PROCEEDINGS OF THE FIFTH ANNUAL UNIVERSITY OF WISCONSIN–EAU CLAIRE STUDENT RESEARCH DAY

April 28-29, 1997

Center of Excellence for Faculty and Undergraduate Student Research Collaboration

Office of University Research
The UWEC Student Research Day is supported by funds from the UWEC Foundation. Grants supporting Faculty/Student Research Collaborations are made possible through funds provided by the Undergraduate Initiative of the University of Wisconsin System, the UWEC Foundation, and the University of Wisconsin-Eau Claire.

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## Schedule of Events

**Monday, April 28, 1997**

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<td>Students Set Up Posters</td>
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<td>9:30-10:00 am</td>
<td>Judges Orientation</td>
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<td>Noon-1:00 pm</td>
<td>Judges Luncheon</td>
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<td>3:30-5:00 pm</td>
<td>Annual Faculty/Academic Staff Grants Reception (Student Research Day Presenters are invited to attend beginning at 4:00 p.m.)</td>
<td>Dulany Inn</td>
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<td>4:30 pm</td>
<td>Announcement of UWEC Student Research Day Awards</td>
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**Tuesday, April 29, 1997**

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<tr>
<td>8:00 am-Noon</td>
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This project culminated in a hands-on workshop which was presented at the National Art Education Convention in New Orleans, Louisiana, on March 23, 1997. It was also presented at the Wisconsin Art Education Convention hosted by UWEC on April 11, 1997.

The first half of the workshop was an opportunity for participants to explore an ancient method of decorating paper using colored paste. During the second half of the workshop, the participants made three book structures using decorative paste papers. Participants received a curriculum resource guide for paste paper and bookmaking in the classroom and a beautiful selection of handmade paste papers for bookmaking while their own paper was drying.

Paste paper is made by applying brightly colored paste to paper and then working it with mark-making tools to form abstract or patterned images. The immediacy of this process produces fascinating and beautiful effects that gives the participants confidence in their artistic ability and offers the opportunity to expand their ideas through experimentation.

The book structures that were taught include: (1) the landscape book (2) the flag book and (3) the embellished meandering concertina. These books were not created to convey words, but rather are to be enjoyed for the aesthetics of their individual components.

The making of paste paper books naturally lends itself to meeting requirements in the National Standards and to the team teaching and interdisciplinary approaches used in education today.

Kari Grosser, Elizabeth McDermott (96)
Faculty Adviser/Collaborator: Mike Weber
Building a Raku Kiln

The building of a Raku Kiln was a project designed to expand the cultural and artistic resources of the students and faculty of UWEC. It involved the research, design, and construction of a kiln specifically for the Raku firing of ceramics. Raku is an ancient glazing technique used for the traditional Japanese tea ceremony. The technique involves removing the pieces from the kiln while still hot and allowing them to reduce in bins of organic materials (leaves, sawdust, etc.). The expansion of ceramic technique outside of the typical electric kiln firings is enriching and interactive. The students of the advanced and beginning ceramics class constructed the kiln in February. It is already enabling us to produce vivid and exciting pieces.

James Whitworth (98)
Faculty Adviser/Collaborator: Jennifer Shaddock
Anthology of First-Person Narratives by 19th Century British Missionaries in Africa

The purpose of this project was to compile a short anthology of excerpted first-person narratives by British missionaries in Africa for English 378: Culture, Ideology, and the British Commonwealth. In addition to the classroom designed anthology, an annotated bibliography was compiled in the hopes of producing a more complete, and possibly publishable, resource for both teachers and students involved in the exploration of Colonial ideologies during Britain’s colonization of Africa.

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Music and Theatre Arts

Todd Schendel (99)
Faculty Adviser/Collaborator: Rodney Hudson
Research on Italian Trombone Literature

Abstract provided with poster presentation.

Communication and Journalism

Jason Voiovich (28)
Faculty Adviser/Collaborator: Joseph Giordano
Public Relations Implications of the Olean Campaign: An Ideographic Analysis of Proctor and Gamble’s Olean Advertisements

How do you convince the American public to eat something proven to cause unpleasant and potentially dangerous side effects? That was exactly the rhetorical problem that Proctor and Gamble faced with its fat substitute Olean.

This research examines print newspaper advertisements for Olean using McGee’s Ideographic Analysis. The sample comes from major newspapers in the four U.S. test market cities dating from September...
The other part of the study was to analyze the population characteristics and labor force composition of Wisconsin counties to develop a comprehensive explanation for the existence of the income differentials. This part of the project used census and input-output data to look for the relationship between the variables and per capita income.

Lyubov Babetskaya (64)
Faculty Adviser/Collaborator: Edward Young
Income Distribution Within U.S. Metropolitan Areas and States

The project uses 1980 and 1990 census data to compare measures of income distribution in Midwest Metropolitan Statistical areas. The results are interpreted based on the urban/rural population mix in the MSAs and the percentage of workers in various industries.

The measures of income distribution indicate that Wisconsin metropolitan areas have a more equal distribution of income than those in other Midwestern states and much more equal than in Southern states.

Rita Erpelding (68)
Faculty Adviser/Collaborator: Wayne Carroll
Econometric Analysis of Recycling Programs

The focus of this research is to examine what factors impact the cost of community recycling programs in Wisconsin. The data were gathered from the communities’ reports for the Department of Natural Resources over a four year period from 1992 through 1995. These reports include over 100 descriptive variables about each of the programs and their service to communities, such as whether curb or drop off collection, the number of recyclables collected, and the size of the population that the program serves. To assist in comparing the various communities, additional information about the income levels, education levels, and density within each community was gathered from the 1990 Census. The analysis uses both linear and logarithmic least squares and two stage least squares regressions to explain the differences in recycling costs between communities.

Jennifer Kothbauer (66)
Faculty Adviser/Collaborator: Diann Benesh
Identification and Evaluation of New Deal Programs Established in Eau Claire

Government intervention is often a source of debate in political, economic, and academic arenas. Analyzing the economic impact of the New Deal, the first large scale example of a growing role for government, will shed light on the current debates. Though the 1930s
seems far in the past for many college students, the significance of the Great Depression, the resulting New Deal Programs, and government intervention has affected many students both directly and indirectly. Results of the New Deal Programs can be found across the nation. Identifying these projects in the Eau Claire area, and their impact on the people and economy, will help students and general members of the community to better understand the impact of government intervention in the economy.

Mark Miller (69)
Faculty Adviser/Collaborator: Maria DaCosta
Township-Village ENterprises

Township-Village ENterprises (TVEs) have played an important role in the development of the Chinese economy. By establishing and maintaining these new enterprises, the Chinese have developed a highly successful organizational structure. This paper will focus on the history of TVEs, their accomplishments, their current status, and will include a discussion of TVEs prospects. An econometric model will be used to address some of these issues.

Vyara Plugchieva (63)
Faculty Adviser/Collaborator: Rose-Marie Avin
The Changing Political, Social, and Economic Status of Women in the Post-Communist Central and Eastern European Countries

The fall of the communist regimes in the late 1980s marked a number of changes in the Central and Eastern European countries (CEEC). While the economic and political transformation is a major topic of discussion both inside and outside these countries, little attention is given to women's issues. This research project studies the impact of the new developments in the region on the socioeconomic status of women and provides an understanding of their role in the new society. After a brief historical overview, the paper analyses the following issues: women's participation in the political decision-making process, women's position in the labor market, employment opportunities for women, women's life choices, the social welfare programs, paternalistic attitude in society, and the role of feminist organizations in shaping society's gender-consciousness. The project also presents the concept of the contemporary woman in Bulgaria, analyzing her image in society, the problems she encounters today, and the possible ways she can acquire equality. Finally, the paper discusses the possibilities of expanding the development of women's issues in these countries by the introduction of women studies programs in higher education.

John Will (67)
Faculty Adviser/Collaborator: Wayne Carroll
Forecasting Trends in Regional Economic Growth

"Forecasting Trends in Regional Economic Growth" involves developing econometric models that describe time-series data. The focus of the project is using the Box-Jenkins method (ARIMA models) to forecast economic data for the Chippewa Valley. Forecasts include confidence intervals about the point estimate based on the standard error of the model. Time series analyzed include employment and real GDP. Research requires application of statistics, including t-statistics, F-statistics, Durbin Watson statistics, standard error, $r^2$, adjusted $r^2$, as well as knowledge of such concepts as autocorrelation and stationarity.

Foreign Languages
Pahoua Yang (30)
Faculty Adviser/Collaborator: Thomas Upton
Native Language Maintenance and Shift of Hmong-Descent Children

While there is a significant body of literature which highlights the advantages associated with bilingualism, cognitive and social, there is little doubt that there is a steady and persistent influence on Hmong children toward using English as their primary language while neglecting development of their native language, Hmong. The goal of this study is to provide a preliminary investigation of the stages by which this shift occurs. By looking at the level of bilingualism that children have at various stages in the immigration process, it is hoped that we will gain a clearer picture of how and why children maintain or lose the ethnic language of their parents. The primary objective of this study is to investigate the rate of shift in language preference among Hmong children.

Geography
John Barbey (58)
Faculty Adviser/Collaborator: Ingolf Vogeler
Foreign Place Names in the United States

Purpose: determine presence and frequency of foreign place names in the U.S.
I. compare and contrast three different data sources
II. map the frequency found in the data
III. examine more closely other important cities and map the results
IV. present the results in a poster session at the UW Student Research Day
The purpose of this project was to conduct a simple nearest neighbor analysis of fast food restaurants along I-35 from the Twin Cities to Dallas-Fort Worth. Clusters were examined at three different scales: (a) major metropolitan patterns (b) small-medium city patterns and (c) isolated interstate interchange patterns. Three primary hypotheses were tested: (1) that a "typical Interstate interchange cluster" typology can be derived (2) that the often stated "copy cat" relationship between McDonalds and Burger King chain locations can be statistically validated using nearest neighbor measures and (3) significant differences exist in fast-food cluster typologies between northern and southern metropolitan areas.

Holly Hansen (37)
Faculty Adviser/Collaborator: Brady Foust
Agricultural Specialization and Water Use in California's Central Valley

The purpose of this project is to examine the relationship between agricultural specialization and irrigation water use in the Central Valley of California. Data were obtained from the 1992 Census of Agriculture at the Zip Code Level. A series of maps of water usage and crop specialization were constructed using a Geographic Information System. The results were analyzed using both visual comparisons and simple statistical techniques.

Cathi Jones (38)
Faculty Adviser/Collaborator: Brady Foust
Impacts of Agriculture on the Water Resources of the Salinas Valley

The purpose of this research project is to analyze the effects of farming practices on the water resources of the Salinas Valley in California. The Salinas Valley is a largely agricultural region that depends on the widespread use of fertilizers and irrigation to support and enhance production. In the last few decades, cities in the valley have been experiencing problems meeting drinking water standards, groundwater levels have been decreasing, and sea water intrusion has increasingly become a problem in the northern end of the valley. The hypothesis tested for this analysis is that in the last 16 years, nitrate levels have significantly increased, groundwater elevation has significantly decreased, and in the last 50 years the seawater intrusion front has moved significantly further inland. Groundwater monitoring data was used to map nitrate levels and groundwater elevation for three different water years over a span of 16 years and chloride levels over a span of 50 years.

Brian Meyer (39)
Faculty Adviser/Collaborator: Brady Foust
Winery Location and Traffic Flows in the Sonoma and Napa Valleys

The purpose of this project is to analyze the traffic flows in the Napa and Sonoma Valleys. These traffic flows will be mapped to extract areas with traffic problems. It is assumed that seasonal (tourist) traffic flows are a major source of concern in the Wine Country. Road capacities and expansion possibilities will also be examined.

Brian Meyer, Shawn Streif (106)
Faculty Adviser/Collaborator: Sean Hartnett, Terry Classen
UW-Eau Claire Campus PhotoMap

This research involved the construction of a new UWEC Campus PhotoMap that will be mounted in large size map cases on campus. This new map is based on large scale aerial photos of the campus taken in the summer of 1996. The photos were scanned and edited in Adobe Photoshop, and then text and symbolization was added in Adobe Illustrator. Inset Photomaps of upper and lower campus were also created. This presentation includes draft versions of the new map; comments and suggestions on the map's design will be solicited.

Jana Minnick (62)
Faculty Adviser/Collaborator: Brady Foust
Spatial Analysis of Recreation Areas and Income Distribution in San Francisco

Income can be directly related to recreation availability. The hypothesis of this project maintains that park frequency will increase as mean annual income increases. The purpose of this project then is to study the relationship between recreation and income using both hard copy and electronic information. Mean annual income will be studied, with U.S. Census data for 1995, at the census block group level using Geographic Information Systems. Park information, provided by the San Francisco Recreation and Parks Department, including location, will be mapped. This will allow analysis to show how income affects recreation. Reports indicate that San Francisco maintains one of the most successful recreation departments in all major U.S. cities. How this factor affects recreation areas in lower income neighborhoods will be considered, as will annual expenditure per resident. Annual maintenance costs at neighborhood
parks will then be compared. This analysis will show the bias that lower income neighborhoods experience.

Jennifer Robinson (57)
Faculty Adviser/Collaborator: Brady Foust
The Influence of Spanish Culture on California Toponyms

This project is intended to analyze the influence which Spanish culture has had on the naming of places in California, the areas where Spanish influenced placenames occur in a high frequency, and to examine the possible cultural and physical factors which attribute to these high concentrations. The main hypothesis of this project is that the density of Spanish placenames will occur in high concentrations near the Spanish missions of California, and decrease in frequency with distance from the core of mission influence. The overall distribution of Spanish influenced placenames will be analyzed at the state level using data from the Geographic Names Information System (GNIS) database. This data was imported into a Geographic Information System (GIS) and then mapped by smaller sections located directly around areas of high concentration.

Andrew Selk (106a)
Faculty Adviser/Collaborator: Brady Foust
Retail and Economic Structure and Ethnicity in Los Angeles

The purpose of this project is to identify the major ethnic regions of Los Angeles, to identify retail structures in those regions, and to find characteristics of the two in each area. The hypotheses of the project are that each ethnic region contains different retail structures from the other and that income also influences the structure. The ethnic groups chosen are Asian, Black, Hispanic, and White. By using both Geographic Information Systems and Standard Industrial Classification information, very specific areas in Los Angeles can be studied to provide more detailed and accurate results. A better understanding of the retail structures in these diverse areas will allow better understanding of the ethnic regions themselves.

Tsutomu Tabei (107)
Faculty Adviser/Collaborator: Sean Hartnett
Chippewa River Bike Trail Map

This research involved the construction of a user's map of the Chippewa River Bike Trail. One side of the map consists of regional maps focused on the bike trail and the Chippewa River. This map illustrates the location of the trail, access points, and the surrounding road network. The back side of the maps includes large scale inset maps in a trip-tic format which focus on segments of the trail. These maps provide a more detailed appreciation of the trail's route and its surrounding Chippewa River Valley environment. This trail map was constructed with Adobe Photoshop and Illustrator software and integrates some digital ortho-photos. This presentation will showcase the maps and describe the methodology used to produce them.

Matthew Tessar (61)
Faculty Adviser/Collaborator: Brady Foust
The Impact of Elevation on Household Property Values for the City of San Francisco

The purpose of this project was to conduct an analysis of housing values and their relationship with elevation within the city of San Francisco. The primary hypothesis that was tested was that as elevation increases, property values in turn increase. Property values were collected at the census block group level and elevation values were calculated using U.S.G.S. Digital Elevation Models. Demographic data available from the U.S. Census was used to explain the visible trends as well as anomalies to the stated hypothesis. The analysis of the spatial distribution, relationship, and interaction between these factors was done using Geographic Information System software.

Kevin Thompson (56)
Faculty Adviser/Collaborator: Brady Foust
Going to Work in San Francisco and Los Angeles Counties

Los Angeles and San Francisco are two of the nation's largest and most prosperous cities. Despite being in the same state, the two cities are quite different. During its growth, San Francisco has consistently had one of the more developed public transit systems while Los Angeles has grown up around the automobile. This project looks at the way people get to work in each city using variables from the 1990 Census of the Population at the block group level and illustrates major differences. As part of the analysis, I will present certain demographic factors that may help to explain the patterns.

Anthony Viavattine (33)
Faculty Adviser/Collaborator: Brady Foust
Seismic Safety—Issues of Urban Planning in San Francisco, CA

This project explores the issues of urban planning in relatively high earthquake prone areas. San Francisco's rock and soil characteristics are primarily mud and fill, alluvium, and bedrock. These rock and soil types respond differently to seismic wave velocities causing potentially dangerous ground liquefaction. We will look at the land use planning of the city and determine the areas that would be strongly affected by seismic waves within the underlying material. Seismic
zation in San Francisco is affected by its underlying material, topology, and distance from the San Andreas and Hayward faults. Our goal is to make a correlation of “safe” areas where buildings may need earthquake support structures, and buildings that may be in need of earthquake insurance.

Michelle Winkels (60)
Faculty Adviser/Collaborator: Brady Foust
Changes in Wine Production and the Impact of Tourism in the Napa and Sonoma Valleys

This project will conduct a historical analysis of the changes in vineyard growth and production in the Napa and Sonoma Counties. In addition, data from selected vineyards will show the impact of tourism economically on the wine industry. By using data from the U.S. Census of Agriculture, AtlasGIS (Geographic Information Systems), other reading and information sources, the Napa-Sonoma area can be mapped and display these wine-producing regions and show the changes in wine production and consumption over time.

History
Jalil Hassan (59)
Faculty Adviser/Collaborator: Selika Ducksworth
White Students Perceptions of Blacks in Eau Claire

The researchers have found that there are some perception differences among UWEC students by college and gender. They have also found that the university’s diversity classes are overwhelmingly approved of by university students with a few exceptions again by gender and major. On the whole, while a distressing amount of students perceive race to be linked to skills, the majority of students’ surveyed expressed fairly tolerant and evidence-based perceptions of race on campus.

Management and Marketing
Tom Werthman (27)
Faculty Adviser/Collaborator: Kathryn Ready
An Examination of Organizational Communication Via the Internet

In the study of organizational behavior, the study of organizational communication is an important dimension. This project involves the study of how organizational communication is changing with the Internet. A classroom exercise is developed which calls for student involvement in contacting major corporations via the Internet in order to gauge the effectiveness of organizations embracing new communication technology. Using this model, students determine how organizations are using the Internet to improve their communication process. Hypotheses are developed and tested in response to the differences in content and response rates across industries. The results are used in class as a method of fostering class discussion concerning the levels of technology that are being employed by major corporations in their communication process.

Political Science
Dylan Lippert (105)
Faculty Adviser/Collaborator: Wesley Chapin
Explaining the Electoral Success of the New Right in Europe

Many advanced industrial democracies in Europe have experienced a vast increase in support for radical right-wing parties over the past two decades. The reasons for this are not yet completely understood. This seeks to add to our understanding about the phenomenon by testing key theoretical arguments regarding why people vote for these parties. A cross-national study of West European states will be undertaken to test various reasons for the electoral success of the “New Right” in Europe. The result of this work will provide important information to both academics and policymakers trying to understand why right-wing support occurs and how to effectively address this crucial issue.

Psychology
Jennifer Colligan (25)
Faculty Adviser/Collaborator: Karen Roper
Learned Helplessness: The Effect of Repeated Failures on Later Task Performance

The effect of repeated failures on the development of learned helplessness (LH) was investigated. LH is the feeling that one’s actions are inconsequential, or do not accurately predict outcome. The effect of LH was observed on a simple performance task. LH training consisted of the administration of noncontingent random reinforcement for performance on two types of identification tasks. The effect of LH was measured as the number of correct solutions on a later anagram completion task. It was hypothesized that after repeated failures in two distinct situations, helplessness would develop and fewer anagrams would be completed (as compared to a control group). Currently, a second experiment is being conducted concerning the effect of LH on memory for a word list.
Shelby Haschker, Molly Kolbe (36)
Faculty Adviser/Collaborator: Blaine Peden, Allen Keniston
To See Our Poster as Others See It

The goal of our study was to describe various aspects of the posters exhibited at last year’s Fourth Annual UWEC Student Research Day. Pairs of observers evaluated poster exhibits in terms of 7 characteristics of the title of the poster, and 7 characteristics of the layout of the poster. In addition, observers rated each exhibit in terms of overall appearance, comprehensibility to the general scientist, and likelihood of winning an award. We reported a descriptive analysis that indicates the percentage of posters that do and do not satisfy the various guidelines for quality posters. In addition, we discussed the implications of our study for those students and mentors who plan to present posters in the future.

Carolyn Heezen, Jennifer Hoffman, Brenda Kastner, Mindy Knieriem, Son Nguyen, Scott Ritter, Eric Schultz, Jason Stromberg (32)
Faculty Adviser/Collaborator: Karen Roper, Larry Morse
Methods of Teaching Behavioral Principles to Gifted and Talented Students

A program was developed by the Behavioral Science Research Group (BSRG) to educate middle-school gifted-and-talented students concerning basic psychological principles, specifically instrumental and classical conditioning. Five in-class lectures at a local Eau Claire middle school were combined with hands-on demonstrations of behavioral principles in a five-week instructional period. Two demonstrations were used to illustrate basic learning concepts in psychology.

Principles of classical conditioning were demonstrated in a goldfish experiment in which a goldfish was conditioned to approach a sound when it was followed by a food reward. Principles of instrumental conditioning were demonstrated using a laboratory rat in an instrumental setting in which the rat was shaped through successive approximations to press a bar for a food pellet reinforcement. At the conclusion of the five-week program, a survey was administered to determine students’ reaction to the program and to gauge the effectiveness of the instructional methods.

Psychology/Counseling
Trish Burgess, John Congemi, Desirea Heckendorf, Melanie Huber, Natalie Kinkel, Stacey Kolar, Jennifer Lignell, Jennifer McGuire, Lisa Rausch, Sue Reithel, Evan Stanelle, Heidi Verschay (34)
Faculty Adviser/Collaborator: P.J. Kennedy, Allen Keniston
Secular Trends in Patterns of Campus Alcohol Use

The College Alcohol Inventory (CAI) will be administered to a 10% random sample of UWEC students. The demographic section of this survey will include two questions about marijuana use. The researchers will examine the relationship between alcohol and marijuana use on campus. Results of this study will contribute to the growing knowledge about the usefulness of the CAI. Additionally, results of this study will provide information about the extent, patterns, and correlates of substance use at UWEC.

Faculty Adviser/Collaborator: Dennis Greene, Allen Keniston, P.J. Kennedy
Validity and Reliability Results of the College Alcohol Inventory

A cover letter, copy of the College Alcohol Inventory, Michigan Alcohol Screenin Test, retrospective drinking diary, and significant other rating college student volunteers. Correlation of data from these assessment tools provided an indication of the instrument’s validity. Reliability was assessed by retesting with the College Alcohol Inventory after a one month interval and correlating the results of the separate administrations. The results of this validity and reliability study meet professional criteria for publication of a previously completed research study using this instrument. Results are a necessary step in the background research needed for further studies.

Social Work
Dawn Erdmann, Michael McElwee (29)
Faculty Adviser/Collaborator: Don Mowry, Steve Tallant
Healthy Communities 2000

The purpose of this study was to gather information from Eau Claire county households with regard to human/social service needs. A proportional sample of households (N=760) was randomly selected from each of 18 geographical locations. 347 surveys were returned, resulting in a 45.56% response rate. This
response rate yields a 5% error rate and a 95% confidence interval. The data were coded and analyzed by undergraduate social work majors. The researchers hypothesized that differences would occur by gender and socioeconomic status with regards to selected variables such as the perception of alcohol and drug abuse. Results are presented along with implications for social work practice within the community.

**Sociology and Anthropology**

Kristen Ullstrup (31)
Faculty Adviser/Collaborator: J. Kenneth Davidson, Sr., Nelwyn Moore

Religiosity, Women’s Sexuality, and Guilt: Sexual Pleasure Revisited

Western religion has historically maintained punitive attitudes towards sexuality and bodily pleasure. The purpose of this investigation was to determine the relationship, if any, between degree of religiosity (defined by frequency of church attendance), women’s sexuality, and feelings of guilt.

An anonymous questionnaire was administered to 535 female undergraduates at a Midwestern university concerning their sexual behaviors and attitudes. Significant differences were found between lower degrees of religiosity and positive attitudes toward nonprocreative sexual activities such as oral-genital sex and anal intercourse. Sexual guilt towards masturbation and current sexual intercourse were correlated with higher degrees of religiosity. No significant differences were found with respect to religiosity and physiological or psychological sexual satisfaction, nor current level of sexual adjustment.

It is imperative that increased attention be given to educating children and adolescents about the pleasurable aspects of sexuality. With such education, traditional punitive attitudes towards bodily pleasure may slowly begin to change, leading to healthier expressions of sexuality.

**Women’s Studies**

Sara Dahlke (65)
Faculty Adviser/Collaborator: Katherine Rhoades

Education Pays: Current Perspectives on Women, Poverty, and Higher Education

The Research Day project that will be submitted is the research based on the Faculty/Student Research Collaboration Grant entitled “Current Perspectives on Women, Poverty, and Higher Education: The Impact of Federal and State Welfare Reform on Post-Secondary Educational Opportunities.” We will summarize the research to date that talks about the benefits of education for low-income students and the effects of recent welfare reforms on participation in higher education. We will draw from two databases: (1) A statewide survey involving 740 women from throughout WI. These women are currently receiving or have recently received AFDC. (2) A campus survey. We will then include our conclusions and recommendations.

**Business and Professional Studies**

**Adult Health Nursing**

Mei Chang, Sandra King, Jill Quam, Sue Thiry, Anne Zarembo (43)
Faculty Adviser/Collaborator: Joan Stehle Werner

Living and Coping with Cancer: Women’s Experiences

Despite great strides in cancer research and treatment, this disease is still the second leading cause of death among United States citizens. In women, breast and gynecological cancer are the most frequent types, and one out of every nine American women will develop breast cancer in her lifetime. The purposes of this exploratory and phenomenological pilot study are to explore and describe the experience of living and coping with cancer. A sample size of at least ten is sought. To date two women have participated in the study, obtained through collaboration with the Regional Cancer Center at Sacred Heart Hospital. Participants are being interviewed using open-ended questions centered around four main topics. These topics include: stressors and crisis periods, coping and quality of life, spirituality, and sense of meaning (or coherence). Tape recorded interviews are being transcribed to extract themes through qualitative analyses.

Mei Chang, Jennifer Kampshoer, Sandra King, Heidi Papenfus, Jill Quam, Sue Thiry, Anne Zarembo, Michelle Zarembo (42)
Faculty Adviser/Collaborator: Joan Stehle Werner

Stress and Coping: Knowledge Synthesis

Stress and coping are phenomena which affect the health and well being of all people and have implications for the health of individuals, families, communities, and for society as a whole. This project focuses on library research and critical evaluation of nursing research in the areas of stressors in the stress and coping process for the five year period from 1991 through 1995. The results of this particular project will be combined with similar projects focusing on the constructs of coping; mediators; resources; and nursing.
Labor support behaviors are one of the most important nursing interventions during the childbirth experience. Documentation of labor support behaviors is essential in building the knowledge base of nursing interventions and the effectiveness of nursing labor support interventions toward positive birth experience outcomes. This pilot project will involve the development of a documentation tool for the laboring woman and her family members. Following the development of the documentation tool, it will be piloted in a local acute maternity labor and delivery unit. Input from the nursing staff will be utilized in revising the documentation tool for efficiency and effectiveness. This pilot project is important for future research in evaluating the effectiveness of nursing labor support interventions with women and their family members. Implications for this project can be applied to nursing education and practice.

Nicky Jordan, Carie Martin-Krajewski, Wendy West (41)
Faculty Adviser/Collaborator: Sue Peck
The Effectiveness of Therapeutic Touch for Decreasing Pain and Improving Functional Ability in Elders with Degenerative Arthritis

The purpose of the study was to determine if Therapeutic Touch (TT) decreased pain and improved functional ability in elders with degenerative arthritis, and if TT was more effective than progressive muscle relaxation (PMR) and routine treatment. 108 non-institutionalized subjects, age 55 or older, were randomly assigned to TT or PMR treatments. 84 subjects completed all six treatments. Visual Analogue Scales (VAS) for pain intensity and distress and the Arthritis Impact Measurement Scale (AIMS) were administered before treatment and after the first, third, and sixth treatments. TT decreased pain (t(46)=7.6, p<.001) and distress (t(44)=7.08, p<.001) and improved hand function (t(45)=2.81, p=.007), tension (t(45)=2.45, p=.014), mood (t(45)=4.67, p<.001), and satisfaction (t(43)=2.78, p=.008). PMR decreased pain (t(36)=6.58, p=.005) and distress (t(36)=6.90, p<.001), walking and bending (t(32)=2.10, p=.044), tension (t(32)=2.32, p=.027), mood (t(32)=2.82, p=.008), and satisfaction (t(30)=2.87, p=.007). There were no statistically significant differences between the TT and PMR groups on the pain measures. Mobility (F(1)=6.81, p=.01) and hand function (F(1)=3.83, p=.05) were significantly different between the TT and PMR groups. Better function was attained by the TT group.

Communication Disorders
Kristin Kleinsteiber (48)
Faculty Adviser/Collaborator: Linda Carpenter
What Makes Treatment “Phonological”?;

This project is designed to study the goals, goal attack strategies, and procedures and activities used in treatment of speech sound production disorders. Results will contribute to an understanding of the strategies used in treatment under a phonologically oriented theoretical perspective.

Lisa Mathison, Jennifer Reilly (47)
Faculty Adviser/Collaborator: Kris Retherford
Instructional Success of a Classroom Sign Language Program

The purpose of this study was to evaluate the instructional success of a program to teach 50 signs to 15 second graders who were interacting with a hearing and signing classmate. After a 15 week break students were tested on comprehension and production of the previously learned signs. Results were compiled and
analyzed to compare differences between receptive and expressive recall. Results confirmed success of the program by attaining a priori criterion.

Lisa Sanders (46)
Faculty Adviser/Collaborator: Lisa LaSalle
Relation of Children’s Temperament to Stuttering in Preschool Children

Twenty subjects consisting of parents with children ages two to seven years who stutter and those who have stuttered in the past but do not presently stutter will be compared to twenty subjects consisting of parents with children who have never stuttered, ages two years to seven years. The questionnaire distributed will contain questions focused on the child’s normal development, stuttering history, and the eight temperaments using a Preschool Temperament Questionnaire, adapted from Thomas and Chess (1977) with supplemented questions. The results of the questionnaire will be analyzed and given a weighed score which will correlate with temperament. Thomas and Chess (1977) have identified various aspects of temperament including activity, mood, threshold, approach/withdrawal, persistence, intensity, distractibility, and adaptability. In addition, research by Oyler (1996) has found that children who stutter appear to differ from children who do not stutter in terms of their temperament. The present researchers further hypothesize that children, ages two to seven years, who stutter will also show a positive correlation.

Chemistry
Kathryn Splan (50)
Faculty Adviser/Collaborator: Judy Lund
Elementary Hands-On Chemistry Activities

I am working with Dr. Judy Lund on a program entitled “Elementary Outreach,” which is being funded by a grant from the Institute for Chemical Education. The objective of the program is to introduce chemistry to elementary school students through hands-on activities. To do this we are developing several kits of activities that the students can do in small groups and, by organizing teams of UWEC students, present them to the schools. In addition we are able to give the teachers some background and ideas to help them include more chemistry related topics in their curriculum. We have also set up a laboratory at the University where students can come to work on activities. Because we have a lab solely for this purpose we are able to leave the activities set up for longer periods of time and can therefore accommodate more students and a wider spectrum of activities. Through this grant we hope to increase the amount of chemistry taking place at the elementary school level and provide students with an interest in chemistry and science in general.

English
Noelle Ambrose, Shannon Galindo, Peggy Lecheler, Brenda Wensel (53)
Faculty Adviser/Collaborator: Karen Peterson Welch
Improving Integration of the English Composition Lab and First-Year College Composition

As four experienced writing tutors, we helped determine ways in which the UWEC English Department Composition Lab could be more fully integrated into the English 110 classroom. Through our work with participating English faculty (C. Fairbanks, T. Hirsch, G. Hochstein, and A. Rubrecht), we examined our own tutoring methods from both theoretical and pedagogical perspectives. We worked with writing students both within and outside of the English 110 classroom, participated in bi-weekly discussion sessions with our adviser (K. Welch), reflected on our experiences through weekly journal entries, and conducted student surveys and faculty interviews at the end of the semester. Working together to compile and analyze the data to determine the effectiveness of this enhanced integration of the classroom and the tutorial enabled us to engage in empirical research as well as to gain theoretical and practical assessment of our work as writing tutors.

Family Health Nursing
Marcia Manz (45)
Faculty Adviser/Collaborator: Susan Moch
Practice Research in New Zealand

It has been reported that there is a gap between nursing research and practice both in the United States and New Zealand. Nurses in New Zealand have implemented projects to decrease the research practice gap. This is a descriptive look at what nurses in New Zealand are doing to close the research gap.

Mathematics
Lori Lofquist (55)
Faculty Adviser/Collaborator: Andrew Balas, Joan Jones
College Algebra, Technology, and Cooperative Groups

Three key elements allowed achievement of the several goals with which we began to plan the curriculum for Math 110, College Algebra: the text “Earth Algebra, College Algebra with Applications to Environmental Issues,” creation of an interdependent and cooperative learning environment, and emphasis on student responsibility for learning and classroom direction.
Research centered on models of successful programs which are directed at teaching women and minorities. Our conclusions led us to focus the problems, projects, teaching, and structure around an emphasis on the communication of ideas to solve real life problems about global warming.

Student management teams were created to provide a direct link to the direction of the course material. Cooperative teams were designed to ensure all voices were heard and ideas exchanged. The class was also team taught to provide a working model of collaboration in the learning environment.

Further assessment is being planned including attitude surveys and narratives.

Michael Toland, Matthew Vanderloo (54)
Faculty Adviser/Collaborator: Gwendolyn Applebaugh

Computer Laboratory Intervention in Math 245

Introductory Statistics, Math 245, has a computer component to enhance statistical thinking. In the past this particular computer component has caused anxiety for some of the students. During the Fall term of the 1996-97 academic year the faculty researcher taught three sections of Math 245. The two student researchers were the Friday computer laboratory assistants for one section. The other two sections did not have laboratory assistants. All sections had the same in-class instructions and assessments. The researchers hope to demonstrate that computer laboratory assistance did enhance statistical thinking by reducing the anxiety that some students experience.

Music Therapy

Angela Fabian (51)
Faculty Adviser/Collaborator: Lee Anna Rasar

Music of Nashville: Therapeutic Applications for Healing

A research survey was mailed to Music Therapists to find out how the music of Nashville was used in a clinical setting. Results were collected and discussed at the National Music Therapy conference in Nashville. Activities and ideas generated from the survey were cross sectioned by population to further illustrate the therapeutic value of this music.

Jessica Lichty (52)
Faculty Adviser/Collaborator: Lee Anna Rasar

Development of Academic Content/Performance Standards for Music in Special Education

Jessica Lichty and Lee Anna Rasar developed academic content performance standards for the area of music in special education. Goals for each exceptionality were examined to determine appropriateness of the arts standards. Following a comparative study of goal areas and performance abilities, a decision was made to either keep, delete, or revise each standard based on applicability to exceptionality.

Karen Stammer (100)
Faculty Adviser/Collaborator: Lee Anna Rasar

Effectiveness of Videolog to Track Interaction Responses

This project involves a music therapy student in reviewing videotaped sessions of music therapy with an autistic teen to document: musical stimulus-response pairings of behaviors; step-by-step development of client’s ability to match pitches, melodic contour, and rhythm patterns presented to him; interactive responses of client across semesters and across different student music therapists; amount of repetition and types of stimuli needed to elicit meaningful communication with environment in musical setting either progress, maintenance of skills, or regression between semesters in area of client interaction to musical stimuli; music therapy approaches or techniques that appear to have been unproductive in eliciting interaction responses; and developmental milestones reached in the process of communication development. The student will prepare a videolog of client’s responses by chaining together related segments of videotape from music therapy sessions across a four-year period. Data collected will be analyzed to assist in future programming with this client and will be presented at a national conference for music therapy.

Natural and Physical Sciences

Biology

Karen Albrecht, Kelly Hosley (20)
Faculty Adviser/Collaborator: Wilson Taylor

Trichome Ultrastructure of the Carnivorous Plant Pinguicula vulgaris

The butterwort, Pinguicula vulgaris, is an interesting plant because it can catch its own lunch. This carnivorous plant has adapted specialized hairs and glands called trichomes that detain insects, while producing digestive enzymes that allow the plant to absorb the insect’s nutrients.

To study the trichome structure, light microscopy and electron microscopy were utilized. With preliminary studies using light microscopy, we found glandular
The human immunodeficiency virus (HIV) specifically infects human T lymphocytes and macrophages. Infection involves integration of the viral genome into host cell chromosomes. This integration step is an obligatory one in the life cycle of HIV and it is dependent on the action of integrase, the enzyme which integrates the viral DNA into the host chromosome. From its seat in the host chromosome, the viral DNA commandeers the host cell’s protein synthesizing machinery and induces it to produce thousands of new virus particles. This ultimately results in the destruction of the host cell. In order to integrate the viral DNA into the target chromosome, integrase must bind to specific sites on the viral DNA then bind to the target chromosome to complete integration. Currently, it is unknown which amino acid residues in integrase are responsible for specific DNA binding. In an effort to determine which amino acids are important, mutant integrase proteins are being generated. In these mutants, amino acid residues which are suspected to be involved in DNA binding have been altered. These mutants are being generated via oligonucleotide cassette mutagenesis of a synthetic integrase gene. The mutant proteins are then expressed in the bacterium *Escherichia coli*, purified, then assayed for the ability to specifically bind DNA.

**Kirsten Cahow (10)**  
Faculty Adviser/Collaborator: David Brakke  
*Limnology of the Lakes in the Ice Age National Scientific Reserve, Chippewa County, Wisconsin*

The Chippewa Moraine contains a high density of lakes, with a wide range of chemical and physical characteristics. The purpose of this project was to examine how geomorphology in the Ice Age Reserve Unit affects the morphology, hydrology, thermal structure and water chemistry of lakes in the area. Most of the lakes in the reserve are small seepage lakes with low conductivity and alkalinity. These lakes are compared to an outlier with much higher conductivity, related to the geomorphic conditions of the surrounding area. In addition, relationships between lake water quality variables and thermal structure were analyzed using multiple regression and compared with a larger data set of 31 lakes located on the moraine. The thermal structure of the lakes on the Chippewa Moraine is controlled primarily by cross-basin length and the transparency of the water column. Transparency is a function of water color due to dissolved organic carbon compounds and chlorophyll a concentrations.

**Chris Eberlein, Bill Keeton (77)**  
Faculty Adviser/Collaborator: Rodolfo Buiser  
*Generation, Expression, and Purification of HIV-1 Integrase DNA Binding Mutants*

The human immunodeficiency virus (HIV) specifically infects human T lymphocytes and macrophages. Infection involves integration of the viral genome into host cell chromosomes. This integration step is an obligatory one in the life cycle of HIV and it is dependent on the action of integrase, the enzyme which integrates the viral DNA into the host chromosome. From its seat in the host chromosome, the viral DNA commandeers the host cell’s protein synthesizing machinery and induces it to produce thousands of new virus particles. This ultimately results in the destruction of the host cell. In order to integrate the viral DNA into the target chromosome, integrase must bind to specific sites on the viral DNA then bind to the target chromosome to complete integration. Currently, it is unknown which amino acid residues in integrase are responsible for specific DNA binding. In an effort to determine which amino acids are important, mutant integrase proteins are being generated. In these mutants, amino acid residues which are suspected to be involved in DNA binding have been altered. These mutants are being generated via oligonucleotide cassette mutagenesis of a synthetic integrase gene. The mutant proteins are then expressed in the bacterium *Escherichia coli*, purified, then assayed for the ability to specifically bind DNA.

**Benjamin Frater (12)**  
Faculty Adviser/Collaborator: David Brakke  
*Vertical Migration of Chaoborus and Daphnia in a Stratified, Seepage Lake*

Zooplankton such as the microcrustacean *Daphnia* (which is roughly 1-2 mm in size) exhibit daily vertical migrations, especially in stratified lakes. This migration is typically at its highest during the night and lowest during the day, covering up to 4 m. The purpose of the migration is to avoid harsh midday sun and remain in the vicinity of its food source, phytoplankton. A much larger organism, *Chaoborus*, resides in the benthos during the day and migrates up into the water column at night, sometimes very near the surface, to avoid predation from fish. *Chaoborus* can withstand extremely low oxygen concentrations or anaerobic conditions, relieving its oxygen debt when migrating to oxygenated waters. Both migrations occur on a daily basis in Cather Lake in Northern Chippewa County, Wisconsin. On two occasions, June 8 and September 21, 1996, we took samples from Cather Lake every four hours to determine the vertical movement of *Daphnia* and *Chaoborus* in the water column. *Chaoborus* was present in its third and fourth instar, which feed on zooplankton. The purpose of this study was to describe the migration of *Daphnia* and *Chaoborus* and determine the interaction and potential predation on the zooplankton by *Chaoborus*.

**Marni Grage (78)**  
Faculty Adviser/Collaborator: Rodolfo Buiser  
*Generation, Expression, and Purification of a Leucine Zipper Mutant of HIV-1 Integrase*

The human immunodeficiency virus (HIV) infects human cells by integrating viral DNA into host cell chromosomes. The integration step is an obligatory one in the life cycle of HIV and it is dependent on the action of integrase, the enzyme which integrates the viral DNA into the host chromosome. From its seat in the host chromosome, the viral DNA commandeers the host cell’s protein synthesizing machinery and induces it to produce thousands of new virus particles. In order to integrate the viral DNA into the target chromosome, integrase must bind to specific sites on the viral DNA then bind to the target chromosome to complete integration. HIV integrase is thought to carry out these functions by forming a multimeric complex comprised...
of multiple integrase molecules. However, the mechanism by which these multimeric complexes are formed is unknown. HIV integrase is believed to contain a structural feature known as a leucine zipper. Leucine zippers are known to be involved in interactions between proteins. To investigate the possible role of leucine zippers in the formation of multimeric integrase complexes, mutant integrases, in which the leucine zippers have been disrupted, were generated. These mutant integrases were constructed by mutating a synthetic integrase gene via oligonucleotide cassette mutagenesis. These mutant proteins were expressed in the bacterium Escherichia coli, purified, then assayed for the ability to form multimeric complexes.

Chris Hawes, Craig Helsell, Xi Chen (18)
Faculty Adviser/Collaborator: Wilson Taylor
*Examination of Droseraceae using SEM and TEM*

Examination of the gland structure of Droseraceae (Sundew) was done using Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). Droseraceae is a carnivorous plant which has elongated leaves with long glands on them. The glands are sticky so when an insect lands on the leaf, it cannot escape. Once the insect is stuck to the leaf, the leaf curls up and digests the insect using proteolytic enzymes.

On average, the glands are 2 mm in length. The head of the gland is .25 mm in length and .20 mm in diameter. The range of magnification for SEM is 30x to 2000x; the range of magnification for TEM is 500x to 150,000x, which allows for a closer examination of the ultrastructure of the glands.

Brian Healy (15)
Faculty Adviser/Collaborator: Terry Balding
*Population, Movements, and Habitat Study of the Wood Turtle on the Eau Claire River*

*Clemmys insculpta*, the wood turtle, is a semi-aquatic turtle listed on the Wisconsin Threatened and Endangered Species list. A population of wood turtles was located on the Eau Claire River in L.E. Phillips County Park, Eau Claire County, Wisconsin. This study was conducted because of the need for information about the local population of wood turtles in the area, which is being considered for a sediment reduction program and a highway bi-pass. Habitat preference, home range, and activities were studied with two individuals using radio-telemetry, while a population estimate was made using a mark-recapture method. *Clemmys* preferred the bottomland hardwoods when terrestrial and lotic water, rather than lentic, when aquatic. The home ranges of the two radio-tracked individuals were 3.94 hectares (9.73 acres) and 6.83 hectares (16.87 acres). Turtles were buried or inactive most often when captured (26%). The population estimate was 32 total individuals with a 95% confidence interval of 25-42.

Susan Helgren (13)
Faculty Adviser/Collaborator: David Lonzarich
*Species-Area Relationship for Stream Invertebrate Communities*

An important question in conservation is whether large habitats provide more species than many small habitats. Answers to this question depend on knowing not only the nature of the relationship between habitat size and animal diversity, but also its underlying basis. For various reasons, invertebrate communities, that establish on rocky substrates of stream bottoms, are ideally suited for research on the habitat size-diversity relationship. In this study, we conducted an experiment to learn how habitat size influenced invertebrate colonization and community organization. Using ceramic tiles as “habitat islands,” we staked three different sizes of tiles in Fall Creek. The experimental design tested the Theory of Island Biogeography, which predicts that large islands (i.e., habitats) experience higher rates of species colonization and greater species diversity than small ones. Over a five week period in spring 1995, we monitored community- and species-level changes on each tile. Results for all tiles indicated: (1) accelerated colonization through the study (2) no differences in densities and (3) dominance by a small number of species. However, results also showed significantly higher colonization rates and species richness on large tiles. These results are consistent with predictions of Island Biogeography theory and support the view that large habitats provide space for more species than small habitats.

Brian Juran (70)
Faculty Adviser/Collaborator: Lloyd Turtinen
*Development and Use of a Sensitive Tumor Necrosis Factor Assay to Analyze Cytokine Expression in Cytomegalovirus Infected Cells*

A sensitive colorimetric tumor necrosis factor (TNF-α) assay based on the cytotoxic effects of bioactive TNF-α on the L929 cell line was developed in order to detect and quantitate bioactive TNF-α produced by monocytes in culture. Our sensitive assay utilizes the conversion of an XTT substrate to a soluble colored formazen product by mitochondrial enzymes in living cells. This assay is as sensitive and considerably less expensive than the typical ELISA method for TNF-α detection and quantitation. Using this assay, we investigated whether human cytomegalovirus Towne strain (CMV) infection can modulate the release of LPS
induced bioactive TNF-\(\alpha\) from THP-1 myelomonocytic cells. Infection of THP-1 cells with CMV prior to LPS induction yielded no significant difference in the amount of bioactive TNF-\(\alpha\) released from infected or uninfected monocytes cell cultures. However, cell density significantly influenced the amount of bioactive TNF-\(\alpha\) present in the monocytes cell supernatants, presumably related to uptake of TNF-\(\alpha\). In other preliminary studies, soluble TNF-\(\alpha\) inhibitors were detected in both CMV infected and uninfected fibroblast cell cultures. However, CMV infected fibroblasts did not release significantly more soluble TNF-\(\alpha\) inhibitors than uninfected fibroblasts as measured by inhibition of TNF-\(\alpha\) activity in our TNF-\(\alpha\) bioassay.

Erica LeMoine, John Schroeder, Michelle Solensky
Faculty Adviser/Collaborator: Paula Kleintjes
Methods for Assessing Balsam Twig Aphids and Their Potential Damage in Christmas Tree Plantations

The balsam twig aphid Mindarus abietinus Koch causes distortion and/or loss of needles on balsam fir. Christmas trees. Insecticides are often applied for control with little monitoring of population levels or their subsequent damage. To assist WI Christmas tree growers, we developed a foliage beating disc technique to detect numbers of aphid stem mothers before and during budbreak. We used visual counts of midcrown infested shoots for estimating aphid abundance post budbreak. Sample size analyses indicated that a minimum of 15 trees could be used to estimate either mean numbers of aphids or mean proportions of aphid-infested shoots. Correlation analyses between mean numbers of aphids or proportions of infested shoots and resulting mean proportions of undamaged shoots produced mixed results with the most significant and negative correlation between infested shoots and subsequent undamaged shoots \((r^2=-0.83)\). We also used a complete randomized block design with four insecticide subplot treatments (Imidacloprid, Diazinon, Azadiracticin, and no treatment) to test for effects upon aphids. There was no significant difference among mean numbers of aphids per subplot pre or post treatment. We also made paired comparisons between tagged and not-tagged Choose and Cut Christmas trees to evaluate public perception of aphid damage. There was no significant difference in damage between trees although measurements of tree shape significantly differed with the public preferring larger trees. Our results suggest that growers should monitor aphids pre-budbreak and limit chemical applications to trees with predictable levels of infestation (e.g. 2 stem mothers/disc results in 50% infestation) and that will be harvested for shipment rather than grown for Choose and Cut.

Christopher Novak, Nathan Philippi
Faculty Adviser/Collaborator: Wilson Taylor
Cellular Ultrastructure of the Surface Glands of the Carnivorous Plant Nepenthes

The goal of this study is to observe and differentiate the ultrastructure of surface glands in carnivorous plants, in particular, the pitcher plant. Classified in the genus Nepenthes, the pitcher plant’s glands will be observed using a scanning electron microscope (SEM) and a transmission electron microscope (TEM). The TEM will display a three-dimensional image of the glands; however, its resolving power is not as defined as the SEM. The grandular trichomes will be of greatest interest, since they contain the digestive enzymes which breakdown various insects for nutrients. Along with the work of two other groups who are studying Pinguicula and Drosera, we will be able to examine and detail the anatomical differences in grandular trichomes among three carnivorous plants.

Jerry Shadick
Faculty Adviser/Collaborator: David Lonzarich
Use of Artificial Structure by Lake Fishes

For many years management officials have used artificial structures in lakes to improve spawning and rearing habitats for fish. These artificial structures have proved their worth over the years. This poster deals with the results of a study on artificial half-logs for smallmouth bass (Micropterus dolomieui) nesting sites. This study was conducted during the summer of 1996 as a follow up to work done by the Department of Natural Resources in 1994. The WDNR had placed 108 half-log structures in Lower Long Lake in an attempt to increase the nesting structure for smallmouth bass. The goal of the study was to determine if smallmouth bass were using the half-log structures and to compare which structures (natural or half-log) the bass preferred as nesting habitat. The hypothesis tested was that smallmouth bass would use the half-logs where no other structure was available, but prefer to use natural structures when available. The conclusions of the study support this hypothesis. Half-log nesting sites were much more prevalent in open water areas.

Michelle Solensky
Faculty Adviser/Collaborator: Paula Kleintjes
Nest Success and Risk of Predation for Songbirds in Christmas Tree Plantations

In Wisconsin, Christmas tree plantations are often planted among hardwood forest fragments. Their value for songbirds is questionable because the plantations lack vegetative diversity, are regularly mowed, and receive pesticide applications. We investigated species composition and nest success of songbirds in two
Wisconsin Christmas tree plantations in May-August 1996. Nest densities and success rates for the plantations studied were 2.5 and 6.0 nests/ha and 0.20 and 0.55, respectively. These differences in productivity may have resulted from differences in vegetation structure, predator populations, or human activity within the two plantations. The plantation which supported a higher nest density and success rate was mowed less frequently and supported a more complex plant community. The 3 species whose nests were most frequently found were clay-colored sparrows (Spizella pallida, n=13), American robins (Turdus migratorius, n=9), and chipping sparrows (S. passerina, n=8). Nest success rates were higher among American robins than among either clay-colored or chipping sparrows (0.56, 0.38, and 0.13, respectively). Nests of American robins were significantly larger, built higher in trees, located in taller trees, and shielded by more foliage than nests of either sparrow species (ANOVA's; df=2,23; p<0.05). The results of an artificial nest component of this study revealed no significant correlation between predation and nest density or density gradient from the forest edge.

Katrina Wysocki (21)
Faculty Adviser/Collaborator: Anne Geraghty
Migration of the Mitochondria in Chlamydomonas reinhardtii Associated with the Induction of the CO2 Concentrating Mechanism

The unicellular green algae, Chlamydomonas reinhardtii, induces a CO2 concentrating mechanism (CCM) when cells grown in a CO2-rich environment (5% CO2) are transferred to an air (.03% CO2) environment. Many changes occur with the induction of this mechanism, such as mitochondrial relocation and the translation of new proteins. The CCM initiates a migration of the mitochondria from the central cytoplasmic regions to the periphery of the cell in the space between the chloroplast membrane and the plasma membrane. Cells arrested at 2, 4, 8, and 16 hours after induction of the CCM were examined via transmission electron microscopy and the mitochondrial relocation was observed as early as 4 hours after induction into an air environment. Translation of a protein named LIP-21 has been seen in the mitochondria at 24 hours after induction. This protein is present within the cytoplasm at approximately 2 hours; however, when LIP-21 becomes associated with the mitochondria and what purpose it serves the CO2 concentrating mechanism has yet to be determined.

Biology/Chemistry

Erin Herriot (14)
Faculty Adviser/Collaborator: Anne Geraghty, Robert Eierman
Assessing the Environmental Impact of the Baraboo Zoo Compost Pile

Oschner’s Park in Baraboo, WI, is a small zoo with an animal waste problem. The park composts the animal wastes generated; however, the compost pile sits directly on the ground and is located approximately 25 yards from the bank of the Baraboo River. Animal wastes are known to be a major source of phosphorus, which can enhance eutrophication in a river system. The goal is to provide information to the City of Baraboo that may convince them to make a permanent change in the way they dispose of their zoo animal wastes. Information is being gathered on alternate waste disposal systems in other Wisconsin zoos, the amount of phosphorous in the compost pile runoff and river water will be measured, and a model of the impact of these phosphorous compounds on the river system will be created. This information will be presented to the City of Baraboo in the form of a final report in June 1997. Results of a preliminary runoff water analysis have shown a significant increase in the phosphorus in the animal waste pile runoff compared to other runoff in the area.

Chemistry

Karen Albrecht, Shane Resch (79)
Faculty Adviser/Collaborator: Thao Yang
The Synthesis and Characterization of Human Atrial Natriuretic Factor

Atrial Natriuretic Factor (ANF) belongs to a hormonal system of great clinical importance. It is a circulating peptide hormone (28-amino acids) produced by the atria of the heart in animals. Its main biological function is to maintain a balance of body fluid and electrolytes through interaction with its receptor on the cell surface. This mechanism leads to the reduction of blood pressure and blood volume, and the excretion of excess sodium ion in the urine. In addition, ANF has other biological roles involving the inhibition of adenylate cyclase activity and the inhibition of DNA synthesis. We are interested to delineate these mechanisms by examining for potential nucleotide binding activity. This presentation will focus on the synthesis, characterization, and purification of human ANF in addition to initial nucleotide binding data and the possible influence of electrolyte concentration on the ANF conformation.
Fluorimetric Investigation of Complex Formation by Cyanine Dyes in Solution

Three representative, commercially available dyes, diethylthiacarbocyanine iodide (I), diethylthiadicarbocyanine iodide (II), and diethylthiatricarbocyanine iodide (III) have been studied and characterized by fluorescence spectroscopy. To date we have investigated perturbation of fluorescence by imidazole (IM) and benzimidazole (B) in methanol solution. In all cases fluorescence of the dyes was quenched by low concentrations of IM and B. With dyes I and II, dynamic quenching is impossible owing to short fluorescence lifetimes of the dyes; static quenching, i.e., 1:1 dye-quencher complex formation, is accordingly inferred. We inexpert the quenching of III similarly. At higher concentrations of either B or IM, fluorescence of II is strongly enhanced. The concentration dependence of the enhancement suggests 1:2 dye-quencher interaction. We infer formation of emissive ternary dye-quencher complexes in solution. Measurement of complexation constants indicated that both binary and ternary complexes are formed more strongly with B than with IM in all cases. This result is consistent with the hypothesis of π-complexation.

Non-Linear Programming Approach to Lower Bounds for the Ground State Energy of the Helium Atom

It can be shown that \( \inf\{H\Psi/\Psi\} \) is a lower bound to the ground state eigenvalue of the equation \( H\Psi=E\Psi \) where \( H \) is the Hamiltonian of the helium atom. For each trial wave function used the ratio \( H\Psi/\Psi \) was minimized with respect to the electron coordinates, and then that infimum was maximized with respect to the variable parameters in the trial wave function via a grid search.

Separation and Identification of Components in Eastern Green Mamba Snake Venom, Using Capillary Electrophoresis (CE) with UV and Electrochemical (CE) Detection

Eastern Green Mamba snake venom is a complex mixture of small molecules, proteins, and peptides including fasciculin, a potent acetyl cholinesterase (AChE) inhibitor. A separation of the venom has been developed using both CE-UV and indirect electrochemical detection with an AChE biosensor. First, the components are separated according to their charge/size ratio and are detected using UV. Then, an end column AChE/choline oxidase biosensor is used to indirectly detect AChE inhibitors. Acetylcholine is added to the run buffer as the substrate for the biosensor. The product of the enzyme reaction is hydrogen peroxide which is oxidized at the platinum electrode surface. When an AChE inhibiting component of the venom migrates over the biosensor, the substrate turnover is decreased. This negative response indicates the presence of an AChE inhibitor. One of the main challenges of this separation is the absorption of venom proteins and peptides to the capillary wall at the pH range used, 6-9, which is the working pH range for the biosensor enzyme activity. The following separation parameters were investigated: addition of an ion pairing agent phytic acid, concentration of the venom sample, separation voltage, and capillary type. The venom components were further investigated by MALDI-TOF mass spectroscopy.
Paul Pelzl (75)
Faculty Adviser/Collaborator: Fred King
Analysis of Integrals Required for the Two- and Three-Electron Atomic Problem

The objective of this research is to evaluate several types of difficult integrals which arise in the two- and three-electron atomic problems. These integrals are being examined primarily through numerical techniques, and checked through more conventional methods. All two-electron integrals have been solved, but some three-electron integrals require further examination.

Qinling Qu (76)
Faculty Adviser/Collaborator: Jack Pladziewicz
One-Electron Transfer Reactions of Tetrathiafulvalene with Alkylhydrazines

Our studies are intended to show how the structures of the hydrazines influence their reaction mechanisms. Tetrathiafulvalene, TTF, and its radical cation are of interest because of their redox properties in solution and in the solid state. Because the self-exchange rate constant for TTF is greater than the rate of diffusion in acetonitrile at 25°C, we have used the cross reaction between TTF and tetraisopropyl, iPr₂N₂⁺, to estimate it. After we obtained the self-exchange rate constant for TTF, we did a series of cross reactions between TTF and tetraalkylhydrazines, i.e. tetramethylhydrazine, Me₄N⁺, tetrapropylhydrazine, Pr₄N⁺. The self-exchange rate constants obtained for the tetraalkylhydrazines showed striking steric effects on the reaction mechanisms.

Laura Risberg (82)
Faculty Adviser/Collaborator: Cheryl Muller
New Sulfoxide Reagents for Selective Oxidation of Primary and Secondary Alcohols

It is very difficult to reliably oxidize a primary hydroxyl group in the presence of a secondary one, or to oxidize a secondary hydroxyl group in the presence of a primary one. We have explored modifications of the Swern oxidation that show that selective oxidations of one type of hydroxyl group in the presence of the other are possible. Two aspects of the reaction were most closely investigated. First, we used different sulfoxides, in place of the commonly used dimethylsulfoxide (DMSO), and have determined relative ratios of ketone or aldehyde product as a function of the sulfoxide structure. Second, we have studied the effect of different reaction temperatures, and different reaction times on the product ratios. Both of these effects are likely due to control of the equilibrium formation of different sulfonyl intermediates from the different alcohols.

Max Ruegnitz (74)
Faculty Adviser/Collaborator: Feimeng Zhou
Fast Scan Anodic Stripping Voltammetry in a Microflow System

In recent years it has been demonstrated that the utilization of microelectronics for stripping analysis can result in the miniaturization and simplification of the instrumentation, decrease of sample consumption, improvement of precision, and enhancement of sensitivity. However, a simple flow system incorporating microelectrodes that has high throughput, small sample consumption, and low detection limits has not been developed.

In this work, a flow-onto thin-layer electrochemical cell, incorporating Pt-based Hg microelectrodes is used for flow injection-fast scan anodic stripping voltammetry at micro-bore flow rates. The slow flow rates are uniformly altered and controlled utilizing a gas displacement pump. Flow injection is carried out with a low dead volume six-port valve. Excellent precision and detection limits have been achieved for the measurements of cadmium and lead at trace levels. Sample throughput and detection limits that are better than that obtained from other flow systems will be presented. Experimental conditions governing the analytical performance of this microflow system (i.e. scan rate, flow rate, Hg film thickness, and preconcentration time) will be discussed. In addition, potential use of this device for automatic analyses will be demonstrated.

Finally, anodic stripping voltammetry at Pt microelectrode-based Hg film will be compared to that obtained at Hg microelectrode produced at carbon fiber substrate electrode. The formation of some intermetallic compounds (e.g. that between Zn and Cd) can be prevented by using carbon fiber-based Hg microelectronic. It will be demonstrated, for the first time, that the Hg microelectrode formed in situ at the carbon fiber substrate electrode is hydrodynamically stable and suitable for routine stripping analysis.

Computer Science

William Hickey (110)
Faculty Adviser/Collaborator: Michael Wick
A Genetic Algorithm Approach to Course Scheduling

Genetic algorithms are intelligent search procedures based on the mechanics of genetics. The use of a genetic algorithm involves the representation of a problem as a genome. The genetic algorithm then creates a population of solutions and applies genetic operators such as mutation and crossover to evolve the solutions in order to find the best one(s). The primary
The objective of this research is to show that genetic algorithms are an efficient and effective approach to the course scheduling problem. The course scheduling problem involves the assignment of the faculty of a particular department to specific courses that are held at specific time units (i.e., 8 MWF), in specific rooms. Each schedule that is then rated according to a given set of parameters with the goal to produce a schedule maximizes a possible given rating. A genetic algorithm approaches the problem of course scheduling by using the principles of natural selection. First an initial population is created and the worst are discarded. The best are then “bred” with each other and some are mutated creating new members of the population. The whole process continues through generations, with the best genes being handed down to future generations. The successful design and implementation of a genetic algorithm approach to the course scheduling will render the construction of an intelligent course scheduling assistant feasible.

Aaron Laffin, Steven Hart (109)
Faculty Adviser/Collaborator: Thomas Moore

Ray tracing in a Distributed Processing Environment

Ray tracing is a method by which complex three dimensional geometric models can be visualized with high resolution computer graphics. The cost of this method is rather large when it comes to rendering time and processing power. Depending on the complexity of the model, single frames can be rendered in as quickly as several minutes or as slowly as several days. This problem is compounded when there is a need to render hundreds of frames for animation sequences. Traditionally these sequences are rendered frame by frame on a single computer. Due to the nature of the problem, ray tracing multiple frames lends itself wonderfully to a distributed processing environment. By processing sequences of frames in a parallel environment, the magnitude of the problem is decreased accordingly by the number of processors in the environment.

Brad Phelps (26)
Faculty Adviser/Collaborator: Jack Tan

Techniques for Addressing the Year 2000 Transition

Most programs written in the past will be encountering the Year 2000 transition problem in a few years. Those with two-digit representation of dates will be incorrectly interpreted by these programs. Efforts are underway to avert a potentially disastrous industry-wide software nightmare. In this paper, we address the problem by discussing various techniques for averting such a potential disaster.

Chris Plate (17)
Faculty Adviser/Collaborator: Jack Tan

DMASTER: Fault-Tolerant Recovery in Hypercube Systems

In this paper, we use the Distributed Recovery Block (DRB) scheme to provide fault-tolerance in hypercube systems. A flaw within the DRB scheme is the amount of redundancy involved in having multiple nodes within the hypercube performing the same operation simultaneously. Our approach, DMASTER, aims to reduce this redundancy, while at the same time preserve an optimal level of fault-tolerance. DMASTER is a scheme which designates one node of the hypercube as a master, and the rest as the slaves. Some nodes are kept free to be used in cases where one or more slaves become faulty. We also provide simulation and analysis to show that our algorithm is optimal.

Matthew Tessar (108)
Faculty Adviser/Collaborator: Thomas Moore

Parallel Optimization of Arc/Info 3-D Flythrough Sequences

Parallel Optimization involves the use of multiple computers across a network to concurrently solve complex, computationally intense problems. One such problem is the production of three dimensional visualizations of the earth’s terrain using Arc/Info. Arc/Info is a cutting edge Geographic Information System (GIS) that provides a programming language which allows for the development of network based applications.

The purpose of this project was to develop an Arc/Info application to produce computer animated flythroughs using 10 fully networked Silicon Graphics workstations in parallel. The rendering and animation of the results of GIS analysis in 3-D allow for more conclusive analysis to be performed than can be done with conventional 2-D models. The distributed system framework that was developed for this project can now be reused to accept other Arc/Info problems and solve them in a quick and efficient manner.

Trevor Williams (111)
Faculty Adviser/Collaborator: Jack Tan

EMC: Improved Multicasting for Faulty Hypercube Systems

In this paper, we describe an efficient interprocessor communication algorithm which performs message routing through a faulty hypercube network using the multicast (one-to-many) methodology. The proposed algorithm, EMC, allows for all possible optimal paths to be considered for message traversal while maintaining a bounded time complexity of $O(k2)$. This capability reduces the amount of traffic on the system to a near optimal amount. Because the problem is NP-hard, EMC uses a heuristic algorithm for
neighboring node distribution, and the results of our simulation border the optimal traffic cost for a multicast routing strategy.

**Geography**

Chad Bartz (121)
Faculty Adviser/Collaborator: Harry Jol

*Three-Dimensional Ground Penetrating Radar: Visualization of a Delta Using PC Based Software*

The Late Pleistocene Box Elder Creek Delta, Utah, is a classic fan-foreset delta dominated by steeply inclined (20-25 degrees) beds of gravel and sand. A 3-D ground penetrating radar (GPR) dataset (25m x 25m; total 2600 traces) was collected in the Brigham City Sand and Gravel Company pit to evaluate the benefits of obtaining a 3-D grid. The 3-D depositional framework allows for a more detailed geomorphic interpretation than widely-spaced two-dimensional profiles.

The three-dimensional dataset of the Brigham City Sand and Gravel Company pit will be used to create a 3-D model of the delta. With the use of the PC based software pulseEKKO and SLICER, it will be possible to view and analyze many different angles of the deltaic environment. The multiple perspectives created by SLICER will then be used to create a digital movie of the delta and the beds of gravel and sand within it. From these perspectives and the movie, a more comprehensive interpretation of the delta will be made.

Bryce Kelley (86)
Faculty Adviser/Collaborator: Garry Running IV

*Geoarchaeological Investigation of the Dell's Pond Ridged Field Site in Eau Claire, Wisconsin*

The purpose of this poster is to present baseline location, field mapping, soil description, and geomorphological information about a ridged field site located in Eau Claire, Wisconsin. William Bartlett, an important local historical figure, first reported the site to Charles E. Brown in 1913. Charles E. Brown was one of the first directors of the Wisconsin State Historical Society and remains an important figure in Wisconsin Archaeology. The site may be an Oneota ridged field. The Oneota culture is a widely recognized and important component of the archaeological record throughout the upper Midwest. These people occupied Wisconsin from 350 to 650 BP (years before present). Oneota were hunter/gatherers and also practiced sedentary agriculture. Despite its economic importance, their agricultural practices are not well-understood. They involved the preparation of ridged fields, a sophisticated but poorly understood cultivation technique. It has been suggested that ridged fields enhance soil fertility and provide protection from early and late-season frost. Few ridged fields have been subject to systematic, interdisciplinary analysis. No such analysis on ridged fields in northwestern Wisconsin or the Chippewa River Valley has been conducted.

The Eau Claire ridged field site is located on the north shore of Dell's Pond directly across the Chippewa River (north) from Mt. Simon (NW 1/4, NE 1/4, SW 1/4, Sec. 8, T27N. R9W). The site consists of three ridges and two furrows oriented from northwest to southeast. The original extent of the ridged field remains unknown. No contiguous occupation site has been identified. Age and cultural affiliation remain unknown. Despite previous assumptions about ridged field geographic distribution, the site is located in a low landscape position on the late-Holocene floodplain. Soils at the site are mapped as Carryville Loam (0-3% slope), a rich, fertile, well-drained soil formed under native prairie. It is subject to spring flooding and seasonal drought and modern agriculture requires management to reduce the impact of flooding, maintain organic matter content, and conserve moisture during the late growing season. At this site, ridged field agriculture may be a technological adaptation to solve similar problems. Planting surfaces (ridges) are elevated. Furrows collect flood-derived fine sediments and organic matter which may have been applied to the planting surfaces to enhance fertility and increase water holding capacity.

Eric Knauf (9)
Faculty Adviser/Collaborator: Garry Running IV

*Organic Carbon in Reseeded Prairie Soils at Muddy Creek Wildlife Area, Dunn Co., Wisconsin*

The purpose of this project is to determine if low soil organic matter is indeed the variable responsible for limited success of prairie restoration efforts at a test site in the Muddy Creek Wildlife Area. Wildlife managers are restoring native prairie vegetation as part of their efforts to improve habitat for the benefit of waterfowl and upland gamebird species. These efforts are expensive and receive limited funding. Currently, efforts to restore native prairie grassland vegetation at a test site in the Muddy Creek Wildlife Area, located in Dunn County, Wisconsin, are achieving limited success as compared to similar projects in Iowa. Preliminary reconnaissance suggest lower success may be related to fertility and organic matter content in local soils because spatial variability in A-horizon thickness and color value (field indicators of soil organic matter content and fertility) appear to mirror variation in prairie grass vigor. Darker, thicker A-horizons are qualitatively associated with thicker, healthier grass communities.
Preliminary laboratory analyses clearly show soil organic matter content, as a percentage of A-horizon mass, varies considerably across the tested prairie restoration site despite apparent topographic, sedimentologic, geomorphic, and crop history homogeneity. Nearest Iron Creek, organic matter percentages are as high as 3.36%. Organic carbon percentage drops off quickly away from Iron Creek to values nearer 1%. We believe that initially, restoration of native prairie communities in the test area will be most successful nearest Iron Creek where A-horizon organic matter is at or near 2%. Effective restoration is possible elsewhere on the site where current organic matter contents are at or below 1% but success will require further accumulation of organic matter in the A-horizon. Such organic accumulation in soils forming under prairie grasslands is relatively rapid but still requires years to decades. We recommend spatial variation in A-horizon organic matter content at future prairie restoration sites be determined beforehand so efforts can be made to increase initial soil fertility, by adding peat where needed, and “speed up” the grassland restoration process.

Amy Jo Steffan (85)
Faculty Adviser/Collaborator: Garry Running IV
Soil Genesis, Morphology, and Catenary Relationships in a Sandstone Bedrock-Controlled Landscape, Glenwood City, Wisconsin

The purpose of this project is to provide baseline soils data along a transect of the typical landscape in the Western Sandstone Upland, a large but relatively unstudied physiographic region of Wisconsin stretching from the St. Croix River to the Baraboo Hills. The impact of 19th and early 20th century agricultural land-use on soil erosion, flooding, stream hydrology, groundwater quality, and overall environmental degradation in the similar but geologically distinct landscape setting of the Driftless Area, the adjacent region to the south, is well-documented. However, little effort has been made to test the validity of this “model” in the Western Sandstone Upland. A landscape transect, or soil catena, sampling approach was employed because soil characteristics vary in a systematic manner depending on the integration of several formative factors. Slope position (landscape setting) is one of the fundamental factors controlling soil formation. In turn, soil morphology, texture, and chemistry play a major role in determining overall landscape sensitivity to land-use. Baseline descriptive and quantitative soil catena data is critical in assessing the possible impact of imminent land-use changes in the region given the current trend toward increasing intensification of rural land-use including industrialization and urbanization.

Preliminary results indicate that the upland soils are relatively thin. Horizonation in the upper portion of upland soil profiles formed in loess (glacioeolian sediments) indicates recent truncation by erosion and organic matter oxidation due to plowing or land clearing. Conversely, soil profiles on adjacent footelects have thicker accumulations of reworked loess, overthickened surface horizons, and cumulic A-horizons indicating recent additions of soil matter delivered from erosion upslope. It appears that Bt-horizons which developed over thousands of years are now relict. Instead, new soil morphology, commensurate with post-European land-use induced conditions are in the early stages of formation. The studied catena appears similar to those described in the Driftless Area which suggests that a return to land-use that includes widespread land-clearing and urbanization will result in increased soil erosion from uplands and slopes, landscape instability, and negative impacts on regional hydrology and environments. We recommend that the fragile nature of upland soils in the Western Sandstone Upland be considered in future regional development.

Greg Gruna, Travis Kloehn, Jana Minnick, Marco Shappeck, Donna Wenzel, Lisa York (114)
Faculty Adviser/Collaborator: Sean Hartnett
Constructing a Bathymetric Map for Pine Lake

The purpose of this project is to construct a more accurate bathymetric map of Pine Lake. For over 30 years, this lake has been used by the Biology Department for the purpose of research. The previous bathymetric information dates back to the 1940s, using a grid system. Global Positioning Systems, Geographic Information Systems, and depth sounders were used to construct a current map. The depth sounder and transect methodology produces a more accurate depiction of the lake bottom structure, and in turn, more accurate calculations of lake volume. Our presentation will compare the two lake mapping methodologies and present a side-by-side comparison of the resulting lake maps.

Geology
Bill Blaser (4)
Faculty Adviser/Collaborator: Robert Hooper
Alteration Along the Cambrian-Precambrian Boundary at Big Falls

Potassium rich fluids flowing along the Cambrian-Precambrian boundary have extensively altered both the chemistry and the mineralogy of the underlying Precambrian rocks. Mafic rocks near Big Falls, WI, that were originally composed of plagioclase (An₄₀-An₄₉).
The Upper Cambrian Eau Claire Formation in west-central Wisconsin represents a shelf sequence deposited between fair-weather wave base and storm wave base. Fine-grained, glauconitic, feldspathic sandstones of the Eau Claire Formation lie between medium- to coarse-grained sandstones of the underlying Mt. Simon Formation and overlying Wonewoc Formation, with the stratigraphic relationship interpreted as a response to eustatic transgression and subsequent regression. Preliminary studies of the Eau Claire Formation in Dunn County, when compared to similar studies of the Eau Claire Formation at Tilden and Colfax, suggested that possible lateral facies discontinuity within the formation may indicate a complex shelf paleogeographic setting. Therefore, the focus of this research is to document the facies distribution within the Eau Claire Formation to determine whether or not the facies are laterally continuous, and by extension, to define the nature of the shelf setting. Several partial Eau Claire Formation sections in Dunn County were measured, and their stratigraphy, sedimentology, and paleontology were described. The measured sections were correlated with one another and previously measured sections within Dunn County, and compared to the Tilden and Colfax sections. Preliminary analysis indicates some lateral variability within the facies distribution.

Thomas Danielson (117)
Faculty Adviser/Collaborator: Karen Havholm
Documenting Regional Variability of the Eau Claire Formation, Dunn County, Wisconsin

Currently two seemingly contradictory hypotheses exist for the Mid-Cretaceous to Early-Tertiary development of the Canadian Cordillera. The central point of contention between the hypotheses is the relative displacement between the Insular and Intermontane superterranes. One hypothesis, based upon paleomagnetic data, suggests there has been 1900 kilometers of relative displacement between the Insular and Intermontane superterranes, while an equally compelling hypothesis, based on geologic data, indicates displacement of less than 300 kilometers. Ongoing investigations into potential stratigraphic linkages across the Insular-Intermontane boundary concentrate on Albian-Cenomanian volcanics and coeval conglomerates. The principal purpose of this investigation is to compare the geochemical signature of Powell Creek Group volcanic rocks on the east side of the Insular superterrane with that of the petrographically similar clasts of the Conglomerate of Chum Creek on the west side of the Intermontane superterrane, in order to evaluate potential stratigraphic links across the zone of proposed displacement. If clasts from the Conglomerate of Chum Creek carry the same geochemical signature as that of the Powell Creek Group volcanic rocks then a relative displacement of 1900 kilometers between the superterranes is not possible.

Major, minor, and trace element geochemical data was collected and evaluated on eight Powell Creek Group volcanic rocks and eight clasts of the Conglomerate of Chum Creek. Analytical data suggest that the volcanic rocks from both units are the product of calc-alkaline, subduction-related magmatism. Each suite displays broadly similar trace element arrays (Spidergrams), and both major and trace element ratios are characteristic of convergent margin magmatism. Although both suites display broadly similar geochemical patterns, there is relatively minor variations within each suite, and profound variations between the two suites. The two suites are clearly not linked to the same magmatic system but are instead the result of two unique magmatic events. The lack of colinear arrays on Harker diagrams, distinct groupings of major element ratios, and significant differences in Ba, Sr, Nb, Ti, Zr, and Y abundances indicate the two suites cannot be derived from the same magmatic system. Distinct geochemical signatures indicate that the Powell Creek Group volcanic rocks cannot be the provenance of the clasts of the Conglomerate of Chum
Creek, eliminating one possible stratigraphic link across the proposed zone of displacement. The lack of a stratigraphic link between the two units does not support nor detract from either of the initial hypotheses, but rather indicates a need for continued studies within the region.

Heather Golding (90)
Faculty Adviser/Collaborator: Martin Miller
Deformational Styles in Fault Gouge, Death Valley, California

Gouge along the Badwater Turtleback fault displays a two-fold zonation according to structural style. Relations between the zones suggest concurrent brittle and ductile behavior.

Zone A lies closest to the fault surface. It exhibits folded color banding, rotated inclusions, and a uniform texture as a result of distributed deformation. Localized strain appears as narrow (<2 cm) ductile shear zones rather than discrete fractures or faults. These features suggest that mesoscopically ductile deformation characterizes zone A. By contrast, zone B, which underlies zone A, contains abundant evidence for brittle behavior. Most importantly, zone B is texturally heterogeneous and cut by numerous discrete fault surfaces as well as narrow ductile shear zones. The fault surfaces range in length from < 10 cm to > 1 m, dip westward, and display separations which are sympathetic with the main fault.

Most fault surfaces from zone B terminate within zone A. Therefore, strain, which was accommodated by brittle means in zone B, was replaced by distributed, ductile strain in zone A. Such a conversion requires concurrent deformation and points to either a grain-size or fluid-content control of deformational style.

Bradley Fuller (8)
Faculty Adviser/Collaborator: Kent Syverson
Glacial Geology of the Pine Lake Region, Chippewa and Rusk Counties, Wisconsin

Glacial landforms and surficial glacial sediments have been mapped at a 1:24,000 scale in a 62-sq. km region of the Chippewa Moraine, Chippewa and Rusk Counties, Wisconsin. This is an extension of a UWEC Geomorphology class project conducted during Fall 1996. Topographic map and soil survey interpretations were used to map preliminary sediment contacts at a 1:24,000 scale, and then three mapping teams spent one day in the field verifying and modifying contacts on the Chain Lake and Moose Ear Lake 7.5' USGS Quadrangles. Additional field work is planned this spring.

The Chippewa Lobe advanced into the Pine Lake region during the last part of the Wisconsinan Glaciation (25,000 years ago), stabilized, and deposited sediment of the Copper Falls Formation in the Chippewa Moraine. Large volumes of sediment were thrust upward at the ice margin and accumulated on the ice surface. Sediment thickness varied and caused differential melting, topographic reversal, and a moraine morphology characterized by kettles, hummocks, and ice-walled-lake plains. Kettles contain peat in swamps and bogs, and lakes such as Pine Lake. Hummocks up to 25 m high give the moraine a rugged appearance and contain reddish-brown, sandy diamicton of the Copper Falls Formation. Ice-walled-lake plains are gently rolling to flat, high plains underlain by silty lacustrine sediment. Ice-walled-lake plains formed as meltwater streams and mudflows deposited sediment within ice-walled lakes. Gravely rim ridges are located near the outer edges of the plains. Meltwater streams transported well-sorted fluvial sand and gravel away from the former melting ice margin and deposited an outwash plain sloping gently to the west in the vicinity of Cty. Hwy. F.

Brian Hennings, Jeffrey Paddock (88)
Faculty Adviser/Collaborator: Martin Miller
Geometry and Kinematics of a High-Angle Fault, Death Valley, California

A NNW-trending high-angle fault zone cuts metamorphic rocks of the Badwater Turtleback in Death Valley, California. We mapped this fault in January 1997 to understand its geometry, slip direction, and associated mineralization.

The fault zone, which lies 70-200 m above the valley floor, is nonplanar in strike and in cross section. Its strike ranges from N20°W to N15°E, and where exposed in canyon walls, steepens with depth. Mineralization, as determined by X-ray diffraction, consists of barite and iron oxide and is a common feature in the fault zone.

The likely slip direction is right-lateral oblique. Rare striated fault surfaces suggest an oblique motion while associated fractures in pegmatite suggest right-lateral. Most importantly, fault surface orientations strike more northerly than the main zone, suggestive of Riedel shears which formed along a right-lateral fault. If this interpretation is correct, this fault never evolved to a mature stage.

Our companion paper describes the regional significance of this fault.
Aerial photographs dating from 1953 to 1993 were digitized and imported into a Geographic Information System (GIS). The GIS was used to measure changes in dune size and shape through time. Manually generated overlays were used to track changes in dune vegetation cover and patterns of urbanization. In 1953 the area around the dune had very little urban development and the dune was mainly unvegetated. Roads and homes encroached on the eastern margin of the dune by 1975. During this time the dune migrated was to the east and south, changing shape only slightly. In the 1980s the eastern part of the dune was mined away, drastically changing the shape and decreasing the size of the dune by 20%. Vegetation also gradually increased on the dune from 1975 to 1993, and dune migration is more towards the south. Two schools were built on the dune's northern (windward) margin in 1993.

Based on the trends, Run Hill is expected to continue migrating south-southwest. However, because the source area for sand upwind of the dune is now covered by vegetation and urban structures, and because of the increasing vegetation on the dune itself, dune migration is expected to slow and perhaps eventually halt. The removal of Run Hill's eastern end will preclude it from migration into the southern woods.

**Scott Lehmann (118)**
Faculty Adviser/Collaborator: J. Brian Mahoney

Development of an Interactive Geologic Program on the Internet: Bringing Wisconsin Geology to the High Schools

An interactive Web-based geological module has been developed through expansion and adaptation of a Mac-based software product produced by a collaborative geology/computer science research project in 1995-96. Ultima Geology is a user-friendly geological map and database of Wisconsin which can be navigated via standard Internet browsers such as Microsoft Explorer and Netscape. It is geared primarily towards students and teachers of secondary education for use in the classroom. Awareness of the geology and geography of Wisconsin is essential to developing an understanding of water, land use, and environment problems within the state, and this Web site will help students gain an appreciation for geological time, landscape development, and other features of our earth. Ultima Geology will also integrate well with a teacher's lesson plans or be used as a stand alone educational tool by individual students to enhance their knowledge of the geology of Wisconsin. High schools are expanding their computer resources to include Internet access for educational means. Free access to a geologic web site will substantially increase student interest, awareness, and involvement of Wisconsin geology, provide a tremendous teaching tool to high school faculty, and introduce students to scientific career opportunities. Linkage of this site with the Departments of Geology and Computer Science at the University of Wisconsin-
Eau Claire will increase student awareness of programs offered through this institution.

The primary goal of this project has been the design and development of an easily understood and quickly accessible interactive educational Web site that provides information about the geology of Wisconsin. The Web site is accessible directly from the University of Eau Claire’s Department of Geology’s homepage. The site displays the entire state of Wisconsin divided into regions from which the user can then further delve, via the developed interface, into a variety of geological topics including maps, rock formations, fossil data and state sources of geological information. The program is constructed on SGI machines with the use of a multimedia Web editor and design tool entitled Web Magic which supports HyperText Markup Language (HTML). Thus far, the Northwest, West Central and Superior sheets of Wisconsin have been developed. Demonstrations and interactive sessions were held at area secondary schools and with several college age students to gather student and teacher feedback that has been incorporated into the design. Design of the Web site entailed collection, synthesis and integration of geological maps, stratigraphic and rock unit descriptions, fossil data, photographic images, pertinent references, and other useful information. It was designed for easy updating to allow further integration of multiple Wisconsin map sheets for which no data currently exists.

Kristine Mercer (6)
Faculty Adviser/Collaborator: John Tinker, Jr.
A Groundwater Modeling Study for a Well Head Protection Plan for the Village of Fairchild, Wisconsin

Groundwater modeling is used to define a zone of contribution for the municipal well of Fairchild, Wisconsin as a first step in the implementation of a Well Head Protection Plan for the village. FLOWPATH (Franz and Guiguer, 1994), a numerical groundwater modeling program, is used to create a calibrated, two dimensional groundwater flow model for the unconfined sandstone aquifer beneath the Village of Fairchild.

Key model parameters include hydraulic conductivity, porosity, aquifer recharge, well release radius, and the pumpage rate for the Fairchild well. The water-table map generated by FLOWPATH is calibrated to the water-table map for Eau Claire County (Muldoon, 1992) and at two water-table observation wells near Fairchild. The calibrated model has a water balance error of 0.11 percent and achieves 0.01 percent error convergence. A sensitivity analysis quantifies the uncertainty in the calibrated model caused by uncertainty in the estimates of aquifer parameters.

The calibrated model is used to determine 1-year, 5-year, 10-year and steady-state capture zones and pathlines for the Village of Fairchild. The results of this study are presented to the Village of Fairchild to help the village complete a Well Head Protection Plan for their well.

Kristine Mercer (7)
Faculty Adviser/Collaborator: John Tinker, Jr.
Groundwater Flow Directions and Bank Storage Adjacent to the Chippewa River at the University of Wisconsin-Eau Claire

Four well nests each consisting of a water-table observation well and piezometer are located on the lower campus of the University of Wisconsin-Eau Claire. The well nests are from 15 to 55 feet in depth and terminate in stratified fluvial sediment. Water levels in each well, in the Little Niagara Creek, and in the Chippewa River have been measured since February 1994 in order to construct low and high water-table maps, to identify groundwater flow directions, and to determine bank storage conditions along the Chippewa River.

The horizontal component of groundwater flow is from well W-1 at the southwest corner of Phillips Science Hall, north approximately 25 degrees west toward well W-3 in front of Schofield Hall, and then discharging into the Chippewa River. The vertical component of groundwater flow is downward at well nest W-1 and W-1A, at well nest W-2 and W-2A near Schneider Hall, and at well nest W-3 and W-3A in front of Schofield Hall. The vertical component of groundwater flow is upward at well nest W-4 and W-4A at Katherine Thomas Hall. The vertical components of flow define a narrow groundwater discharge area along the Chippewa River.

During high discharges of the Chippewa River, the downward groundwater flow changes to upward flow at well nest W-2 and W-2A and at well nest W-3 and W-3A indicating a widening of the discharge area of the Chippewa River. Bank storage occurs when water from the Chippewa River moves from the river into the groundwater flow system. During April of 1996, bank storage affected all well nests including well nest W-1 and W-1A at the southwest corner of Phillips Science Hall.
Several pre-Late Wisconsinan (>25,000-yr-old) till units are located outside the area formerly covered by Late Wisconsinan ice. In westernmost Wisconsin, till of the Pierce Fm. (gray, silty, calcareous) is overlain by till of the River Falls Fm. (reddish-brown, sandy). In northcentral Wisconsin, till units of the Marathon Fm. (brown to gray, silty, calcareous) are overlain by till of the Lincoln Fm. (reddish-brown, sandy) (Clayton et al., 1992). Correlations have been hampered by poor exposures in addition to extensive weathering and erosion of the units.

To aid correlation attempts, a database of pre-Late Wisconsinan till attributes has been compiled using 25 years of data from the UW-Madison Quaternary Geology Lab. Data obtained by uniform lab procedures was collected from archival lab spreadsheet files, and locations, depths, and sediment lithostratigraphic unit interpretations were collected from well logs, field notes, and appendices in graduate theses (sometimes in spreadsheet files). The FoxPro database contains information about location, elevation, color, magnetic susceptibility, grain size, and carbonate content. Preliminary calculations of some mean till attributes for specific lithostratigraphic units are provided in the table below. In the future, the completed database will be used to test proposed correlations and to analyze lithologic variations within each unit using GIS software.

Jeffrey Paddock (84)
Faculty Adviser/Collaborator: Karen Havholm, J. Brian Mahoney
Cycles within the Upper Cambrian Lone Rock Formation: Sedimentologic Response to Fine-Scale Sea Level Changes

Shelf sediments of the Upper Cambrian Lone Rock Formation were deposited along the Hollandale Embayment during a transgression represented by the Wonewoc-Lone Rock-St. Lawrence succession of formations. Six measured sections in Dunn County, west of Menomonie, indicate a prominent cyclicity within the fine to very fine grained glauconitic quartz arenite of the Lone Rock Formation. This cyclicity is expressed in a 1-1.5 m thick repeating tripartite sediment package that consists of (1) a thin (<4 cm) basal intraformational conglomerate overlain by (2) several thin (<15 cm) cross-stratified beds with mud draped and bioturbated tops, capped by (3) a highly bioturbated zone containing remnants of cross strata and intraformational conglomerate. This succession is sharply overlain by the undisturbed basal conglomerate of the next package. Rarely, the basal conglomerate is absent. The proportion of bioturbated sediments to undisturbed strata in each package increases upward through the section. Roughly 10 m below the contact with overlying nonglauconitic sands, hummocky cross stratified beds replace or overlie the bioturbated portion of the repeating package. Each tripartite package represents multiple storm events with decreasing storm energy or frequency through time. Although this pattern could result from climatic fluctuation, the upward increase of bioturbation and hummocky cross stratification suggests smaller scale deepening events superimposed on the overall Wonewoc-Lone Rock-St Lawrence deepening trend.

Heidi Rantala (1)
Faculty Adviser/Collaborator: Robert Hooper, J. Brian Mahoney
Constraining Heavy Metal Redistribution in Fluvial Sediments Downstream from Sulfide Mining Districts: Preliminary Results from the Coeur d’Alene River Valley, Idaho

The Coeur d’Alene River of northern Idaho is the site of extensive heavy metal contamination resulting from historic river disposal of mine tailings rich in Pb and Zn sulfides from the Bunker Hill Mining District. The District operated along the Coeur d’Alene River (CdA) from 1886 until the mid-1960s, and has been one of the nation’s largest producers of silver, lead, and zinc. Principal ore minerals include tetrahedrite, galena, sphalerite, pyrite, pyrrhotite, and chalcopyrite. Mine tailings were either dumped into the river or onto the easily erodable river banks where they were redistributed by fluvial processes and deposited as bedload, floodplain, wetland, or lacustrine sediments. The tailings contain unusually high concentrations of lead, iron, manganese, zinc, copper, silver, cadmium, arsenic, antimony, and mercury. The United States Geological Survey has documented high levels of heavy metal contamination in floodplain and lake sediments downstream from the tailings. The district was declared a Superfund site in 1986 after blood levels in children were discovered to contain over 10 times the maximum allowable lead amount.

The mechanics of heavy element redistribution and resultant bioavailability in fluvial environments are poorly understood. The lack of understanding regarding heavy element transport has hampered mitigation and remediation efforts in the region. Current U.S. Geological Survey models assume that sulfide minerals are physically transported downstream from tailings piles, and oxidize (i.e. begin to breakdown) following periodic flood events that remove sediment from the river bottom and deposit it in the oxidizing environment of the floodplain.
Oxidization of the sulfide minerals is thought to liberate heavy metals, which become bioavailable to both indigenous flora and fauna and migratory birds. The floodplain therefore acts as a holding bin for the oxidized sediments and easily mobilized heavy metals, which are periodically remobilized downstream by recurrent floods. However, streams in the headwaters of the Coeur d'Alene River Valley immediately adjacent to mine tailings contain significant amounts of heavily iron-stained sediment and algal material, suggesting that sulfide mineral breakdown is initiated extremely early in the transportation process.

The biologic impact of metals in floodplain sediments downstream of the Mining District is an important concern in watershed ecosystem management. The bioavailability of heavy metals in the original sulfide ore minerals is low, the breakdown of sulfides during weathering produces secondary minerals with more readily bioavailable metals, as evidenced by waterfowl mortalities due to Pb poisoning in marshes of the lower Coeur d'Alene Valley. Therefore, an understanding of the metal-bearing mineralogy and the solubility of metals within this sediment is critical to any remediation effort. This investigation examines the distribution of heavy elements in fluvial sediments down-stream of the tailings piles to constrain models of heavy element transport and provide data critical to effective remediation.

Submerged channel bar (bedload), overbank levee (floodplain), and marsh (wetland) sediment samples from a transect 25 miles downstream from the mining district have been geochemically analyzed for total metals using ICP-MS and XRF and for mineralogically analyzed using XRD and SEM. Sediments from marsh and levee environments were sequentially leached in a five step microwave-digestion procedure (exchangeable, carbonate, oxide, organic and residual fractions: Tessier et al., 1979) and each fraction was analyzed for Pb and Zn by Atomic Absorption. X-Ray diffraction and scanning electron microscopy of heavy mineral separates indicate that the majority of Pb in the levee and point bar sediments is bound in Fe-Mn-Pb oxides that adhere to the surface of detrital particles. Zn is partitioned between detrital sulfides (primarily sphalerite) and Fe-Mn oxide coatings; remnant detrital Zn and Fe sulfides are more abundant in the submerged point bar deposits than the subaerial levee deposits. Sequential extraction of Pb and Zn indicates differences in metal partitioning between levee and marsh samples. Levee samples released most of their Pb and Zn content when subjected to reducing conditions (oxide fraction); smaller amounts are released under slightly acid conditions (carbonate fraction), but substantial Zn remained in the residual fraction. Conversely, reduced marsh samples liberated variable but substantial quantities of Pb and Zn from the exchangeable and carbonate fractions. Pb and to a lesser extent Zn are readily bioavailable in sediments from both floodplain environments but are more easily mobilized in the marshes.

A complete understanding of the mechanisms of sulfide mineral breakdown and subsequent heavy element remobilization is critical in evaluating contamination pathways and planning remediation efforts in contaminated sediments. The increased awareness of the interconnectedness of geologic, biologic, geochemical, and hydrologic systems necessitates the integration of diverse methodologies to fully understand the complexities associated with contamination problems. The results of this investigation will be directly applicable to ongoing contamination investigations and remediation efforts by the U.S. Geological Survey in the Coeur d'Alene River.

Matthew Tessar (115)
Faculty Adviser/Collaborator: J. Brian Mahoney
Development of Three Dimensional Geologic Map Imagery

This project integrates topographic and geologic data sets from the Eastern Cascades of Washington State to develop a series of maps and cross-sections to help illustrate and interpret the geologic setting of the region. Digital elevation (DEM) data have been incorporated into ARCINFO to model topographic features, and geologic data has been digitized in AUTOCAD and brought into the ARCINFO platform as overlays tied to the master topographic base. Linkages to structural, geochronologic, isotopic, and geochemical databases are being developed. This project combines traditional field research with Geographic Information Systems software (ARC/INFO) and Silicon Graphics Workstations to produce highly accurate state-of-the-art 3-D geologic map sets. This project is focused specifically on developing automated methods to facilitate development and integration of U.S.G.S. digital elevation models, surface geology, and fence diagrams (cross-sections) showing underlying geologic features into the Arc/Info 3-D Surface Modeling Extensions. The combination of these 3 elements allows visualization of the interaction, relationship, and spatial distribution of surface geologic features with the underlying geology.
The Upper Cretaceous Pasayten Group is broken up into three formations, including (1) the Winthrop Formation, which consists of a metamorphic and plutonic basal cobble conglomerate grading up into a prevalent cross-bedded sub-volcanic lithic arenite (2) the Ventura member of the Midnight Peak Formation (also known as the RedBeds), consisting of thinly bedded red-green feldspathic lithic volcanic wacke and interbedded shale (3) the conglomerate of Hampton Creek, which is dominated by structureless chert lithic feldspathic arenite. The Winthrop Formation is gradationally overlain by the Ventura Member of the Midnight Peak Formation, which is disconformably overlain by the conglomerate of Hampton Creek.

Petrographic analyses of samples from each formation will demonstrate compositional variations within the Pasayten Group. The Gazzi-Dickinson point count method combined with Dickinsonian QFL triplots will quantitatively determine variations in the detrital mode of sandstones throughout the Pasayten Group, which indicate variations in sediment supply between the three formations. The Winthrop Formation contains abundant quartz, plagioclase, potassium feldspar, biotite and volcanic, plutonic, and metamorphic rock fragments, indicative of a dissected volcanic arc. The Ventura Member of the Midnight Peak Formation contains abundant chert and volcanic lithic detritus, with lesser quartz and plagioclase, primarily set in a fine-grained “muddy” matrix. The volcanic lithics within the Ventura Member are distinctly different than volcanic detritus in either the underlying or overlying formations. The conglomerate of Hampton Creek is dominated by chert lithic detritus, with lesser volcanic lithic material, quartz and plagioclase, suggestive of a recycled orogen provenance. Petrographic analysis demonstrates that the Pasayten Group received detritus from three distinct sources during its history. Early in its history, the Pasayten Group (Winthrop Formation) received sediment from a dissected volcanic arc rich in volcanic, plutonic, and metamorphic debris. Sediments within the Ventura Member indicate renewed volcanism coeval with an influx of chert-rich detritus, suggesting input from a recycled orogen source. The upper portion of the Pasayten Group (conglomerate of Hampton Creek) shows a distinct increase in chert-rich detritus and a decrease in volcanogenic input, indicating the dominance of a recycled orogen source.

### Mathematics

**Melissa Brendel, Monica Chadha, Cecelia Peterson (22)**

*Faculty Adviser/Collaborator: Veena Chadha*

**Analyzing Diet Problem**

This project will investigate problem formulation in situations in which an individual wishes to minimize the cost of meeting a set of requirements. A diet problem is studied from the samples of nutritional information provided by “Friday Canning Corporation,” New Richmond, WI. Computer program is used to analyze the problem using the Simplex method of Linear Programming.

**Matt Feldmann (23)**

*Faculty Adviser/Collaborator: James Walker*

**New Techniques of Image Processing**

The purpose of this project is to investigate methods of image processing. The first step is to compare digital image processing with coherent illumination (using laser light). This involves classical techniques from Fourier Analysis. The second step is to compare the Fourier digital methods with wavelet digital methods.

### Physics and Astronomy

**James Dunn (24)**

*Faculty Adviser/Collaborator: Paul Thomas*

**Bringing Mars Rocks to Earth Part II: Plotting Long-Term Orbits of Rocks**

This project examines the problem of what orbit is required to take an ejected piece of Martian material from Mars’s orbit to an eventual crossing with Earth’s orbit. Knowing the speed at which the material is ejected from Mars allows us to plot its orbit in a gravitational orbital simulator, Dance of the Planets. The orbits are organized by how close it comes to Earth’s orbit after one half-orbit. We can then run a long-range simulation to determine when the material may cross Earth’s orbit.

**Patrick Gustafson, Chris Hagness, Nathan Harris, Chris Hawes, Matthew Vogel (72)**

*Faculty Adviser/Collaborator: Kim Pierson*

**Flux Dependence of the Topography Formed on the Surface of Ag/Cu Multiphase Alloys Bombarded by Argon Ions**

Ion bombardment of the polished surface of Ag/Cu alloys has been performed. Bombardment causes a complicated erosion phenomenon which results in the formation of microscopic cones. The mechanisms controlling the formation of this type of feature during ion bombardment have yet to be conclusively
explained. The phenomenon is thought to be a synergism of surface erosion and migration of surface atoms due to the impact of the incident ions. The purpose of these experiments is to determine if surface migration is enhanced as the ion flux density is increased. Experiments by other researchers have indicated that as the flux density is increased a cooperative effect between neighboring ion impacts causes a dramatic increase in surface migration and thus an increased rate of cone formation. The results of this project have important consequences for the deposition of the thin films used in the fabrication of integrated circuits.

Patrick Gustafson, Nathan Harris, Chris Hawes, Matthew Vogel (73)
Faculty Adviser/Collaborator: Kim Pierson
Integrated Circuit Metallization

Currently, there is a concerted effort in the semiconductor industry to develop the new techniques required to realize the next generation of integrated circuit miniaturization. CRAY Research has graciously donated specially fabricated test wafers to UWEC so that experiments can be performed in effort to investigate a new technique which will be used to more efficiently perform one of the steps in the process used to fabricate microelectronic integrated circuits. This step called, "integrated circuit metallization," involves the construction of the microscopic electrical conductors which connect all the circuit components on an integrated circuit. The results of these experiments indicate that the new method is promising, but further work is required to determine if a commercially viable technique can be developed.

Gary Hendrickson, Aaron Steffen (122)
Faculty Adviser/Collaborator: George Stecher
Photometric Measurements of Two Eclipsing Binary Star Systems

We present measurements of the light curves of the eclipsing binary star systems AP Aurigae and XY Leonis made with the 24-inch Newtonian reflector at Hobbs Observatory. Our data were acquired with a Photometrics Star 1 CCD camera and were analyzed with the MIRA Professional image processing package. We discuss properties of the star systems which can be inferred from the light curves as well as our data reduction techniques.

Tom Kroeger, Tami Woodcock (112)
Faculty Adviser/Collaborator: Paul Thomas
Bringing Mars Rocks to Earth Part I: Excavation by Asteroid Impact

Approximately twelve (12) meteorites recovered on Earth are known to have come from the planet Mars. These meteorites, known as SNCs, were presumably ejected from the surface of Mars as the result of a large asteroid impact. Various computer models are used to analyze the impact of an asteroid on Mars. More specifically, to determine at which impact angle will the maximum amount of material be ejected into space and whether the ejected material comes from the asteroid itself or from the Martian surface.

Jennifer Robinson (87)
Faculty Adviser/Collaborator: Robert Barth, Jr.
Applications of Geographic Information Systems in Archaeology

This research project combines traditional field research with new technology to help compile landscape information with actual archaeological site information. This database compiles an inventory of the archaeological sites within Region 3 of the Wisconsin State Historical Society and integrates it with geographical information layers such as hydrology, transportation features, vegetation, soils, contours, and Township and Range Sections. Using Atlas Geographic Information Systems (GIS), this information can be analyzed at different scales and intensities, aiding in the interpretation of archaeological site data. With further development, this technology may be used to compile an interactive database which will allow any user to gather visual graphical information about a region and then view the textual information which supplements that area.

Graduate Entries

Adult Health Nursing

Lisa Hinde (133)
Faculty Adviser/Collaborator: Michaelene Mirr
Elderly in Polk County

A self-administered, anonymous survey tool was developed and distributed in the Spring of 1996 to over 1,000 elderly (age 65-99) residents of Polk County, WI. Housing complexes for the elderly, congregate meal sites, home delivered meal recipients, Home Care patients, Social Services housekeeping clients, churches, and reclusive residents identified through township chairpersons were targeted to receive the survey. Efforts were also made to survey the Native
American elders by distributing the survey at a monthly meal at the Turtle Lake casino. Five hundred and fourteen (N=514) completed surveys were returned, coded numerically, and entered into the SPSS system for analysis of frequencies and associations. Further qualitative interviews were conducted to confirm equivocal findings in the quantitative data and common themes emerged.

The sample is older and more independent than was anticipated. The Task Force has identified services they already provide that may need greater promotion such as tax assistance clinics and friendly visitors. Volunteer programs such as Inter-Faith Caregivers were considered as possible resources for some of the needs expressed by the elderly residents. The regional Area Office on Aging will also be studying the data to determine its applicability to other rural areas of the state.

Sandra Packard (129)
Faculty Adviser/Collaborator: Winifred Morse
Caring for the Caregivers of Persons with Alzheimer's Disease: Interventions and Outcomes

The purpose of this literature review and evaluation is to look at the current literature from 1987 to present on research studies which test interventions for relieving burden and stress in caregivers of persons with Alzheimer's disease and related dementias. The research studies will be compared according to intervention strategies, design, sample, outcome measures, and results.

As the population of elderly persons increases, the numbers of persons affected by Alzheimer's disease and the related dementias is expected to increase. Families in this country are currently providing the majority of health care to dependent and frail elders in the home setting. Caring for the person with Alzheimer's disease and related dementias places unique demands on the family caregiver. Although there is considerable variability in adaptation to caregiving, caregivers as a group report increased physical health problems, increased mental health problems, decreased participation in social/recreational activities, and decreased financial resources.

The climate of cost containment in health care has most experts predicting that the bulk of health care delivery will be shifted from the acute care setting to the home. The numbers of family caregivers will increase as will the symptoms of burden and stress already exhibited in this population. The literature on caregiver stress has many proposed intervention strategies, but there are few interventions in the literature that have been tested using a research design. Few of the existing studies have focused on which interventions can most effectively reduce caregiver stress. If health care policy and third party payers are to be influenced to spend dollars on increased services to caregiving families in the future, health care providers and services must be able to demonstrate effective interventions with measurable outcomes.

Biology
John Ford (92)
Faculty Adviser/Collaborator: David Lonzarich
Preference of Habitat Types for Coho Salmon in Tributaries Streams of Lake Superior, Wisconsin.

Little is known about the factors that limit stream populations of coho salmon (Oncorhynchus kisutch) that occur in the tributaries of the Great Lakes. Although this species has been intensively studied in its native range of the Pacific Northwest, it is unclear if knowledge of these pacific populations can be applied to the conservation of Great Lake's populations. Regional differences in climate, especially as they affect winter stream flows and water temperatures, suggest that the factors limiting coho in Great Lake tributaries may differ substantially from pacific streams. Research done last season found overwinter survival in these streams is much higher than their native streams. In an effort to help clarify how the freshwater residency affects overall productivity of coho salmon in Lake Superior, I propose to monitor habitat use by coho salmon during the overwinter period.

Kelly Hosley, Kristin Zuzek (91)
Faculty Adviser/Collaborator: Lloyd Turtinen
Cloning, Expression, and Purification of a Herpesvirus Encoded Cytokine Receptor

Large DNA viruses, including herpesviruses, have been shown to encode proteins that help them evade the host immune responses. These proteins mimic cellular receptors and function to interrupt signal transduction pathways and divert host cytokines away from normal receptors. Cytomegalovirus (CMV), a herpesvirus, encodes an open reading frame (US29) whose predicted amino acid sequence shows similarity to cell tumor necrosis factor receptor (TNFR) p55. The viral US29 gene product is a transmembrane protein with 41% similarity to TNFR p55 based on sequence analysis and alignment data. In order to determine if US29 is a TNF receptor, CMV DNA encoding the extracellular portion of the putative US29 protein was amplified using polymerase chain reaction and cloned into an E. coli. expression vector. E. coli. transformants were treated with IPTG to induce expression of the
US29 protein. Following lysis of the cells, the US29 product was detected using polyacrylamide gel electrophoresis. The US29 protein was isolated by nickel affinity chromatography utilizing a six histidine tag engineered into the protein. Assessment of its ability to bind TNF in biological assays is currently being completed.

Matthew Solensky (93)
Faculty Adviser/Collaborator: Terry Balding
Distribution, Productivity, and Nesting Habitat Use of Taiga Merlins (Falco columbarius columbarius) in North-Central Wisconsin

During 1994-96, 56 active Taiga Merlin (Falco Columbus columbarius) territories were found in north-central Wisconsin. Surveys of randomly selected lakes produced thirteen territories, seven of which had no previous records of use. Thirty-four sites fledged 122 young, for an average of 3.6 young/nest. Seventy-four nestlings and one adult female were banded.

Breeding pairs were found throughout the study area including randomly selected lakes. However, areas of apparent concentration were observed. Regions with numerous lakes (>5, 1 km² lakes/10 km²) or large lakes (>1 km²) were found to have more (95%) Merlins than lakes that were small (<1 km²) and isolated (≥5 km from the nearest lake >1 km²) (5%). Lakes that had a strong (>34% of playback sites with conifers) shoreline conifer component were more likely to have Merlins than those with a minimal amount of conifers.

Twenty-five habitat variables were measured at twenty-two different successful nest sites. Statistical comparison of habitat variables from nest sites at random and non-randomly selected lakes revealed that significant differences only occurred with the understory variables. All nest structures used were built by American Crows (Corvus brachyrhynchos). Generally, Merlins selected nests that were placed at a south to southeasterly direction in regard to the bole of the nest tree. Nests were located within the top 20% of the nest tree of which 60% were white pines (Pinus strobus) averaging 20 m in height. Of the 34 successful sites, 26 were found in proximity (<100 m) to a human landscape feature, such as permanent and seasonal residences, campsites, and boat landings.

Communication Disorders
Jacquelyn Kaanta (134)
Faculty Adviser/Collaborator: Lisa LaSalle
Conversational Precipitators of Children’s Disfluency Clusters

Pragmatic factors in childhood stuttering are important, and yet not well understood. Mothers' and children's assertive and responsive "conversational acts" (Fey, 1986) that preceded and included "disfluency clusters" (i.e., instances in which two or more disfluencies co-occur) were investigated. Subjects were mother-child dyads, including 12 boys and 2 girls who stutter (CWS) (M=50 mos; SD=7 mos) and 12 boys and 2 girls who do not stutter (CWNS) (M=51 mos; SD=8 mos). Results indicated that all children produced disfluency clusters in assertive statements most frequently. For children who stutter, significantly (T=11; z=2.93; p < 0.025) more disfluency cluster-inclusive utterances were assertive statements than requests for information. There were no differences (p > 0.01) between children who stutter and children who do not stutter in terms of what preceded disfluency clusters, whether it was mother utterances (75-77%) versus child utterances (23-25%), or any types of mother or child conversational acts. Results are discussed in terms of the Demands-Capacity Model of childhood stuttering (Starkweather, 1997).

Tina Radichel (135)
Faculty Adviser/Collaborator: Larry Solberg
The Effect of Hydration Therapy with Adolescent, Non-Professional Singers

The purpose of this study was to determine the effect of hydration therapy on perceptual and acoustic measures of the voice with adolescent non-professional singers. Twenty-two 15- to 18-year-old participants were selected randomly; participants in the experimental group drank five 16-ounce containers of water each day for 7 days while participants in the control group consumed no more than one 16-ounce container per day. Both acoustic and perceptual measures were gathered. Results indicated that students drinking five 16-ounce bottles of water each day displayed significantly different measures from pre- to post-test. These data partially support the hypothesis that hydration positively impacts vocal production in this population. Clinical implications may include using hydration therapy as a means of primary prevention of voice disorders in young people, and future research avenues are discussed.
For many Latvians the end of World War II marked an important borderline in their lives. With the imminent Soviet reoccupation of Latvia in 1944 and their memory of the 1940-41 Soviet terror, about 150,000-180,000 or 7 percent of the population went into exile and subsequent resettlement in nations throughout the world, particularly in the United States. A significant number—about 2,000 Latvians—made Minnesota their new home. The experience and life stories of the first and second generation Latvian settlers are in the core of this project.

Media Development Center
Amy Hartfeld, Krista Hauenstein (95)
Faculty Adviser/Collaborator: Allison Malat
Learning a BIT at a time

The Bringing Instruction in Technology to Students (BITS) program provides training in computing skills for UWEC students by providing free workshops taught by student trainers and by providing in-class instruction per faculty request. Workshops are offered throughout each semester and cover a variety of topics including basic computing skills, Eudora Pro Email, Netscape Navigator, Web Publishing, Word, Excel, PowerPoint, and PageMaker.

Student trainers network with their peers and role model the advantages of using technology for current academic endeavors as well as preparing students for the future. Documentation is distributed during the hands-on computer workshop to enable students to continue to enhance their skills outside of the instructional environment. Ample time to practice newly-formed skills and ask questions is part of the outline of each workshop. Evaluation forms at each session give the attendees an opportunity to voice the strengths and weaknesses of the workshop and offer suggestions to improve the program.

Nursing Systems
Kevin Fritz (131)
Faculty Adviser/Collaborator: Sandra Sweeney
Males in Nursing as Published in the American Journal of Nursing

Data have been obtained from five distinct chronological sections of the American Journal of Nursing over a year period that specifically relates to content and trends affecting the treatment of males in nursing. Men comprise approximately four percent of all registered nurses in the United States according to figures released in 1994. Nursing, as an occupational, vocational, and more recently professional field has, since the days of Florence Nightengale, been viewed primarily as a female dominated profession. Given the historical background, an extensive effort was made to systematically conduct a content trends analysis of all issues of the American Journal of Nursing from January 1900 to December 1995 to identify the various contexts
surrounding the publication of any information involving "males" in nursing. No one has embarked on such a systematic review previously.

Dorothy Roback (130)
Faculty Adviser/Collaborator: Marjorie Oleson
Aspects of Nursing Home Residents' Quality of Life

This study describes elderly nursing home residents' perceptions of selected aspects of their lives, including the importance of location and the effects of relocation within the nursing home, an emerging area of research. Vladeck and Feuerberg (1996) noted that, given the current trend of restructuring in health care organizations, residents may be relocated within nursing homes without their consultation, resulting in negative outcomes. The convenience sample consisted of five, mentally competent residents over age 65 from one nursing home in Wisconsin. In audiotaped interviews, residents responded to open-ended questions and single-item, five-point scales. Data were collected regarding perceived health, outlook on life, perceived control, quality of nursing care, overall quality of life, the importance of location, and the effects of relocation within the nursing home. Findings will assist nurses and other health care providers to assess and intervene in ways that promote a good quality of life for residents.

Psychology

Darci Ament (123)
Faculty Adviser/Collaborator: Beverly Dretzke
Gender Differences in Academic Attributions of Gifted and Nongifted Students

The purpose of this study is to compare achievement responsibility and future aspirations regarding mathematics for four groups of high school students. These groups are gifted females, gifted males, nongifted females, and nongifted males. High school students in college preparatory classes have completed the Intellectual Achievement Responsibility scale that presents items regarding responsibility for their academic successes (e.g., student worked hard, easy task) and failures (student didn't try, difficult task). The students also responded to questions regarding their confidence in doing well in specific college courses and to questions about their future career goals. Previous research has indicated that males are more likely than females to attribute successes to their own efforts and ability, and that males express more academic confidence. We expect to find that a gender difference exists in the gifted population as well as in the nongifted population. Furthermore, we expect that nongifted males will be more confident and will make more positive internal attributions than gifted females.

Jodi Jirikowic, Darin Kubly (124)
Faculty Adviser/Collaborator: Robert Tomlinson
An Analysis of Teachers' Perspectives on Behavioral Characteristics of AD/HD

The purpose of this study was to examine both general and special education teachers' ratings of a student's behavior using the ADDES and a brief questionnaire. The extent to which the student exhibits inattentive, impulsive, and hyperactive behaviors from the teachers' perspective and their perspective on the identification of AD/HD for each student was compared to the subscale scores on the ADDES. Any training the teachers have received on AD/HD was analyzed as well to determine the influence it may have had on their perspectives.

Psychology/Human Development Center

Rebecca Kohls (125)
Faculty Adviser/Collaborator: Richard Fuhrer
The Use of Stimulant Medication as Treatment for Attention Deficit Disorders in the General Education Classroom

The purpose of this study was to examine stimulant medication use of students diagnosed with Attention Deficit Disorders in the general education classroom. In addition, teacher attitudes pertaining to instruction of students with Attention Deficit Disorders and the use and efficiency of stimulant medication as treatment were solicited. Participants included a random sample of 702 general education teachers (K-5) in Wisconsin. Names were obtained from the Department of Public Instruction. Participants were asked to complete a survey that included demographic and Likert scale items. Results obtained from this study indicated that 6 percent of students in the general education classroom were identified with some type of ADD (4 percent as ADHD and 2 percent as ADHD) and 7 percent of those identified with some type of ADD were receiving stimulant medication as treatment. Ritalin was the most frequently prescribed stimulant medication. The most common dosage of medication was 10 mg. In addition to being diagnosed ADD/ADHD and receiving stimulant medication as treatment 57 percent of these students received special education services.

Teachers most frequently reported they did not know who made the initial referral for ADD/ADHD assessment in most cases, more than one educational program (e.g., behavior, curriculum grading, environmental) was implemented for these students. Teachers reported that their generally viewed stimulant medication at similar effective levels for reducing maladaptive behaviors and improving academic progress.
Julie Martzke (126)
Faculty Adviser/Collaborator: William Frankenberger
A Survey of Perceived Safety in Schools: A Comparison of American Indian and Non-Indian Middle School Students

This study reports survey results from 113 American Indian middle schoolers and 84 non-Indian middle school children in northern Wisconsin regarding their perceptions of school safety. The purposes of this study were: to determine children's perceptions of personal/social issues at school including personal safety, self-esteem, violence witnessed, bullying behavior, personal victimization, and peer relationships; to compare perceptions of children from predominantly American Indian and non-Indian schools on the issues delineated above; to explore relationships among these specific social issues; to determine grade and gender differences among children on the issues; and to report student perceptions of faculty and staff awareness of these issues. In summary American Indian students were found to have less positive peer relationships, more scared/unsafe feelings at school, experienced more personal victimization, witnessed much more violence and bullying, and participated in more bullying than did students at the nonreservation school. However, there were no significant differences in any of the questions related to the students' self-esteem.

Lori Marx (127)
Faculty Adviser/Collaborator: William Frankenberger
The Effect of Class Size on Achievement Level in Grades K-2

This study reports basic concepts, reading skills, and reading achievement test results, as well as parent survey results, and teacher interview data regarding the effect that implementation of smaller class sizes had on students in grades K-2 at Randall Elementary School. Longfellow Elementary School did not implement smaller class sizes and served as the control group. The purposes of this study were: to compare test scores of children in small classes with those of children in large classes in grades K-2 in schools with large populations of low-income and minority students, and to examine parents' and teachers' thoughts and feelings concerning the small classes. In summary, for all grades and on all tests there was a significant mean increase from the beginning to the end of the school year for both schools. Comparison of learning rates for children at the two schools were significantly different in three instances. There was a significantly higher rate of improvement for Longfellow kindergarten students on the Boehm Test of Basic Skills. First-grade students were administered a reading skills test comprised of three sections. Randall School students made significantly greater gains on the phonemic blending section while no significant differences were found on the other two sections. Randall School second-grade students made significantly greater gains on the reading portion of the Iowa Tests of Basic Skills. In addition, teachers and most parents report positive results.
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