behavior of the solution. The answer to the first question has to do with the regularity (non-singularity) of the matrix A and the second with its stability. Unfortunately, due to changes in environmental conditions, the parameters in the matrix A may vary over time. Consequently the system must be modeled by an equation of the form $X'=AIX$, where AI is an interval matrix. The concepts of regularity and stability have been extended to interval matrices and have been well-studied in the literature. In this paper we develop a numerical algorithm for constructing a maximal regular (stable) interval matrix containing a given regular (stable) point matrix. Such an algorithm would enable one to take the nominal values of the parameter matrix A for a system and determine how far they can drift before the system breaks down or becomes unstable.

Jill Koss

Faculty Advisors/Collaborators: **Mohamed Elgindi** and **Robert Langer**

On the Numerical Computation of Maximal h -Positive (semi) Definite Subinterval Matrices

Many physical systems can be modeled by systems of differential equations of the form $X'=AX$, where X is a vector of unknown functions and A is a matrix of system parameters. Because the parameters of a physical system may drift over time due to changes in environmental conditions, it is necessary to consider systems of the form $X'=AIX$, where AI is an interval matrix. The long-term behavior of solutions of such a system depends on the stability of the interval matrix AI . Since the stability of a matrix A can be reformulated in terms of the positive-definiteness of $-A$, and since much is known about positive-definite matrices, one is led naturally to the study of positive-definite interval matrices. Positive-definiteness is also of intrinsic interest in relation to the numerical stability of algorithms for solving linear algebraic systems. In this paper we first generalize the concept of positive-definite matrix to something that we call h -positive-definite and extend this concept to interval matrices. Then we develop a numerical algorithm for constructing a maximal h -positive-definite interval matrix containing a given h -positive-definite point matrix. We hope that this will eventually yield quantitative information about the stability of the solutions of $X'=AIX$.

Physics & Astronomy

Ryan Aschbrenner

Faculty Advisor/Collaborator: **Doug Dunham**
Analysis of X-ray Photoelectron Spectroscopy Data from Silicon Carbide

This research project focuses on the analysis of x-ray photoelectron spectra obtained from two types of silicon carbide (SiC) reconstructions, namely the 3x2 and c(4x2) surface reconstructions. This spectroscopy data was previously collected by exposing a sample of SiC to monochromatic x-rays, and then energy analyzing the electrons that were admitted as a consequence of the photoelectric effect. The number of emitted electrons is then plotted as a function of electron kinetic energy, which is determined by the electron's binding energy. The resulting plot contains peaks that are not well-resolved; the peaks contain shoulders and small peaks that are due to the component peaks. The component peaks represent atoms that are in different chemical environments within the sample. Specialized software is used to place constraints on the shapes of these component peaks and to determine the position of each peak on the intensity vs. energy plot. The component peaks must add constructively to match the experimental data, and the positions of these peaks must remain consistent from one trial to the next. Furthermore, the results must be consistent with physical constraints.

Kevin Bartig

Faculty Advisor/Collaborator: **Lauren Likkel**
The Excitation of Hydrogen Molecules in J900

We are examining the near infrared emission of molecular hydrogen in planetary nebulae by means of long-slit spectroscopy. We present results from data obtained in both the K-band and the H-band of the nebulae IC5117 and J900. The data were gathered in November 1999 using the 2.7 meter Harlan J. Smith Telescope at McDonald Observatory in Fort Davis, Texas. Spectra were extracted using the data reduction software IRAF. Examination of the molecular hydrogen line intensity ratios in these spectra reveal the excitation mechanism at work in the nebula. Two excitation mechanisms are plausible, one of UV pumping and one involving shocked gas surrounding the nebula. Knowledge of the specific excitation mechanism will permit calculation of the total mass of hydrogen present, ascertained from the strength of the molecular hydrogen lines.

Jacob Gapko

Faculty Advisor/Collaborator: **Scott Whitfield**
Determination of the Angular Distributions of the Molecular Chlorine 3s-Photoelectrons

One of the consequences of the photoionization process in atoms or molecules is that the emitted electron can be ejected in a preferential direction. This direction is parameterized by the angular distribution parameter, which can range in value from -1 to 2. In a physical sense, this roughly corresponds to emission angles of θ and $\theta + \pi$ respectively as measured with respect to the polarization vector of the ionizing radiation. We have measured the angular distributions of the electrons of molecular chlorine as well as their associated satellite lines. Their variation as a function of photon energy over the range of 30 eV up to 70 eV will be presented and discussed.

Anna Kindt

Faculty Advisor/Collaborator: **Paul Thomas**
Computational Modeling of Large Scale Impacts on the Icy Crust of Europa

Europa, one of the larger moons of Jupiter, is believed to have an ocean of liquid water, possibly 100 km deep, underneath its icy crust which may be as thin as 10 km. Recent images of Europa have shown that this icy crust barely shows any evidence of the cratering which is evident on

most other Solar System bodies. However, it is known that Europa must have been subject to the same bombardment by asteroid and comet as other objects in our Solar System. This project, one of two examining large scale impacts on Europa, studies the impact process by performing fully three-dimensional simulations of the penetration of the surface ice. The models include impactors of varying sizes and impact speeds and examines and contrasts their outcomes.

Anna Kindt, Jim Moriarty

Faculty Advisor/Collaborator: **Lyle Ford**

Methods of Determining Light Curves of Asteroids

As asteroids move through their orbits, they also rotate about their axis. This rotation can be measured by observing the varying brightness of the asteroid. By taking data at regular intervals, the varying brightness can be plotted against time to produce a light curve. The rotation period of the asteroid can then be determined from the light curve. This project compares two different ways to analyze periods of asteroids: the Fast Fourier Transform and the Lomb Periodogram. We use simulated data to find the technique which will work best for the data which we are most likely to get. The data will be unevenly sampled because we can only observe at night and weather often interferes with observing. The Fast Fourier Transform assumes evenly spaced data while the Lomb Periodogram does not. We compare and contrast these methods.

Amy Rassbach

Faculty Advisor/Collaborator: **Matt Evans**

Varying the growth of Manganese on Si(111) with temperature and coverage

Mn is known to form islands with a $\sqrt{3} \times \sqrt{3}$ reconstruction when deposited onto a heated Si(111) surface. The minimum height of these manganese silicide islands is 4 Å and can be varied by changing the rate of Mn deposition and the deposition temperature of the Si(111) substrate. This dependence will be shown through the statistical analysis of scanning tunneling microscopy images. In addition the deposition location dependence for submonolayer coverage of Mn will be discussed. The probability of Mn clusters to occupy the faulted half of the Si 7×7 unit cell changes depending on the deposition temperature of the substrate, and whether the annealing is done during the Mn deposition, or post deposition.

Randy Recob

Faculty Advisor/Collaborator: **Kim Pierson**

Transmission Electron Microscopy of Semiconductor Devices: Collaboration with Local Companies

This project is part of a UW-System Applied Research Grant designed to develop the capabilities here at UWEC to analyze semiconductor devices using the new High Resolution Transmission Electron Microscope (HRTEM) recently acquired via a grant from the National Science Foundation. Techniques required to make thin slices less than one-millionth of a meter thick have been developed using a newly designed instrument from a company in California. The thin slices are then analyzed with the HRTEM and provide local semiconductor companies with greatly magnified images of the structure of semiconductor devices. These images provide crucial feedback in the development of new devices and they are also used to identify failure mechanisms for currently manufactured devices.

Derrick Whitelaw

Faculty Advisor/Collaborator: **Paul Thomas**

Numerical Model of the re-freezing of Europa's icy crust following a melt through event

The presence of a subsurface ocean on Europa is strongly implied by a wide variety of imaging data, including the sparsity of impact craters; low surface relief with lateral separation of crustal

plates and crater morphologies. Galileo magnetometer data also supports the presence of an ocean via the detection of a possible induced magnetic field in a saline liquid water layer. Tidal models estimate a mean surface thickness of 10-20 km. Such a thin icy crust would be subject to occasional melt through events as a result of both large impacts and large scale diapirism. I present the application of a numerical model of re-freezing following a catastrophic melt through of Europa's icy crust. Our model solves the one dimensional heat equation for an ice layer of variable thickness with constant temperature boundary conditions, T_o at the surface and T_m (the melting temp. of ice) at the base.

Cindy Yoose

Faculty Advisor/Collaborator: **Kim Pierson**

Surface Topography Growth on Two-Phase Alloys Due to Sputtering

Our research has practical importance for technologies that rely on determining the chemical composition present on the surfaces of materials and at interfaces between layers of materials. These types of analyses are vital to the microelectronic industry. To determine the chemical composition of surfaces and interfaces, beams of atoms are used to slowly erode away the surface to a certain depth. Next, various techniques are used to determine the chemical composition of the surface. Artifacts in the data occur when the surface does not erode away smoothly. Our research is directed at trying to determine the synergistic nature of the variables that control the development of surface topography during the surface erosion process. The current project is designed to provide data to satisfy the reviewers of a paper recently submitted for publication.

Graduate Entries

Biology

Jaime Malcore

Faculty Advisor/Collaborator: **Jon Scales**

Investigation of the Molecular Mechanisms of Pag-Induced Cell Dissociation: "To stick or not to stick, that is the question"

Receptor tyrosine kinases (RTK's) play an important role in cell proliferation, differentiation, and migration during embryogenesis. The Eph receptors make up the largest subfamily of RTK's and have been shown to play important roles in the patterning of the vertebrate nervous system. In *Xenopus*, Pagliaccio, an eph-class receptor, has been shown to modulate cadherin-mediated cell adhesion. As a result, we have undertaken an investigation to elucidate the specific intracellular regions of the cadherin molecule being targeted by Pag activity.

Communication Disorders

Rebecca Hubing

Faculty Advisor/Collaborator: **Kristine Retherford**

Language and Reading Gains Made by Children Who Participate in Fast ForWord™ as Compared to Children Who Receive Traditional Intervention

This research project investigated the efficacy of a computer and Internet-based program entitled Fast ForWord™. Fast ForWord™ is designed to ameliorate the temporal processing deficits that are seen as the cause of some language and reading impairments. To compare the effectiveness of Fast ForWord™ to that of traditional intervention services, three matched pairs of children were formed. These children were matched on the basis of age, gender, reading and language skills,

and educational or medical label. Within each pair, one child participated in Fast ForWord™, while the other child received traditional language intervention services. The language and reading skills of both children within a pair were assessed using standardized tests of reading and language at three points in time: before the Fast ForWord™ subject started Fast ForWord™, immediately after that same subject completed Fast ForWord™, and six weeks after the subject completed Fast ForWord™. The results of the study were mixed; specific results will be presented at the poster session.

Kristin Kleinsteiber

Faculty Advisor/Collaborator: **Larry Solberg**

A Comparison of the Voice Quality of Extraverted and Introverted College Students Using Long Term Average Spectrum

The purpose of this study was to determine whether or not there is a difference in the voice quality of extraverted and introverted speakers. The subjects were 46 female college students. The subjects were divided into two groups based on their extraverted or introverted personalities, as assessed by the Myers-Briggs Type Indicator (MBTI). Each subject's voice quality was analyzed using Long Term Average Spectrum (LTAS). The results of this study support the hypothesis stating that there would be a difference in LTAS measures of voices of introverted and extraverted speakers in the 5-8 kHz range, which has been associated with breathiness in the voice. The introverted speakers produced more energy in the 5-8 kHz range than their extraverted counterparts did. Research implications are discussed.

Kris Kleinsteiber, Krista Clough

Faculty Advisor/Collaborator: **Larry Solberg**

The Relationship Between Occupation and Perceived Voice Handicap

This retrospective study investigated the relationship between occupation and self-ratings of voice problem severity and life impact of the voice problem in 96 adults who had been evaluated in the Voice Clinic in the Center for Communication Disorders at UW-EC. Subjects were classified into one of four voice-usage levels (Koufman and Isaacson, 1991): elite vocal performer (e.g., singers), professional voice user (e.g., teachers), nonvocal professional (e.g., sales persons), and nonvocal nonprofessional (e.g., clerks). The subjects rated the severity of their voice disorders and the impact of their voice conditions on their lives on a 1-7 scale. There was a low-to-moderate positive correlation between voice usage classification and severity of the problem and a moderate positive correlation between voice usage classification and perceived life impact of the voice disorder. Those who relied on their voices more for their livelihoods perceived themselves as being affected more by their voice disorders. The elite vocal performers (e.g., singers) perceived themselves as being disproportionately impacted by their voice disorders relative to the perceived severity of their voice problems.

Teri Stock

Faculty Advisor/Collaborator: **Lisa LaSalle**

Phonation intervals in the spontaneous speech of preschoolers who stutter

Reducing speech rate, by stretching words or extending phonation intervals and/or by pausing longer or more often, has been a long-standing method for speaking more fluently. Speech rate reduction has been analyzed in adults who stutter, parents of children who stutter, and older children who stutter; however, the population of preschoolers who stutter has been largely ignored in terms of spontaneous speech rate reduction possibilities. If we knew more about whether and how preschoolers who stutter spontaneously slowed their speech rate through phonating and pausing, we would have a better idea of how spontaneous recovery from stuttering could occur. In this project, children who stutter will be compared to their normally fluent peers on spontaneous speech rates, testing the hypothesis of no difference. Secondly, within the each talker group, we will compare the phonetic intervals (PIs) of fluent words and inter-word pauses

(IWPs) that characterize disfluent utterances to those PIs and IWPs that characterize fluent utterances. High quality recordings will be collected from three- to five-year-old children and analyzed acoustically using the Kay Elemetrics Computerized Speech Lab.

Jane Wiedmeyer, Jennifer Johnson, Kelly Lessman

Faculty Advisor/Collaborator: **Larry Solberg**

The Predictive Value of Acoustic Measures of Vocal Pathology

This study determined which of six measures of frequency and amplitude variability best predicts vocal pathology. Voice samples of 50 female subjects (i.e., 25 with normal voices and 25 with vocal nodules) producing the vowel /a/ were analyzed with a Computerized Speech Lab. A stepwise discriminant analysis (SPSS) of the data was completed. Two variables entered into the analysis (i.e., amplitude perturbation quotient and fundamental frequency). The combination of the two variables correctly classified 80% of the subjects (i.e., 88% of the normal subjects and 72% of the voice-disordered subjects). With only amplitude perturbation quotient entered into the analysis, 76% of the subjects were correctly classified (80% of the normal subjects and 72% of the voice-disordered subjects). Based on this research, amplitude perturbation quotient appears to be the best commonly used acoustic measure for predicting vocal pathology.

Curriculum & Instruction / Foundations of Education

Paulette Sampson

Faculty Advisors / Collaborators: **Tamara P. Lindsey, Katherine A. Rhoades**

Illuminated Shadows: Privilege, Policy, and Diversity in Education

This project examines the responses of two groups of undergraduate students to classroom activities which address issues of diversity. Participants also were involved in designing a hate crime policy for a school district. Narrative data that inform the analysis were derived from class projects, class observations, and interviews with education majors in two sections of FED 385, Social Foundations of Human Relations, during the 1999-2000 academic year.

English

Natalya Kaganovich

Faculty Advisor/Collaborator: **Asha Sen**

Images of Home in the Works of South Asian Immigrant Writers--Bharati Mukherjee and Chitra Divakaruni

Alienated by their otherness from both the Indian and the American communities, South Asian American writers are in need of finding a means of communication. As most of their writings are meant for the American audience, they appropriate the American stereotypical views on India and the Indian community for their works. Such appropriation is a way of trying to become part of the American society, to be accepted as its legitimate members. In my project, I analyze how such stereotypes function in the works of Bharati Mukherjee and Chitra Divakaruni.

Kimberly Newport

Faculty Advisor/Collaborator: **Erna Kelly**

Margaret Cavendish: A Modern Edition of Two Plays and An Annotated Bibliography of Secondary Sources

Recent scholarship on seventeenth-century writer Margaret Cavendish has made apparent the need for modern scholarly editions of her work. Although her epistolary and science fiction novellas have been reprinted in recent years, more than a dozen of Cavendish's plays are still out

of print. Therefore, one of the aims of our project has been to produce a modern edition of two of Cavendish's plays. Our research also involved completing for publication an annotated bibliography of secondary sources, which covers more than 100 articles and books about Cavendish and her writings for the past 100 years. Both publications, the plays and the annotated bibliography, will be valuable resources for the growing number of Cavendish scholars as well as for teachers of English literature and their students.

Management & Marketing

Dmitry Yarushkin

Faculty Advisor/Collaborator: **Thomas Bergmann**

Comparative analysis of pension plans in Russia and the U.S.

The objective of this paper is to consider the superannuation schemes presently working in Russia and in foreign countries and to develop recommendations on theoretical and practical application of foreign experience when creating a new superannuation scheme in the Russian Federation. Retirement insurance is an integral part of social security and therefore should be considered within the package of other measures of social security as a complex arrangement of endowment for citizens after their retirement. The paper is divided into three chapters. The first one considers principles of social protection in Western countries and provides a retrospective look on development of this system from ancient times until modern days. Retirement insurance, in particular, is examined to provide reader with knowledge of European pension system and its various kinds. The second chapter analyzes the U.S. pension plan. The American experience has been appealed to, first, because the American pension plan has succeeded in the creation of high welfare for an ordinary American pensioner. Second, the Russian proposed reform of the private retirement insurance, is largely based on the decentralized model adopted in the U.S. The third chapter provides detailed information about the superannuation scheme of the Russian Federation, as well as the ways and methods to reform it at its present stage. This paper is the first to collect and analyze odd bits of information both on various pension plans abroad and on the present status and methods to reform the superannuation scheme in the Russian Federation.