

Center of Excellence

for Faculty and Undergraduate Student Research Collaboration

Proceedings of the 12th Annual University of Wisconsin-Eau Claire Research Day

April 26 and 27, 2004

Office of Research and Sponsored Programs

UNIVERSITY *of* WISCONSIN - EAU CLAIRE



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

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Schedule of Events

Monday April 26, 2004

<i>Time</i>	<i>Event</i>	<i>Location</i>
7:00 - 9:30 am	Students Set Up Posters	Council Fire Room
9:00 - 9:30 am	Judges Orientation	Alumni Room
9:30 am - 3:00 pm	Judging	Council Fire Room
Noon - 1:00 pm	Judges Luncheon	Alumni Room
Noon - 5:00 pm	Poster Session Open to University Community	Council Fire Room
4:00 - 5:00 pm	Student Research Day Reception	Tamarack Room
4:15 pm	Announcement of UW-Eau Claire Student Research Day Awards and Kell Container Corporation Collaborative Research Scholarship	Tamarack Room

Tuesday April 27, 2004

<i>Time</i>	<i>Event</i>	<i>Location</i>
8:00 am - Noon	Poster Session Open to University Community	Council Fire Room
Noon - 1:00 pm	Students Remove Posters	Council Fire Room

Arts and Humanities

American Indian Studies

Tammy Goss (178)

Faculty Advisor/Collaborator: **Lawrence Martin**

Ojibwe Missionary-Based Literary Tradition

The objective of this research project is to analyze the phenomenon of Ojibwe literacy between 1825 and 1925. The major focus will be on the works of Frederic Baraga during the early portion of this period. Additionally, Franciscan missionaries also published several prayer books and hymnals based on Baraga's works, along with new material. A major goal of the project is to make this material available to the general public, researchers, and scholars through searchable, digital images, located on a specifically developed web site. The second phase of the project will consist of comparative analysis of successive editions of prayer books and hymnals published by Baraga and his associates to identify which specific texts came from Baraga's own hand and which were added by his successors. This analysis may also provide evidence regarding changes in wordings that were made as the writers' knowledge of the Ojibwe language improved over the years, or they discovered better words for abstract concepts. Finally, an analysis of the language used in these texts will probably yield interesting and unique features of the Ojibwe language. Unusual and unknown words, no longer in use today, will be identified as well as extended meanings of familiar vocabulary.

Art & Design

Michael Teuteberg (177)

Faculty Advisor/Collaborator: **Michael Christopherson**

Stereo Image Manipulation

Student Michael Teuteberg shall have the opportunity to complete research which explores photographic stereo image manipulation. Michael's collaborative responsibilities will require the mentorship of Professor Michael Christopherson, Department of Art & Design, and Wisconsin artist, John Ganske. The University Art Accessions Committee has granted approval for the installation of an outdoor public sculpture by John Ganske. John creates two sculptural images which are photographed separately and create a single image when viewed through a stereo slide viewer. The photographic documentation becomes a non-existent three-dimensional image. This fascination conceptual proposition has always had its limitations in how it can be presented and viewed in a public setting. Michael Teuteberg will attempt to resolve the limitations of traditional photographic stereo viewing by implementing a digital format. His own interests in photography creates a compatible match for this unique project. The final photographic work will be displayed in the foyer of the Haas Fine Arts Center. The public will be able to view a three-dimensional photographic image inside the Haas Fine Arts Center and John Ganske's two flat sculptural images just outside of the fine arts center.

Leslie Vaglica (174)

Faculty Advisor/Collaborator: **Scott Robertson**

A Community Art Project for the Community

The contents of a value survey taken by members of the Eau Claire community. The survey requests that they rank a series of generalized priorities: health, community, family, self image, personal comfort, civil rights, world affairs, the environment, and education. Illustrations of each of these things will be done and their scale will be determined by the results of the survey. For example, if family is generally the most valued, it will be the largest drawing. These drawings will be reproduced and displayed around Eau Claire so that people can see a visual representation of what values their community members have. There will also be supplemental brochures to accompany them which will act as small resource guides for the city of Eau Claire. For example, the civic rights brochure will list important addresses of representatives, rights, and a small art project that can be done to exercise their rights, a postcard to a congress member, or some such thing. These will all go up around the city to encourage discussion between community members, raise awareness about issues as well and open people to the idea of functional civic art.

Mary Vorndran (175)

Faculty Advisor/Collaborator: **Steve Terwilliger**

Creative Exploration of Study Abroad: New and Mixed Media

This research project concentrates on the photographic work of Steve Terwilliger and Mary Vorndran. The main focus is on digital printing, particularly high quality black and white. These new printing technologies are helping to establish a non-darkroom facility for highest quality photography in the Art & Design department at UW-Eau Claire, which opens the door for greater accessibility to the

medium. Steve Terwilliger's work is concerned with photographic collages in a "fool the eye" effect within the construction of a single scene. Along with this, he is exhibiting single straight photographs that fit into a landscape tradition. Mary Vorndran's work contains images from experiences abroad and domestic within the last year. Her technical focus is on the comparison and contrast of black and white versus color printing processes along with the incorporation of mixed media and three-dimensional pieces. Their work is to refine the advantages of digital based processing of black and white images for extended tonal range, showing a full range of detail from shadows to highlights even within backlight situations. The results of their collaboration are displayed at the Acoustic Cafe and in the lobby of the UW-Eau Claire library.

Art & Design / Theatre

Dana Johnson, Christopher Nimm, and James Pitroski (176)

Faculty Advisor/Collaborator: **Jody Sekas** and **Steve Terwilliger**

Bringing Art to Light: A Multi-Media Urban Experience

Our project involves an interdisciplinary collaboration between students and faculty of the UW-Eau Claire Art and Theatre Departments, who seek to introduce the Eau Claire community to a significant, international underground art movement. We hope to exhibit international stencil graffiti imagery throughout downtown Eau Claire by employing light to project these images onto the exterior walls of buildings. Part of a local, public art installation hosted by the Eau Claire Regional Arts Center, this project is intended to portray some forms of graffiti art as a well-recognized, viable, aesthetically intriguing form of expression, created by inventive, talented, caring artists, whose art successfully connects people to a shared vision of our contemporary world. Students involved in the project will gain considerable knowledge in the use of various forms of lighting instrumentation, projection strategies, digital imagery manipulation, stencil creation, as well as experience with the collaborative process and strategies for the exhibition of public art.

English

Asia Brandvold (14)

Faculty Advisor/Collaborator: **August Rubrecht**

The Development of English Relative Pronouns

We traced the origin and development of the relative pronouns "that," "which," and "who/whom/whose" from their origins in Middle English to the present day. We established a corpus by selecting 1,000-word samples of representative texts available in electronic format, from Middle English (ca. 1200-1500), the 16th, 17th, 18th, 19th, and 20th Centuries. We identified relative pronouns and examined their contexts using the "find" feature on MS Word and statistically analyzed their incidence in the relevant contexts using MS Excel. We also, retrospectively, similarly investigated the relative particle used in Old English (ca. 800-1200) so as to establish a historical baseline rate for the incidence of relative clauses before the current crop of relative pronouns came into use. The investigation allowed us to describe how the rules governing the use of these forms, in terms of their referents and their syntactic contexts, have changed. The significance of the study is that it provides perspective on certain current usage questions, such as whether it is appropriate to use "that" with a human referent and whether "which" and "who" are permissible, instead of "that," in non-restrictive relative clauses.

Bobby Kuechenmeister (30)

Faculty Advisor/Collaborator: **Joel Pace**

In Brightest Day, In Blackest Night: Green Lantern's Light from 1994-1996

Comic books are becoming recognized and studied as a literary genre with the birth and rise of cultural studies. Our project demonstrates how literary theory and religious studies may be applied to the medium. We explain the conventions of comics by drawing parallels to Aristotle's conventions of Tragedy and uncover how these texts are cultural artifacts by using a New Historicist approach to indicate how comic book story arcs reflect religious themes. Our examples are the "Emerald Twilight," "Zero Hour," and "Final Night" storylines published by DC Comics from 1994-1996.

Foreign Languages

Sara Heitzinger, Timothy Wenzel, and Jenna Cushing-Leubner (8)

Faculty Advisor/Collaborator: **Johannes Strohschank**

Salvaging Old German Books at the Milwaukee County Historical Society

The Milwaukee County Historical Society holds a treasure of several thousand German books dating from the 19th century. This collection has accrued over the years through donations by German-Americans of southeastern Wisconsin. At the start of this project, these books had never been examined, let alone catalogued. The purpose of this project was first to sift through these books in order to

separate valuable volumes from those that could be discarded, then to compile lists of the remaining books by author, title, and subject. These books will later be given call numbers to make them accessible to the general public. First spot checks showed promising results in terms of significantly enriching the source base for institutional research and individual study of German immigration to Wisconsin, and further examination proved a bountiful collection of great cultural and historical merit.

Timothy Wenzel (9)

Faculty Advisor/Collaborator: **Johannes Strohschank**

Influence of Klaus Groth on Theodor Storm's Works

An analysis of the impact of Klaus Groth's Low German (Plattdeutsch) poetry on the works of Theodor Storm during the writers' 25 year friendship. Using approximately 100 poems and 5 novellas, along with the authors' correspondence, this study traces similarities in the writers' selection of topics, the settings, the employment of terms and use of other aspects of dialect and rhyming patterns.

Geography & Anthropology

Renée Rollman and Thomas Hahn (10)

Faculty Advisor/Collaborator: **Timothy Bawden**

The Cultural Atlas of Wisconsin: Research Update

This poster displays a sample of the work that has been done in an ongoing research effort to produce the Cultural Atlas of Wisconsin. The Cultural Map of Wisconsin, upon which the atlas is based, was published in 1996 by the University of Wisconsin Press and drew national attention and acclaim. In general, the map displays 1200 important cultural and historical places in the state with 400 descriptive text blocks and 800 icons identified in an accompanying booklet. The Cultural Atlas includes greater coverage of these places along with graphics, such as maps, tables, and historic photographs. The Atlas is organized into six individual chapters, representing six regions in the state. Two of the six regions have been completed - The Driftless Area and the Northwoods - and during the 2003-2004 academic year we are completing the research for the chapter on the South Central region. In the Summer of 2003 the University of Wisconsin Press agreed to publish it as a stand-alone cultural atlas.

History

Stephanie Bertschy, Melisa Davis, Marie Kilps, John Paul Miller, Lauren Schrader, Patrick Tracy, Jeremy Trautlein, Megan Trunnell, and Kyle Zellner (172 and 173)

Faculty Advisor/Collaborator: **Patricia Turner**

Researching the Past for the Public: The CFMIT History Project

Public History is historical research that results in scholarship designed for a public audience. The research methods and evidentiary standards used in public history are identical to that used in traditional academic scholarship, but the projects produced are aimed at increasing public understanding and appreciation of the past. The Chippewa Falls Museum of Industry and Technology (CFMIT) History Project is the first public history research project undertaken by undergraduate students at UW-Eau Claire. For our capstone seminar, we contracted with the CFMIT to research, design, and create online historical exhibits that each interpret and document a topic central to the social and economic history of the greater Chippewa Falls region. Our nine exhibits will be published on the CFMIT web site in June of 2004 and will become a permanent part of the CFMIT's virtual exhibitions. Each exhibit analyzes and displays an array of archival documents, oral histories, and other primary sources. The CFMIT History Project will not only introduce to a world-wide audience the historical importance of the Chippewa Valley, but will also serve as a teaching tool for how to research and interpret local history.

Josh Bourget (12)

Faculty Advisor/Collaborator: **Matthew Waters**

Homer and the Search for an Heroic Past

From 1200-800 BCE Greek Civilization entered a 'Dark Age' in which writing was lost. By 750 BCE the epic poet Homer had begun to transcribe the *Iliad* and the *Odyssey* from the strong oral tradition in which they were based. The epics focus on the trials and the tribulations of several Greek heroes of the Trojan War and its aftermath, generally thought to have taken place in the Late Bronze Age (1600-1200 BCE). The epics were fundamental in the Classical Greek tradition and the Greeks regarded them as their true history. The Greeks had no written history to this point and may have used the epics as an historical guide in their search for a 'Heroic Past'. Even Homer's legacy as a poet and a writer was revered among the Greeks and several additional poems and even some with anonymous authors were attributed to him. This research is based on the Homeric Epics and the Homeric Hymns (in translation), it is also augmented by secondary sources dealing with the historicity of Homer, the Epic Cycle, as well as commentary on the epics themselves.

Emily Cramer and Jessica Verschay (171)

Faculty Advisor/Collaborator: **Patricia Turner**

Recovering the Social: Peasant and Community Prior to the French Revolution

Our research takes up the recent challenge to “find the long-lost ‘social’” in the French Revolution by re-examining the largest extant record of rural popular opinion prior to the French Revolution – the primary cahiers de doléances drawn up by rural parishes in response to the convocation of the Estates-General. For the initial phase of our study, we utilize the computer database of grievances collected by Gilbert Shapiro and John Markoff for their exhaustive content analysis of the cahiers in order to determine the nature of the rural Third Estate grievances, those of the “poor and powerless.” By using the Shapiro and Markoff database to locate and analyze the rural cahiers within their representative sample, this project examines in detail the social rationale behind these grievances. In our research, we go one step further by coding for the rationales behind the grievances, as well as the grievances themselves, for the cahiers of the French rural region of the Forez. By analyzing such data as community size, grievance type and rationale, we draw conclusions about the nature of rural French communal life just prior to the French Revolution.

Barbara Featherly (11)

Faculty Advisor/Collaborator: **James Oberly**

Historical Movement of the Mohican Nation

In October, 2001, the Stockbridge-Munsee Historical Committee hosted a conference on the topic “Many Trails of the Mohican Nation.” Twenty presenters—some academic historians, some tribal historians, gathered on the Stockbridge-Munsee Indian Reservation in Shawano County, Wisconsin to discuss Mohican history, culture, and tribal sovereignty. The Tribe’s Historical Committee is working to publish the presentations in a volume. Student cartographers from UW-Eau Claire have designed maps to supplement and highlight the text. In addition, the work of the UW-Eau Claire student cartographers will be featured in a forthcoming book by UW-Eau Claire faculty member James Oberly, “A Nation of Statesmen: The Political Culture of the Stockbridge-Munsee Mohicans, 1815-1974,” to be published by the University of Oklahoma Press. Barbara Featherly was contracted to modify the maps made for the 2001 conference to serve the needs of James Oberly’s book. Additional maps were made in order to illustrate and supplement subjects not covered by the maps made for the 2001 conference before being sent to the publisher.

Music & Theatre Arts

Anna-Lisa Bjorklund (180)

Faculty Advisor/Collaborator: **Toni Poll-Sorensen**

Tap Fusion

Tap dance is an American Art Form whose popularity overpowered other styles of dance in the first three decades of the 20th century. This project, Tap Fusion, researched a variety of Tap Dancing styles. The research began with a survey of the history of Tap, clarifying how Tap started as an outgrowth of the rhythms of African slaves and the folk dances of European Immigrants. It continued to look at the ways Tap evolved into the different styles that are known to us today. With the completed research, I prepared a concert including nine tap dances that showcased the different styles of Tap Dance. The concert was adapted into a multi-media lecture demonstration format to help aid in the understanding of the various styles of Tap Dance. The presentation is designed to show how tap is a fusion from sounds of the machine age with the sensuality of the jazz age, and everything else in-between.

Kelly Kriesel (15)

Faculty Advisor/Collaborator: **Terry Allen**

Scriptwriting: A Study in Translation and Adaptation

This grant work was an exploration of script writing; to compare the medium differences for a script writing for both the stage and screen. After brainstorming and plotting out a story line, I began to write my script in it’s play version. After several re-writes, I then had to translate and adapt it into a screenplay. The translation and adaptation, that still maintained the original storyline, was the result of examining such influences on writing such as conflict, subtext, dialogue, images, location, and character development. Understanding the options available in screenplays, not available otherwise, was to challenge me to ‘show’ more of the story through images, as opposed to having to ‘tell’ it through dialogue in a stage play.

Jacob Morris (179)Faculty Advisor/Collaborator: **Robert Baca***The Life of Jack O'Farrell: Preserving Eau Claire Jazz History*

Our main goal for researching the life of Jack O'Farrell is to unearth the rich jazz history Eau Claire has experienced on behalf of Mr. O'Farrell's actions. His involvement in the Eau Claire community through performing in various local jazz combos and airing local jazz radio shows reflects the growth and fruition of Eau Claire jazz history. In preserving Eau Claire jazz history, we will examine Mr. O'Farrell's life the following ways:

- Convert the surviving recordings of his combo recording sessions and jazz radio shows from Real-to-Real (analog) format to CD (digital) format.
- Collect information on Mr. O'Farrell's life via interviewing his friends and family.
- Extract from Mr. O'Farrell's biographical information Eau Claire jazz history.
- Organize a chronology of Mr. O'Farrell's life.
- Donate our collection of information and CD's to the Wisconsin State Historical Society, Eau Claire County Area Resource Center, and UW-Eau Claire McIntyre Library.
- Air jazz radio segment(s) on Wisconsin Public Radio, WUEC 89.7 FM commemorating Jack O'Farrell and his involvement in Eau Claire jazz history.

Nursing Systems

Sara Gerondale and Jennifer Stafslie (13)Faculty Advisor/Collaborator: **Lois Taft***Nursing in World War II: Treating the Wounded and Confronting Unforeseen Foes*

The purpose of this faculty/student collaborative research project was to investigate the history of nursing and the context of nursing practice in World War II. The stories of this aging population will soon be lost to history. Eighteen retired nurses told their stories about nursing during World War II. Their mean age was 84, with a range of 78-94. Interviews were audiotaped, transcribed, and summarized as memoirs. Themes across interviews were identified. Three nursing roles identified in the oral histories were treating the wounded, coping with combat fatigue, and dealing with infectious disease. Sixty-seven percent of the nurses described experiences treating the wounded. This role is a common image of World War II nurses, but many also described experiences confronting unforeseen foes. Forty percent of the nurses described coping with combat fatigue and forty percent described combating infectious disease. Many of the nurses described multiple roles. Three themes common to all three roles were seeing the world, facing danger, and making do. The findings of this study lead to a richer understanding of the historical context and the personal experiences of nurses in World War II.

Behavioral and Social Sciences

Computer Science

Theresa Steffen and Cindy Smith (33)Faculty Advisor/Collaborator: **Dan Stevenson***Analyzing the Lack of Diversity in Computer Science*

Lack of female participation in the computer science field is a growing trend both nationally and at UW-Eau Claire. It has persisted through the Internet boom and continues to grow. Women need to be represented in the growing computer science field to maintain diversity, the key to the generation of original ideas. There are many possible avenues that can be pursued by Universities to help combat this trend. However, none of these options stand out as an obvious quick fix. This project focuses on surveying women to determine the cause for the lack of participation. Specifically, it focus is on participation here at UW-Eau Claire. The results are analyzed and we identify measures that could produce the biggest impact in terms of increasing the number of women.

Economics

Ryan Lindsay (32)Faculty Advisor/Collaborator: **David Schaffer***The Changing Effects of Education on Wages in the U.S.: A Decomposition Analysis*

One of the standard empirical “facts” in economics is that, on average, people with higher levels of education will be paid more for the work that they do. We use data on more than 120,000 individuals from the U.S. Current Population Surveys of 1971, 1987, and 2002 to calculate the changing size of these effects over the last 32 years. In addition, we propose that there are at least two different effects of increased education, which should be noted separately. First of all, increased education may allow a worker to become more productive within their current occupation. Secondly, increased education may allow a worker to move to a new, more productive occupation, which requires more education. By using the 500 different occupation categories reported in the CPS, and by using the average level of education within each occupation as a proxy for the educational requirements, we are able to disaggregate the effects of education into these two categories. Our results illustrate the advantages of this particular decomposition.

Geography & Anthropology

Peter Curry and Christopher Hendren (53)

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

A Socioeconomic and Cultural Transect along Lexington Avenue in New York City

This project examines demographic, socioeconomic, and cultural changes along Lexington Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major cross streets along Lexington Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 19th and 21st streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Andrew Eddy and Ross Jahnke (52)

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

A Socioeconomic and Cultural Transect along Park Avenue in New York City

This project examines demographic, socioeconomic, and cultural changes along Park Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 33rd street and 28th street to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Barbara Featherly (74)

Faculty Advisor/Collaborator: **Lisa Theo**

Spatial Analysis of Environmental Protection Agency (EPA) Sites in California, Idaho, Nevada, Oregon and Washington and the Type of People Living Near Them

The Environmental Protection Agency is the governmental agency responsible for monitoring the release of possibly toxic substances by businesses with operations in the United States. This agency also has two projects responsible for cleaning up sites considered toxic that have been identified as needing cleaning; some of these sites are now owned by the EPA. The purpose of this project was to explore the ethnic, financial status and age of people living within five or ten miles of these sites. It was especially important to determine the population density of these areas in order to eliminate some of the anomalies that occurred with people living near these sites.

Barbara Featherly, Sabrina Hicks, Tracey Gilbert, Beth Guse, and Mitchel Stimers (37)

Faculty Advisor/Collaborator: **Lisa Theo**

Spatial Differences in Women’s Progress and Prosperity in Wisconsin The Lieutenant Governor’s Wisconsin Women = Prosperity Initiative

Using the Institute for Women’s Policy Research, The Status of Women in Wisconsin report, Lieutenant Governor Barbara Lawton has initiated an effort to assess women’s progress in our state: Wisconsin Women = Prosperity. This project demonstrates the spatial differences of women’s progress in Wisconsin. Data on access to health care, political activity, economic viability (jobs, child care, W2), education attainment, and others, our research finds that women continue to trail men at all levels. Rural women have a significant disadvantage compared to women in urban areas. The results of this research will supplement the Wisconsin Women = Prosperity Initiative and will be presented at a statewide conference in June.

Jennifer Freeland and Michele Shaw (81)Faculty Advisor/Collaborator: **Garry Running** and **Robert Barth***GIS-Based Investigation of Precontact Landuse: Small Stream Valleys, Eau Claire County, WI*

Previous archaeological research in Eau Claire County suggests that the valleys of smaller streams were intensively used by prehistoric people and formed an important settlement and land use has ever been undertaken, however. It is crucial that such an investigation be conducted now, because increasing residential development along these streams is threatening to destroy much of the archaeological database. The goal of this research, the preliminary phase of which is presented here, is to create a GIS-based model of prehistoric settlement patterning along streams in Eau Claire County. The model, created utilizing Arc8.0 software, includes the following data layers: location, age, and cultural affiliation of known sites; hydrography, topography (DEM slope and slope aspect), soils (morphological units by map unit) and surficial geology; original vegetation; and existing road networks. From the preliminary results, Arc8.0 Spatial Analyst will be used to develop a predictive model of site location for testing and refinement. The results of this research will expand our understanding of the prehistory of Eau Claire County and the Chippewa River Valley, as well as enhancing efforts to preserve archaeological sites from encroaching development.

Emily Georgeson and Troy Altobell (54)Faculty Advisor/Collaborator: **J. Brady Foust** and **Lisa Theo***A Socioeconomic and Cultural Transect along 3rd Avenue in New York City*

This project examines demographic, socioeconomic, and cultural changes along 3rd Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 15th and 17th streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 4, 2004.

Matthew Goethel and Lindsey Prell (58)Faculty Advisor/Collaborator: **J. Brady Foust** and **Lisa Theo***A Socioeconomic and Cultural Transect along 5th Avenue in New York City*

This project examines demographic, socioeconomic, and cultural changes along 5th Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 43rd and 45th streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. These transects highlight geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, and field trip March 29-April 6, 2004.

Eric Lynde and Neil Trombly (77)Faculty Advisor/Collaborator: **J. Brady Foust** and **Lisa Theo***A Socioeconomic and Cultural Transect along 8th Avenue in New York City*

This project examines demographic, socioeconomic, and cultural changes along 8th Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 55th and 57th Streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Rebecca Mossige and Bryan Girard Frenz (59)Faculty Advisor/Collaborator: **J. Brady Foust** and **Lisa Theo***A Socioeconomic and Cultural Transect along Madison Avenue in New York City*

This project examines demographic, socioeconomic, and cultural changes along Madison Avenue in New York City. Data was derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenues that represent significant socioeconomic and cultural changes. A similar transect was conducted along 41st street and 39th Street to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques.

This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Matthew Resenhoeft and Michael Heikkinen (57)

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

A Socioeconomic and Cultural Transect along 6th Avenue in New York City

This project examines demographic, socioeconomic, and cultural changes along 6th Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. Similar transects were conducted along 47th and 49th streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Renée Rollman and Mark Hudnall (56)

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

A Socioeconomic and Cultural Transect along 7th Avenue in New York City

This project examines demographic, socioeconomic, and cultural changes along 7th in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. Similar transects were conducted along 51st and 53rd streets to provide contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Jessica Schaid (163)

Faculty Advisor/Collaborator: **Zoltan Grossman**

Somali Immigrant Settlement in Small Midwestern Communities: The Case of Barron, Wisconsin

Tens of thousands of Somali refugees have settled in the Twin Cities since Somalia’s civil war erupted in 1991. Minneapolis-St. Paul has become the de facto “capital” of the Somali community in North America. Somalis have arrived directly from refugee camps, or in secondary migrations from other U.S. cities, drawn by an attractive urban job market and refugee service agencies. More recently, many Somalis have begun to settle in smaller cities and towns around southern Minnesota and western Wisconsin. This diffusion is creating an “immigration hinterland” that increasingly resembles the ethnic make-up of the Twin Cities. They have been drawn by meat processing plants (and other industries that do not require advanced English language skills) in small Minnesota cities such as Rochester, St. Cloud, Owatonna, Faribault and Marshall, and the Wisconsin “turkey capital” of Barron. Much like Latino meatpackers before them, Somalis have faced racism and cultural gaps in previously monoethnic rural towns. However, these gaps are exacerbated by religious differences, and a negative focus on Somali Muslim immigrants after the release of “Black Hawk Down” and September 11th. The study is using a survey to trace the migrations of refugees from Somalia to Barron, and contrast their experiences to urban Somali immigrants. The study also compares the policies of rural communities toward Somalis, and recommends proactively educating rural residents about the new immigrants.

Mila Sopova and Erin House (31)

Faculty Advisor/Collaborator: **Helaine Minkus**

The UWEC International Student Host Family/Friend Program

The Center for International Education, UW-Eau Claire, provides a host family experience for all international students who choose to participate. A new international student spends the first two or three days after arrival at the home of the host family before moving into a dorm. Once classes begin, the family and student are expected to meet at least once per month. Questionnaires administered to international students over the last three years and interviews conducted with international students and host families attest to the great success of the program. Seventy nine percent of the students feel close to their host family and 90% report that the host family has been helpful in their adjustment to American life. The relation with the family provides a sense of security to the student and allows them some experience of American family life. The program contributes very powerfully to broadening the outlook of the families and so internationalizes the local community. A survey conducted of colleges and universities in Wisconsin, Michigan and Minnesota found some other schools with friendship family programs but none included an initial home stay, a feature that UW-Eau Claire participants regard as a critical component.

Andrew Steuernagel and Jessica Pink (75)

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

A Socioeconomic and Cultural Transect along Amsterdam Avenue in New York City

This project examines demographic, socioeconomic, and cultural changes along Amsterdam Avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 52nd and 59th streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Josh Vissers and Becky Marohl (76)

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

A Socioeconomic and Cultural Transect along 9th Avenue in New York City

This project examines demographic, socioeconomic, and cultural changes along 9th avenue in New York City. Data were derived from the 2000 Census and projected to 2003. The primary purpose was to map and analyze major “divides” along the Avenue that represent significant socioeconomic and cultural changes. A similar transect was conducted along 50th and 58th streets to provide a contrast. All analysis was conducted at the census block group level using standard Geographic Information Systems techniques. This transect highlights geographic change associated with neighborhood, distance to major amenities (such as Central Park), race and ethnicity, and other factors. Field checking and visualization was done during the GEOG 401, Capstone Experience, field trip March 29-April 6, 2004.

Human Development Center

Melissa Irwin, Krista Bowman, and Kimberly Johnson (162)

Faculty Advisor/Collaborator: **La Vonne Cornell-Swanson**

The Use of Stimulant Medication for Treatment of Attention-Deficit/Hyperactivity Disorder: A Survey of School Social Workers' Knowledge, Opinions/Attitudes, and Experience

This project uses a questionnaire to examine social workers' (a) knowledge (b) attitudes and (c) experiences regarding the use of stimulant medication for the treatment of attention deficit-hyperactivity disorder (ADHD). The questionnaire will be sent to five hundred social workers from School Social Workers Association of America (SSWAA). Once the surveys are collected, the results (taken from a Likert-scale format) will be used to assess the knowledge, attitudes, and experiences of social workers regarding stimulant medication to treat ADHD. This study will then compare the results to what research on ADHD and using stimulant medications for treatment has shown, as well as to similar studies performed recently in other disciplines. These issues are of interest for several reasons. First, there has been an increasing use of psychoactive medications to treat children with ADHD. Second, the issue of the use of stimulant medication to treat children with ADHD and the larger issue of psychiatric treatment of school-aged and preschool children is one of the most important and controversial issues facing schools in the U.S. today. Finally, this nascent trend towards pharmacological treatment of the youth of our country must be assessed in an effort to empirically determine its risks and benefits.

Political Science

Mark Rasmuson (35)

Faculty Advisor/Collaborator: **Geoff Peterson**

Supranationalist Membership: The European Union and Its Impact on Voter Participation

Very little has been discovered yet about the relationship between membership in a larger, supranationalist group like the European Union and its affects upon nationalist voter participation. The purpose of this paper is to research and then determine the extent to which if any membership in a supranationalist organization such as the European Union influences voter participation in their own national parliamentary elections. Since pocketbook issues are credited with having the predominant sway in voter's decisions, extensive economic data of E.U. nations, such as their; GDP, Unemployment and Inflation (C.P.I.) has been accumulated to eliminate these as the cause of voter decline or increase. Next is compared voter participation prior to and after a nation joins the E.U. and draw the appropriate correlations. Consensus opinion in political science is that voter participation world wide is on the decline. Just cursory observation would lead one to believe that this is also the trend in Europe Union nations. Our supposition then is that voter participation should decline and especially so the more and the longer a nation is integrated into the E.U. As Robert Dahl states, “The

smaller the unit the greater the opportunity citizens to participate in the decisions of their governments, yet the less the environment they can control. Thus for most citizens, participation in very large units becomes minimal and in very small units it becomes trivial.” [1] Newman, Michael. 1996. “Democracy, Sovereignty and the European Union.” New York. St. Martin’s Press. 137.

Nichole Ray (36)

Faculty Advisor/Collaborator: **Geoffrey Peterson**

American Indian Public Opinion Survey Development: One Step Forward, Two Steps Back

Research on the political behavior of minority groups in the past has largely ignored or overlooked American Indians. Although some research has been done, most of it has focused on national politics and has been limited to a single tribe or reservation. As tribes become more economically and politically empowered it is vital that this research be conducted. Tribal values, beliefs, family and clan structure, distrust of the federal government and a history of isolation from the mainstream society have contributed to a political culture that is vastly different from other cultures in the United States. To research the political behavior of American Indians the most recent World Values Survey will be modified slightly to allow for cultural appropriateness and to allow for wider sampling of the American Indian population. Sections regarding tribal self-identification, beliefs about the federal government and issues pertaining to tribal government and sovereignty will be added. The survey will be part of a research project that is being proposed to the National Science Foundation.

Psychology

Elizabeth Alden-Anderson and Amanda Besner (99)

Faculty Advisor/Collaborator: **Kevin Klatt**

A Comparison of Teaching Academic Skills to Accuracy versus Fluency in Children

The effects of teaching skills to fluency versus accuracy on generalization, retention of skills, discrimination, endurance, and stability (the ability to perform in the presence of a distractor) were measured. The participants were young, typically developing children. Skills not already in the child’s repertoire were identified and taught, one at a time, to 100% accuracy, defined by ten correct trials in one session. Generalization, retention, discrimination, endurance, and stability were probed and recorded after the subject met criterion on the skills. Fluency training followed. Fluency training consisted of practicing the skill until the child could perform both quickly and accurately, and was measured as frequency of correct responses per minute. After the child could fluently perform the skill (at a predetermined rate per minute, depending on the skill) generalization, retention, discrimination, stability, and endurance were once again probed and recorded. Reliability was recorded by two data collectors sitting at opposite sides of a long table in the same room as the child. Data were recorded and graphed to compare the two conditions. Results will be shown along with a discussion of the implications.

Carey Baehman and Stacie Schmitz (164)

Faculty Advisor/Collaborator: **Catya von Karolyi**

Gender Differences in the Identification of Impossible Figures Presented in the Right versus the Left Visual Half Field

Are there significant gender differences in visual spatial ability? Previous research has both supported and failed to support that males are superior to females on visual spatial tasks. As part of a larger study, we compared males and females on a computer-based visual spatial task. In this task participants were asked to identify impossible and possible figures presented in the left- and right-visual half fields. Impossible figures are drawings of objects that appear to be three-dimensional, but cannot, in fact, exist in three-dimensional space. We hypothesized that males would be faster and more accurate at identifying impossible figures presented to the left visual half field; whereas females would be faster and more accurate than males when impossible figures were presented in the right visual half field. Results indicating whether gender difference in visual spatial abilities are related to hemifield presentation will be presented and discussed.

Amy Beaudry (124)

Faculty Advisor/Collaborator: **Blaine Peden**

Virtual Research Ethics

This project examines the attitudes and views of the current generation of Internet researchers regarding various aspects of virtual research ethics such as the shortcomings identified by Peden and Flashinski (2004). For example, we are interested to know whether these researchers are concerned about issues such as inducements, informed consent, and debriefing. We are also interested in assessing the inclination of current Internet researchers use of video streams to solve these problems as well as their views about a proposal for an online participant’s bill of rights. The goal of this project is to improve conditions for online research participants, produce more responsible internet researchers, and inform IRBs as to issues that affect internet research.

Kimberly Clausen, Angela Mueller, Kasey Stephenson, Elizabeth Alden-Anderson, and John Smethells (98)

Faculty Advisor/Collaborator: **Kevin Klatt**

The Effects of Enthusiasm on Responding During Skill Acquisition for Children with Autism

This study examined the effects of enthusiasm on the acquisition of new skills for children with autism. Two teachers used a discrete trial format to teach various skills to two children with autism. Correct responding resulted in either enthusiastic or non-enthusiastic verbal praise. Enthusiasm was judged by facial expression, voice volume, and inflection. In general few differences were found between the enthusiasm and non-enthusiasm conditions.

Carla Lagorio, Jared Choate, and Wendy Lyman (119)

Faculty Advisor/Collaborator: **Gregory Madden**

The Effect of Real and Hypothetical Rewards on Delay Discounting

Extreme discounting of delayed outcomes has been correlated with a range of substance abuse disorders. Many of the studies that have established this correlation ask participants to choose between hypothetical rewards. Prior studies comparing choices involving hypothetical or potentially real choices have reported no differences but they used within-subjects designs. This raises the possibility that participants remembered the choices made in one condition and repeated them in the other. In our first experiment, the effects of potentially real and hypothetical rewards on delay discounting were examined. An adjusting-amount procedure typical of the human delay discounting literature was employed using a between-subjects comparison design. No significant effect of reward type was detected. These findings are consistent with prior experiments that have failed to demonstrate a systematic difference in discounting rates between hypothetical and potentially real rewards. Experiment 2 uses a within-subjects design that compares hypothetical reward discounting to choices involving real rewards (i.e., the consequence of every choice is obtained). Participant's hypothetical reward choices are compared to their real choices to further examine the validity of the use of hypothetical rewards. Our further assessment of the reward types is needed before any conclusions can be drawn from our research.

Timothy Lefever, Daniel Hehli, Samantha Cook, Lisa Nackers, Amy Beaudry, and Sarah Weis (121)

Faculty Advisor/Collaborator: **David Jewett**

Establishing a Pre-Clinical Model of "Hunger"

Most drug treatments for obesity increase energy expenditure and metabolism, but it is unclear if these drugs alter "hunger." It is also unclear what neurotransmitters mediate "hunger." Using behavioral techniques, we established a pre-clinical model of "hunger." Rats discriminated between 2-hour and 22-hour food deprivation in a two-lever, choice procedure. Rats learned the discrimination (mean = 58 daily trials; range 30-133). During generalization tests, 6-12 hrs food deprivation produced stimuli similar to 2 hrs food deprivation. Fifteen hrs food deprivation produced stimuli similar to that of 22 hrs food deprivation. During other tests, rats food restricted for 22 hrs responded appropriately, were given 20 min food access, and tested. Rats selected the lever associated with 2 hrs food deprivation, indicating food consumption eliminates discriminative stimuli associated with 22 hrs deprivation. Saccharin and sucrose did not produce this effect. In rats maintained under 2 hr deprivation, ghrelin and neuropeptide Y (injected into the hypothalamus) produced stimuli similar to 22 hr food deprivation. These findings suggest that discriminative stimuli produced by 22 hrs food deprivation may be sensitive to factors altering food consumption and may serve as a model to examine dietary and neurochemical factors that alter internal states associated with eating.

Wendy Lyman and Sara Nolta (169)

Faculty Advisor/Collaborator: **Blaine Peden**

Father-Daughter Relationships and Women's Experience of Domestic/Partner Abuse

This study is a continuation of a prior study on women's perceptions of domestic/partner abuse. It will examine the association between the father-daughter relationship quality and two measures: the incidence of domestic/partner abuse in an adult woman's life, and her perception of abuse severity. Women will respond to Likert-scale items and will rate vignettes of abusive situations. The hypothesis is that father-daughter relationship quality will negatively correlate with incidence and with perception of severity of abuse. Results will potentially be useful for counseling centers and domestic abuse shelters, as well as provide a basis for future studies.

Justine Majeres (103)

Faculty Advisor/Collaborator: **Marie Crothers**

Dissociative Identity Disorder Going to Trial

This study addressed individuals' reaction when presented with a vignette about a mentally ill individual charged with a crime. Participants indicated what plea they would recommend if hired to defend the individual. Analyses focused on participants' gender and knowledge of mental illness and criminology as predictors for selecting the plea.

Justine Majeres, Elizabeth Alden-Anderson, Amy Beaudry, Connie Cameron, Samantha Cook, Lacey Eveland, Daniel Hehli, Timothy Lefever, and Lisa Nackers (100)

Faculty Advisor/Collaborator: **David Jewett**

The Effects of AgRP, and NPY on Food-Reinforced Behaviors Under a PR1 Schedule

Previous studies have consistently shown the neurotransmitters agouti-related peptide (AgRP), ghrelin, and neuropeptide Y (NPY) increase eating in Sprague-Dawley rats. These studies demonstrated ghrelin and NPY significantly increased the break point (a quantitative measure of motivation) under progressive ratio (PR) 1 reinforcement schedules. The purpose of this study was to determine if AgRP, increases motivation similarly to ghrelin and NPY. Subjects were trained to lever press to obtain food under a PR 1 reinforcement schedule. Once baseline performance was stable, subjects were implanted with cannulae in the lateral ventricle. Following recovery, the effects of AgRP and NPY were assessed. No significant differences were found for break point among saline ($M=10.8$; $SD=3.9$), 0.1 nmol AgRP ($M=14.8$; $SD=7.5$), and 1.0 nmol AgRP ($M=20.7$; $SD=11.5$) ($F(2,16)=2.09$; N.S.). However the largest dose of AgRP (1.0 nmol) significantly increased food intake in the subjects ($F(2,16)=6.76$; $p=.010$). These findings support previous findings that AgRP increases eating, but AgRP did not increase motivation (e.g. food-reinforced responding).

Kim Masters, Megan Green, Samantha Cook, and Sara Nolta (122)

Faculty Advisor/Collaborator: **Allen Keniston**

Eating Disorder Patterns at Diverse United States Universities

The proposed study has several objectives: 1) Expand on a previous study conducted at the University of Wisconsin-Eau Claire (UWEC) entitled "Eating Disorders on Campus: Prevalence Rate and Correlates" (Masters, Marsh & Lonsdale, 2003) to include both males and females, include relevant demographic variables, and include college campuses from different regions in the United States. 2) Identify characteristics of students at-risk for developing an eating disorder. 3) Help Assess the need for treatment and/or prevention services on college campuses. 4) Investigate the correlates of region and type of university on disordered eating attitudes and behaviors. 5) Collaborate with other regional universities to assess the generality of results. Researchers will obtain a copy of and permission to use the Eating Attitudes Test (EAT-26; Garner, 1997), as well as its scoring and interpretive information, from <http://www.eating-disorder.org/eat26test.html>, which will serve as the basis for our data collection. Faculty members at ten universities throughout the United States will be contacted about collaborating on this project based on the universities' regional location. At least one faculty member and one undergraduate student will be enlisted to assist in the completion of this study from each corresponding campus.

Michael Paul, Julie Slowiak, and Eric Ewan (118)

Faculty Advisor/Collaborator: **Gregory Madden**

Toward an Animal Model of Human Pathological Gambling

Building upon prior research conducted in our lab at UW-Eau Claire, this ongoing research is examining pigeons' daily work output under conditions in which food rewards are of a predictable magnitude (3 pellets) or of an unpredictable magnitude (an average of 3 pellets). The unpredictable reward amounts are designed to mirror the variable reward amounts obtained by humans in gambling situations. Pigeons' behavior was examined across a wide range of work requirements in a closed economy (i.e., long-duration sessions and consumption determined by the subjects' behavior). Thus far, we have found no effects of variable reward magnitudes but research conducted in the foraging literature suggests that if a difference is going to be detected, it will be observed at large work requirements (which we have yet to get to—we conduct steady-state research requiring each condition be continued for at least two months and this study is only about half-way completed). Combined with our prior findings, our results suggest thus far that the variable work requirements common to gambling situations (e.g., the variable number of slot machine plays before a payoff) can be implicated as an important determinant in pathological gambling. The role of variable reward amounts has yet to be fully evaluated.

Heather Petersen, Christine Benedict, and Amanda Besner (97)

Faculty Advisor/Collaborator: **Kevin Klatt**

Teaching Vocal Imitation to Children with Autism

A behavioral intervention was used to teach vocal imitation to two young boys with autism. Vocal imitation was taught using a discrete trial format consisting of prompts and reinforcement. The children were taught to imitate the therapists vocal instructions. Initially, the children had a small repertoire of sounds and/or words and no imitation skills. At the end of the interventions the children had learned to imitate considerable sounds and words. The language skills they developed are necessary for learning more complex communication skills, and are required for functional communication with their natural environment.

Jessica Pinch and Tesa Zimmerman (166)

Faculty Advisor/Collaborator: **Blaine Peden**

Perceptions of Marital Name Choices: A Study Utilizing Visual Technology

The focus of the present study is to evaluate the difference between a paper and pencil survey method of data collection, and a more interactive, computer-based method, to extract perceptions of marital name choices. Recent research has begun attempting to determine such differences. Tourangeau, Couper, and Steiger (2003) have researched differences in participant responses by using a computer-based version, differing in areas such as personalization or interaction. An Internet sample will be utilized. Each participant will provide ratings of personality traits and life outcomes for a man or woman who has taken a non-traditional or traditional name change, portrayed by an actor or actress via streaming video. The personality traits are scored on a Semantic Differential Scale (Dion, 1987), and the life outcome ratings on a Likert Scale. Computer technology is growing at a fast rate. The utilization of such technology may produce more accurate results, by more adequately portraying real persons making different name choices at marriage. Computerized methods of data collection are growing in popularity, and this study seeks to find whether or not such methods replicate paper and pencil results. The implications are that new methods may be found to be more reliable and valid, by actually depicting live persons.

April Pufahl (123)

Faculty Advisor/Collaborator: **Blaine Peden**

Incidental Vocabulary Acquisition: A Clockwork Orange Study

A semi-replication of previous Clockwork Orange studies on incidental vocabulary acquisition conducted with college-age native English speakers. In this study, participants were asked to read a passage from Anthony Burgess' novel, *A Clockwork Orange*, which includes 'nadsat' vocabulary unfamiliar to anyone not exposed to the book or movie. The experimental group read the original passage while the control group read a modified version of the text in which all nadsat words were translated into their English equivalents. Both groups were then given a multiple-choice test on the nadsat vocabulary. Participants were not told they would be tested on vocabulary, but rather were told they would be tested on their reading comprehension. I am currently in the process of collecting data, but I predict that the experimental group will show small but significant vocabulary gains over the control group.

Karin Rasmussen and Andrea Lueck (170)

Faculty Advisor/Collaborator: **Blaine Peden**

Perceptions of Online Therapy as Associated with Type of Disorder

This study evaluates the effect of source of information and type of therapy on the strength of college students' opinions of appropriateness of method of therapy for assault issues and alcohol and drug abuse. The sample population consisted of 65 (25 male and 40 female) students at a Midwestern university. Each participant was given a packet of either scientific or website information about online therapy via block randomization. F-tests indicate a significant interaction between type of information and type of therapy on perceptions of the most appropriate type of therapy for treating assault issues $F(1, 63) = 10.45, p < .01$, and alcohol and drug related disorders $F(1, 63) = 4.91, p < .05$. Findings indicate that source of information and type of therapy influence people's perceptions of the appropriateness of treatment via traditional and online methods of therapy. Future studies are necessary to determine the effectiveness of online therapy.

Ryan Rowe, Kasey Stephenson, and Sara Czekalski (120)

Faculty Advisor/Collaborator: **Gregory Madden**

What Happens when Pigeons Obtain Unearned Supplemental Income?

A number of studies (e.g., Timberlake et al., 1987) have reported that supplemental unearned income, if obtained more than 16 minutes after a work session does not affect animals' motivation to work for food. In these studies, the price of food increases between the delivery of each food pellet (price is operationalized as the number of responses on a lever or button). Subjects respond to earn food and the researcher records the price at which the animal refuses to provide further work - this is taken as a measure of motivation to work. When free supplemental feeding is given immediately after a work session, this decreases animals' motivation to work. However, if free food is delayed by 16 minutes or more, it has no effect on motivation. Oddly, only one study (Timberlake, 1984) has examined the effects of delayed free food against a baseline of no free food, and this comparison was only made with one animal and for only eight sessions. The present study began by assessing four pigeons' baseline work output and food consumption when the price of food increased between food rewards. Once responding, consumption, and the animals' weights had stabilized, free food was given. To ensure that subjects' overall motivation did not change in this condition, we made sure that each subject earned exactly the number of pellets that they had earned on the average of the last six days of baseline. Next, we changed the color of the button that the pigeons pecked to earn food, but the work requirements remained unchanged. On days when subjects earned less than they had during

baseline during the work component, we gave them what they didn't earn for free after a 4, 16, 32, or 64 min delay. If they earned all of their food during the work portion of the session, they obtained no free food. At the time of this writing, data are too preliminary to characterize (we have just completed baseline). The most recent data will be presented at the poster session, but the experiment will continue through the fall, 2004 semester.

Ben Stefonik (79)

Faculty Advisor/Collaborator: **Allen Keniston**

The Role of Formal Logic when Solving Pragmatic Syllogisms

The study's purpose is to investigate the difference between formal deduction and pragmatic deduction under the framework of the mental model theory of reasoning. Participants will be asked to answer a series of formal and pragmatic syllogisms under necessity instructions. Participants will include college students from the University of Wisconsin-Eau Claire. The origins of reasoning research were almost exclusively based on logicism. This approach explained human rationality in terms of people's abilities to solve formal logic problems, excluding in its analysis any type of prior knowledge or contextual information. However, the entire field has slowly placed a greater emphasis on ecologically driven studies, which incorporate pragmatically rich contexts that more closely resemble everyday reasoning. Few studies have made direct comparisons between formal and pragmatic logical problem solving. This study predicts that participants will more accurately solve pragmatic syllogisms than formal syllogisms, because formal syllogisms require participants to reason abstractly in a manner that is not representative of everyday reasoning processes. The goal of the study is to provide insight on the relatively unknown relationship between formal and pragmatic logic. Data is expected to be collected and analyzed by March 12, 2004.

Kasey Stephenson and Angela Mueller (96)

Faculty Advisor/Collaborator: **Kevin Klatt**

Assessing Preferences with Increasing Progressive Ratio Schedules

This study was designed to add to the preference assessment literature by assessing preferences while using progressive ratio schedules. Two children with developmental disabilities participated in this study and were required to emit an increasing number of acquired responses to obtain various tangible items. The expected results of this study will show that the children will emit more responses for one tangible item over the other. These expected results will add to the body of preference assessment literature as well as the behavioral economics literature. These results will show the usefulness of preference assessments while working on mastered skills and this procedure could potentially be used to teach new skills.

Kasey Stephenson, Kristin Walters, Wendy Lyman, Joe Muellenberg, and Katie Uphall (78)

Faculty Advisor/Collaborator: **Kevin Klatt**

Acquisition of Various Pre-Academic Skills for a Young Child Diagnosed with PDD-NOS

Various pre-academic skills were taught to a 3-year-old boy diagnosed with PDD-NOS. Low levels of pre-academic skills (i.e., matching to sample, manding, tacting, vocal/motor imitation, and one-step instructions) and high levels of inappropriate behaviors were observed prior to choosing appropriate interventions. A cohesive team used behavioral intervention to teach new skills and to prevent problem behaviors. Skills were taught using data-based analysis to assess when target skills were achieved. This case study's data supports the use of behavioral principles to teach new skills and decrease inappropriate behavior.

Zachary Wedge, Douglas Flashinski, Ashley Cole, David Parker, Lisa Nackers, and Alyssa Moore (102)

Faculty Advisor/Collaborator: **Lori Bica** and **Marie Crothers**

Evaluation and Preliminary Findings of Years One and Two of a Sexual Assault Prevention Program

One in four women is sexually victimized during her college years, usually by a male peer (Koss & Oros, 1982). Freshmen are at particularly high risk during their first weeks on campus, creating a significant need for active prevention programming. Given that neither attitudes nor intentions are powerful predictors of behaviors, the literature suggests that the future efforts focus on behavior change. The program, now in its second year, was designed to incorporate effective elements and recommendations from existing literature. Six residence hall wings made up the program group (N=85) and six similar wings comprised the comparison group (N=79). A pretest was administered to all participants to determine previous sexual experiences and behaviors that might be linked to sexual assault. The program group participated in three prevention sessions. Session I examined the nature/scope of the sexual assault problem, Session II involved exploring issues specific to each gender, and Session III provided participants the opportunity to practice the protective skills/behaviors they learned via role-playing. Post-tests will be administered to all participants at the conclusion of each semester until graduation. Program participants' evaluative comments from both years will be compared.

Marla Wojtanowicz and Michelle Frasch (168)

Faculty Advisor/Collaborator: **Blaine Peden**

Effects of Relationship Status and Gender on Perceptions of Sexual Behavior Across Cultures Between the United States and Scotland

The scientific objective of the research was to investigate the effect of relationship type on perceptions of sexual behavior cross culturally between the United States of America and Scotland in the United Kingdom. The practical objective of the proposed research is to try to discover if there is a difference in the perceptions of sexual behavior in different relationship types cross culturally between the college aged students of the United States and Scotland. The proposed research will investigate if the perceptions of sexual behaviors done in a committed dating relationship are viewed as more appropriate than the same sexual behaviors done in a non-dating relationship and if they differ between the University of Scotland, Edinburgh, and the University of Wisconsin, Eau Claire in the United States. The researcher will manipulate a relationships type by making the perpetrator either in a committed dating relationship or a non-dating relationship. We hypothesized that appropriateness and likelihood of engagement scores will be lower for the non-dating relationship condition than the committed non-dating relationship condition. The researchers will also manipulate the kinds of sexual behavior the person may engage in and the participant will rate their scores as they see fit. We hypothesized that appropriateness and likelihood of engagement scores will be lower for women than men and higher overall in the University of Scotland campus compared to the UW-Eau Claire campus students. The researchers will also assess demographic variables regarding, relationships status, number of sexual partners, frequency of sexual intercourse, religion, politics, and age.

Nicole Zeug (80)

Faculty Advisor/Collaborator: **April Bleske-Rechek**

Differential Validity of Closed-Ended and Open-Ended Exam Questions

There is currently a debate in educational circles over the relative value of closed-ended versus open-ended exam questions. Due to troubling differences between the sexes and some ethnic groups on performance on closed-ended standardized test items, some educators have argued for a move to the use of more open-ended items on exams. However, open-ended questions are generally considered less reliable statistically than closed-ended questions. Further, limited research has suggested that open-ended questions do not add to the prediction already afforded by closed-ended questions of important outcome variables such as people's performance on related achievement tasks. The current project assesses the differential validity and perceived value by students of closed-and open-ended exam questions. Approximately 110 students enrolled in Psychology 100 took two mid-semester exams that consisted of 70% closed-ended and 30% open-ended exam questions. Students completed a post-exam questionnaire after each exam to report their level of comfort with and their expectation of success on the two question types. Students also completed a timed version of Raven's Advanced Progressive Matrices. We will be presenting the validity of the two exam question types, as given by their relations to students' college admissions data (ACT/SAT score, high school GPA), students' end-of-semester GPA, and students' score on the Raven's.

Tesa Zimmerman and Jessica Pinch (167)

Faculty Advisor/Collaborator: **Blaine Peden**

Does Marital Name Choice Influence Perceptions of Female and Male Partners?

Do societal perceptions of gender prompt traditional name change (woman replaces surname with man's) and deter non-traditional name changes (woman retains surname or man alters surname) upon marriage? Research in this area by Dion (1987), Dion and Schuller (1990) and Takiff, Sanchez, and Stewart (2001) have revealed that differences in perception do exist based on titles or names. A Mid-western University sample of 160 students, 114 females and 46 males, was utilized. Participants rated personality traits and life outcomes for a man or woman who had taken a non-traditional or traditional name change, which was depicted in a vignette. This study proved many stereotypes. Participants rated the marriage partners as more independent when both partners chose a completely new surname, and at the same time rated them less intelligent. On the other extreme, the two more traditional name choices were rated as more likely to have children than the two non-traditional name choice options. The implications are that a different image is projected based on the decision to use a traditional or non-traditional name. A forthcoming trend may include less traditional decisions in women who have entered the business or professional world.

Tesa Zimmerman and Jessica Pinch (165)

Faculty Advisor/Collaborator: **Blaine Peden**

Perceptions of Marital Name Choices: A Study Utilizing Visual Technology

The focus of the present study is to evaluate the difference between a paper and pencil survey method of data collection, and a more interactive, computer-based method, to extract perceptions of marital name choices. Recent research has begun attempting to determine such differences. Tourangeau, Couper, and Steiger (2003) have researched differences in participant responses by using a computer-

based version, differing in areas such as personalization or interaction. A face-to-face as well as Internet sample will be utilized. For the Internet version, each participant will provide ratings of personality traits and life outcomes for a man or woman who has taken a non-traditional or traditional name change, portrayed by an actor or actress via streaming video. An ANOVA will analyze personality traits based on semantic differential ratings and life outcome ratings based on Likert ratings. Computer technology is growing at a fast rate. The utilization of such technology may produce more accurate results, by more adequately portraying real persons making different name choices at marriage. Computerized methods of data collection are growing in popularity, and this study seeks to find whether or not such methods replicate paper and pencil results.

Sociology

Meghan McDonald (34)

Faculty Advisor/Collaborator: **Jeff Erger**

Does the Development of an Identity as “Cardiac Survivor” Increase Adherence to Medically Prescribed Cardiac Rehabilitation Programs?

This research tests the connection between a social identity as a “cardiac survivor” and adherence or non-adherence to a medically prescribed cardiac rehabilitation program (CRP). The goal is to see if those who develop a primary identity as “cardiac survivor” adhere to treatment at higher rates than those who do not. This tests a major theoretical claim in the medical sociology literature on the relationship between identity and adherence (Burton and Hudson, 2001). The research took place at two local hospitals’ CRPs. The research employed a two stage survey, with phase 1 at the start of cardiac rehabilitation, and phase 2 three months later. We hypothesized that greater identity salience as a “cardiac survivor” and an increase in the salience of that identity would increase adherence. Results of the study indicate a potential link, but show that further research is needed.

Sociology / Student Health Services / Housing & Residence Life

Amanda Stoffregen (101)

Faculty Advisor/Collaborator: **Donald Nielsen, Sarah Harvieux, and Jodi Thesing-Ritter**

Core Research Alcohol and Drug Survey

The Core Institute is a not-for-profit organization whose main purpose is to assist institutions of higher education in drug and alcohol prevention efforts. The Core Alcohol and Drug Survey was distributed in collaboration with Student Health Services and Housing and Residence Life. The 44 question survey was administered to 28 randomly selected classrooms to approximately 850 UW-Eau Claire students. The questions address actual use of drugs and alcohol, as well as the perceived use of others on this campus. In addition to the 39 standard questions, 5 questions concerning sexual assault on campus were added. This survey was administered in 1998, 2000, 2002, and 2004. The results will be compared to past years’ results and also used to guide educational programming and other prevention measures for UW-Eau Claire students.

Business and Professional Studies

Accounting & Finance

Ann Walker (140)

Faculty Advisor/Collaborator: **D’Arcy Becker**

Why Play Millionaire? Effects of Active Teaching on Student Intrinsic Motivation

It is commonly accepted that teaching methods that are active and involve students in an engaging manner are essential to effective teaching. However, students have a variety of preferred learning styles, which means no single teaching method is appropriate and effective with all students. Students respond in unique and often unpredictable ways to different teaching methods, requiring instructors to use portfolios of teaching methods that cater to a broad set of students. The choice of teaching methods for a given set of course material may be simplified by the application of general principles such as those found in the Bonner (1999) framework. This study examines the choice among active teaching methods for an undergraduate course in Auditing based on the specific educational outcomes desired and the potential motivational impact on students. A Millionaire-style game was played, and student intrinsic motivation changes were monitored through surveys. Millionaire had short-term positive effects on student intrinsic motivation. In addition, the game had marginally significant impact on improving student quiz scores. Playing the Millionaire encouraged students to reflect on their own knowledge, test themselves against the questions prior to a formal assessment, and discuss the course information in a unique forum.

Adult Health Nursing

Samantha Gueldenzopf and Amy Shardlow (159)

Faculty Advisor/Collaborator: **Rita Sperstad**

The Tie that Binds- Birth, Culture, and Education: A Review of Literature

Birth, culture and education are each significant areas to the “whole” of a unique undergraduate nursing clinical experience. For the past six years, the named faculty member has facilitated a directed study course for senior nursing students which focuses on care with women and families during pregnancy, labor, and birth within a culturally diverse setting. The course consists of a review of theory and concepts, a week-long immersion clinical experience participating in the care of Mexican women and families, while living communally at a free standing birth center in Weslaco, TX (10 miles from the border of Mexico). Investigation of select topics and critical reflection in seminar format follows the clinical experience. Because of the great value in this experience, the named faculty member has committed her dissertation research question to be: “How do nursing alumni from the University of Wisconsin-Eau Claire describe the meaning of a cultural diverse clinical experience at a perinatal birth center during their undergraduate education as contributing to their professional development?” The current faculty/student research project focuses on the review of literature related to birth, culture and education as a foundation for the dissertation research.

Samantha Gueldenzopf, Stacy Key, Carmen Kellogg, Julie Martin, Laura McCorkell, and Amy Shardlow (160)

Faculty Advisor/Collaborator: **Rita Sperstad**

Transformed Self: Meaning of a Cultural Care Course to Students and Faculty

Historically, professional nursing organizations have mandated the importance of cultural factors in determining human health, health related behaviors, and the integration of the cultural dimension into nursing education (American Nurses’ Association 1991, American Academy of Nursing 1992, American Nurses’ Association 1996, American Academy of Nursing 1995). Trends of the 21st century such as increased immigration, communication and changes in population, demand an even greater need of cultural competence by nurses in providing holistic care. Although nursing curricula has done much work to integrate cultural education, a lack of evidence exists to indicate that cultural education in nursing increases cultural sensitivity and understanding (Meleis, Isenberg, Loerner, Lacey & Stern, 1995, Eliason & Raheim 2000). Critics suggest that the didactic or experiential methods of cultural education in nursing fail to advance beyond differentiation of the self from the ‘other’ (Duffy 2001). Duffy proposes that transformation of the self is imperative to the development of cultural sensitivity. This can be accomplished using Mezirow & Associates’ (1990) critical methodology, namely ‘thoughtful action with reflection’ (Duffy). This poster presentation summarizes the transformative education process used in a directed study course with senior nursing students focused on cultural care. The course included a week-long immersion clinical experience at a free standing birthcenter in Weslaco, TX, ten miles from the border of Mexico. Students and faculty participated in the holistic care of women and families during pregnancy, labor and birth, home visits after birth, and well-baby exams. Following the clinical experience, the group met every two weeks during the semester to critically discuss chosen topics with assigned readings, and pointed application questions from the clinical experience. Discussion summaries were written by the designated discussion leader. At the end of the course, each student and the faculty member individually participated in a critical reflection exercise. The group then identified the transformed learning outcomes within the context of Campinha-Bacote’s model of cultural competence (1999).

Mary Hinz and Penny Every (156)

Faculty Advisor/Collaborator: **Joan Stehle Werner, Robin Beeman, and Ruth Tanyi**

Adjustment and Spirituality of Women Receiving Dialysis

Adjustment and spirituality have been investigated increasingly often in clinical populations. Consistently, significant associations emerge between these two phenomena. Spiritual Well-being (SWB), as a type of spirituality, is composed of two dimensions: Existential Well-being (EWB), referring to a person’s sense of meaning and purpose in life; and Religious Well-being (RWB), one’s well-being in relationship to God. The aim of this study was to explore comparisons of SWB, EWB and RWB scores between one sample of women adjusting to end stage of renal disease (ESRD) and dialysis ($n=65$), and other clinical populations adjusting to various other diseases and conditions. This study employed a descriptive-comparative design using secondary analysis of data previously collected as its method. SWB data from women with ESRD on dialysis were previously collected at five free-standing out-patient dialysis centers in a large Midwestern metropolitan area in 2002. These scores were compared with results reported in the literature. Results of this secondary analysis indicate that women adjusting to ESRD on dialysis scored lower on overall SWB ($M=91.54, SD=16.8$) than did, for example, women adjusting to breast cancer ($M=99.80, SD=15.2$), medical outpatients ($M=99.89, SD=16.0$), and caregivers of terminally ill persons ($M=93.91, SD=17.7$). RWB and EWB scores were also found to be lower than those of several other clinical populations. Reasons for these lower scores are unclear, but signal an important area of need for women with ESRD on dialysis. Results may be interpreted in various ways, which will be elaborated upon, and point to the necessity of assessing spirituality in practice, especially spiritual well-being as a major component of overall adjustment and well-being. Because there are many reports of SWB scores in the literature, the Spiritual Well-being Scale is an advantageous choice for assessment of spirituality in clinical populations who are adjusting to disease or medical conditions.

Amy Shardlow (161)Faculty Advisor/Collaborator: **Rita Sperstad***The Path to Cultural Awareness Through Nursing Honors*

This poster presentation depicts the progress of my nursing honors coursework over the last four semesters. The main themes that were identified throughout the honors topics were cultural awareness and privilege. Coursework activities that were performed are outlined. A review of cultural literature was done which facilitated critical analysis within the context of cultural awareness. The final aspect of this poster reflects the personal meaning of cultural competent care in respect to professional nursing.

DuWayne Shelley (117)Faculty Advisor/Collaborator: **Rosemary Jadack***The Effect of Laryngectomy on Eating Habits and Nutritional Intake*

The purpose of this descriptive study was to describe eating-related experiences and informational needs of persons following a laryngectomy. Thirty-four people with a laryngectomy (68% total laryngectomy, 24% with total plus radical neck dissection) were recruited from an Internet-based laryngectomy support group in the United States. There were 29 males and 5 females with a mean age of 62 years. Respondents completed a questionnaire containing both quantitative- and qualitative-type questions that examined the 1) effect of laryngectomy on food choice, eating habits, and overall enjoyment of eating; and 2) perceptions of teaching received from health care professionals regarding potential eating difficulties as a result of laryngectomy. Findings showed that 90% of the participants experienced a change in one or more aspects of eating. The most prominent of these were: decreased sense of smell, decreased taste, decreased enjoyment of eating, and an increase in the length of time required to eat meals. Most participants were not satisfied with the information received from health care professionals. Topics requiring emphasis during patient teaching were identified from participant comments. In summary, total laryngectomy produced significant changes in factors related to eating that can affect nutritional intake and quality of life. Participants reported that most health care providers did not adequately prepare them for potential alterations in eating that can occur following a total laryngectomy. Data from this study can be used to raise awareness of incidence and severity of changes in eating that occur after laryngectomy and to improve patient preparation to cope with these changes.

Allied Health Professions

Devon Garratt (151)Faculty Advisor/Collaborator: **Jennifer Johs-Artisensi***Parish Nursing Programs in the Chippewa Valley Region*

Parish nursing is a model of nursing care that focuses on health promotion and disease prevention. Parish nurses are specially trained to act as health educators, patient advocates, counselors, and trainers within their faith communities. A local group of Parish Nurses are interested in building a regional coalition and gaining support from the local health systems, and the current project is designed to assist in achieving this goal. This project has been designed to allow us to identify the prevalence of Parish Nursing programs in the local 8-country area, describe the services and activities these programs are engaged in, and gain a better understanding of the impact these low-cost programs have, including best practices that can be used to enhance existing programs and/or provide a framework for establishing new programs in the area, thereby expanding access to healthcare for the members of our community. We are currently collecting data from the 180 churches we surveyed and will be analyzing and presenting results.

Hilary Pascarella (152)Faculty Advisor/Collaborator: **Jennifer Johs-Artisensi***Resident Relocation*

We have been undergoing research pertaining to resident relocation. This was done by sending approximately sixty surveys to an assortment of nursing homes and assisted living facilities. These surveys asked twenty-five questions in relation to how each medical facility deals with residents, which have been transferred to their facility. Currently, the data is being gathered and inserted into a database for further analysis. Our main objectives are to begin to identify the best practices that will lead to the smooth transition of nursing home residents to different facilities and community placements across the state of Wisconsin. The long term goal of this project is to identify more specifically what the most current practices for resident relocation in the State of Wisconsin have been and how those practices have impacted outcomes, followed by a distribution of information, recommendations for superior practices and potential legislative changes in policy.

Jacquelyn Petroni, Amber Johnson, and Sara Ries (116)

Faculty Advisor/Collaborator: **Lee Anna Rasar**

Assessment of Effects of Harp on Developmental Skills of Early Childhood Students with Special Needs

Harp lessons will be provided to twenty-five four- and five-year-old students with special needs in the Menomonie School District by student Music Therapists Jacque Petroni, Sara Ries, and Amber Johnson under the supervision of Paula Smith and Lee Anna Rasar. Music therapy students will see each student with special needs to teach the student how to play harp and will complete an assessment of baseline skills in the areas of motor coordination, language/speech skills, cognition, attention span, ability to engage in purposeful, meaningful behavior, emotional status, and social interaction. Following the assessments, goals of focus will be established for each student and will complement the IEP goals developed by the speech therapists, occupational therapists, physical therapists, classroom teachers and the School Psychologist. Petroni, Ries, and Johnson would work with Rasar and Smith to develop these goals following the assessments. Each student with special needs will receive weekly harp lessons for a period of six weeks following the assessment. Another assessment will be completed for each student following the six-week period of harp lessons. Session notes will document each student's responses in each harp lesson, and videotaping will be used to show physical responses and possibly to document emotional responses. Additional information about any changes noted in emotional, social, behavioral and physical health of each student during this time period will be collected by school staff and families of each student. Student music therapists will collate this data in chart format and may also use videologs.

Jacquelyn Petroni, Susan Sundly, and Sara Ries (115)

Faculty Advisor/Collaborator: **Lee Anna Rasar**

Assessment of the Effects of Musical Respiratory Interventions for Patients on Ventilator Support

Patients on ventilator support who are able to use Passy Muir valves were instructed how to play harmonica and were led in singing exercises daily for two months. A baseline was recorded for each patient to note the number of seconds patient was able to sustain single pitches on harmonica, and to note the number of seconds the patient was able to play harmonica in one breath. Prior to and after each musical intervention, pulse oximetry for each patient was measured, as well as the number of seconds patient was able to sustain a single pitch on harmonica, both inhaled and exhaled. Harmonica and singing trials occurred daily for four weeks. Adaptations for pre-test and post-test were made for a patient who is blind and who has a developmental disability. A harmonica holder was utilized by a patient who is paralyzed from the neck down. Comparisons were made across time to note any changes in the ability of each patient to sustain single pitches on harmonica, in the number of seconds each patient could play in one breath, and in pulse oximetry. Individualized programs for harmonica and singing were developed for each patient based on responses during this project.

Communication & Journalism

Stephanie Buchholtz, Matthew Beasley, Mark Bulinski, Mark Lawrence, Cheryl Constant, Kaye Finne, Maighie Fitzgerald, Kurt Haberli, Marc Harter, Leeann Haupt, Elaine Johnson, Jennifer Maurer, Laura Middleton, Linnae Riesen, Amy Rosenthal, Ashlee Streit, Michael Strubel, Gretchen Switalski, and Anna Valeri (125)

Faculty Advisor/Collaborator: **Robert Sampson**

A View From Within: A Communication Audit

By way of a communication audit, this study investigates the internal communication among the various locations and levels of management at an Eau Claire organization. Eight locations of the organization will be analyzed using subscales taken from the International Communication Association (ICA) Audit (Goldhaber, Richetto, Dennis, Falcione, & Rogers, 1976). Each location will be analyzed using the completion of the ICA, randomly selected interviews, and observation of employee meetings. The ICA will be distributed to each employee within all Eau Claire locations to directly measure the communication sent to others, follow-up on information sent, sources of information, timeliness of information received from key sources, organizational communication relationships, and channels of communication. Additionally, employees will be randomly selected to voluntarily participate in a confidential interview. A variety of employee meetings will also be observed to compare in conjunction with the qualitative and quantitative elements examined. Statistical analysis will be practiced to accurately compile and analyze the internal communication among locations and between levels of management.

Communications Disorders

Jason Bennett and Sara Halada (138)

Faculty Advisor/Collaborator: **Kristine Retherford**

Applying Knowledge of Grammatical Structures: A Survey

The purpose of this study was 1) to evaluate grammatical knowledge of UW-Eau Claire undergraduate students and 2) to provide a foundation for further research regarding grammatical knowledge of Communication Disorders majors. Surveys have been designed to

evaluate knowledge the researchers believed was valuable to Communication Disorders students and to the university population at large (e.g., subjects, verbs, and editing knowledge). Surveys were distributed to freshman in English 110 classes and were scored separately and were compared by both researchers. Students' performances were compared to their perceptions of their performances. Results and implications of the study will be discussed as well as future research goals for the study.

Jenique Musil and Julia Murphy-Antczak (139)

Faculty Advisor/Collaborator: **Linda Carpenter**

Role-Play Assessment Tool

The Role-Play Assessment Tool (RAT) is designed for evaluating the spoken English skills of adult non-native speakers of English. Unlike discrete point assessment tools typically used to examine dialectal differences, the RAT provides an integrated view of communicative skill in functional contexts. The RAT is based on Cummins' (1981) framework of English proficiency, which is comprised of two continua: The contextual support dimension runs horizontally and ranges from "context embedded" to "context reduced;" the cognitive demand dimension runs vertically and ranges from "cognitively undemanding" to "cognitively demanding." These continua intersect to create a four-quadrant matrix, with each quadrant characterized by unique features of support and demand. The RAT includes a total of 16 role-play scenarios, with four in each quadrant. The RAT's communicative focus allows for evaluation of a speaker's use of language in context. Scoring considers pragmatics of conversation, and protocols draw on the work of Prutting and Kirchner (1987), McTear (1985), and Damico (1980). The RAT was piloted with students from UW-Eau Claire. Undergraduate and graduate students in communication disorders served as administrators and foreign students served as subjects. Information from the pilot led to revision of the scenarios, instructions, and scoring protocol.

Kerry Witherell (126)

Faculty Advisor/Collaborator: **Timothy Steele**

Educational Speech-Language Pathologist's Perspective of Auditory Processing Disorder: A Survey

A survey to describe the acceptance, knowledge, comfort-level, clinical caseloads, and training related to auditory processing disorders (APD) was mailed to 442 Speech-Language Pathologists (SLPs) working in Wisconsin schools who were members of the Wisconsin Speech Language and Audiology Association (WSHA). There was a 34.6% return rate. Results indicated strong acceptance that APD is a physiological and quantifiable phenomenon. There was also strong agreement that team assessment, intervention, and management is preferred over an individual approach. SLPs reported an average caseload size of 33 students with an average of 0.8 students per caseload diagnosed with APD. Finally, continuing education and/or additional training related to APD appears warranted.

English

Jessica Kazeck (148)

Faculty Advisor/Collaborator: **Carmen Manning**

Continuing the Conversation: Further Research into Using WebCT for Journal Responses

The purpose of this project was to investigate how differences in response for students completing course journals in an online forum versus traditionally on paper correlate to class performance as measured by class participation, essays, and exams. Half of the students in my English 150 Introduction to Literature course completed their journal responses on WebCT; the other half completed their journal responses on paper. Journal responses are being analyzed to determine differences between the nature of student response in the two different journal methods. These differences will then be investigated for correlations to student class performance.

Family Health Nursing

Brandi Sparks-Luther (149)

Faculty Advisor/Collaborator: **Jan Berry**

Student Perceived Learning Outcomes and Satisfaction in a Preceptored and Nonpreceptored Clinical Experience

Precepting has been advocated as an efficient and effective model of student learning, creating a positive experience for the student. Research demonstrates students achieved greater confidence with the increased clinical experience and enhanced continuity of learning. The purpose of the study was to compare student perceptions of achieving outcome objectives of the course and satisfaction with the course when comparing a traditional clinical experience with a preceptored clinical experience. The survey tool developed utilized statements graded on a Likert scale. A comment area was available for each statement. The fall 2002 senior class completed the survey tool. Data collected was saved for comparison to the next class. The fall 2003 senior course was perceived as meeting objectives at a higher rate. Satisfaction with the course was much higher in most areas. Further evaluation of suggestions shared by students is needed. Scheduling of clinical time was one of the major difficulties noted. The instructor role also needs to be evaluated as interaction with students was limited when on the units and on-call time commitment was extensive.

Foreign Languages

Erin Flehmer (137)

Faculty Advisor/Collaborator: **Kate Reynolds**

Development of Interlanguage Preposition Accuracy in Advanced ESL Writing

This qualitative research study brings interlanguage theory to bear on the writing process, which refers to the pedagogical practice of teaching writing in which learners engage in brainstorming, outlining, drafting, editing, and revising in order to improve the quality of their written assignments. Patterns that emerged include evidence of native language transfer, possible structure fossilization and a need for instruction in the process of writing. The study advances the field's knowledge of interlanguage development by providing current information about preposition teaching and ESL writing instruction; therefore, it allows for an improved understanding of preposition development in interlanguage and therefore greater understanding of how to address the issues in learning accurate preposition usage and how to teach more appropriately. The interactive presentation will discuss interlanguage theory, the research methodology, the findings relevant to international students' preposition use in the writing process, the connections to interlanguage theory, and the pedagogical ramifications.

Lindsay Olsen (150)

Faculty Advisor/Collaborator: **Juan Carlos Chaves**

Providing Healthcare to Hispanic Patients

Hispanics are a very fast-growing minority group in the United States. It is important for healthcare providers to be aware of the Hispanic culture and the Spanish language in order to provide care to these individuals. A review of the literature on Hispanic culture, language barriers, and healthcare was conducted. The results show that language barriers and cultural misunderstandings can create a significant barrier to access and understanding of healthcare among Hispanics.

Geography & Anthropology

Travis Franz and Erin Heidtke (143)

Faculty Advisor/Collaborator: **Lisa Theo**

The Development of a Nature Trail at Northstar Middle School

This student-faculty collaborative project entails the mapping, collection and recording of environmental data at Northstar Middle School in Eau Claire, WI to develop a nature trail and website that can be used by Northstar students, faculty and the community. Four learning pods will be created along the nature trail where Northstar faculty can take their classes and educate them on the natural ecology in their backyard. Each learning pod will be set in a different ecological setting; one will be in a grove of birch trees, one in an oak tree orchard, and two in a nest of pines. The trail and learning pods will also be accessible to the general public to use. The area was mapped using GPS and GIS with aerial photos and a Digital Elevation Model (DEM) was created to show proper elevation. In addition, there research was done on the flora and fauna in the area as well as data collected in the areas of soils, temperature, erosion aspects and overall biodiversity. As well as this poster presentation, a website will be created that the students and faculty of Northstar Middle School as well as the community will have access to in their classrooms and homes for their own ecological education.

Eric Lynde and Travis Franz (142)

Faculty Advisor/Collaborator: **Tim Bawden**

The Hinterlands of Major League Baseball

Geographers have studied patterns in sports for over three decades, largely beginning with John Rooney's 1969 pioneering article "Up from the mines and out from the prairies: Some geographical implications of football in the United States." Rooney argued at the time, that "fan loyalties are probably among the strongest of human attachments, and their regional boundaries are well documented and functionally organized via major sports radio and television networks." Since that time, media technology and professional sports in general have been dramatically transformed, which, in turn, has likely had an impact on the regional boundaries of the fan base of professional teams. This poster examines geographic patterns associated with Major League Baseball in North America. In particular, we first illustrate how major league baseball has expanded and evolved geographically during the past 30 years and discuss the ways in which media technology and media coverage has changed during that time. Second, we examine the size and location of teams' fan base. Our data came from a 2002 online ESPN survey in which 40,000 respondents were asked a variety of sports related questions including their favorite teams. The data were collected at the zip code level, allowing for fine scale analysis, and transferred to a GIS for further spatial analysis. Third, through a multiple regression analysis we identified several major factors that help explain the size of a team's fan base including city size, age of the franchise, and media coverage.

Mitchel Stimers and Tracey Gilbert (141)Faculty Advisor/Collaborator: **Lisa Theo***The Advertising Range of Wisconsin's Northwoods: A Teaching Tool for K-16 Educators*

A constant struggle for teachers at all levels is finding ways to successfully teach students complex theories and concepts. Student comprehension is often enhanced by applying these theories and concepts to real world situations. Following up on a pilot study conducted during November 1999, this project demonstrates an every day application of the Urban Geography concept of Central Place Theory by examining highway billboard signs along major highways entering Wisconsin's Northwoods. In addition, the concepts of range, threshold, intervening opportunities, complementarity, and transferability are demonstrated. Using Global Positioning Systems (GPS), data management/processing programs (such as Microsoft Excel), and Geographic Information Systems (GIS), data was collected on the location, distribution, and type of establishment advertised. Using statistical and spatial analysis we demonstrated that the greater the distance (range) between a billboard and its advertised business, the larger the threshold (the minimum population necessary for a particular business to be successful). The data was used to create a series of maps and graphs applicable for multiple grade levels. A lesson plan was created for elementary school, middle school, high school, and post-secondary classes. These lesson plans will give teachers at each level a method for student collection of comparable data for their own analysis.

Human Development Center

Kristina Hall, Melissa Irwin, and Krista Bowman (128)Faculty Advisor/Collaborator: **William Frankenberger***Comorbid Diagnosis and Concomitant Medical Treatment for Children with Emotional and Behavioral Disorders*

The purpose of the current study is to determine the types of psychiatric disorders and the corresponding medications prescribed to children enrolled in the elementary Emotional Behavioral Disability (EBD) programs. The project will employ a questionnaire that will be distributed to elementary level EBD teachers to determine the percent of children identified with Attention Deficit Hyperactivity Disorder, anxiety, depression, and any other psychiatric disorders. In addition, the project will determine the number of children diagnosed with multiple psychiatric disorders and the number of children treated with multiple psychiatric medications. Additionally, the research will assess the attitudes of EBD teachers concerning the use of psychiatric medication to treat elementary level children. Due to the minimal amount of research existing concerning this subject, the current study aims to gather information to increase public awareness and understanding of the current level of psychiatric disorders and corresponding treatment among elementary level EBD children.

Erin Marsh and Tasha Alexander (127)Faculty Advisor/Collaborator: **La Vonne Cornell-Swanson and Linda Carpenter***Interdisciplinary Team Impact on Impressions and Beliefs about Interdisciplinary Team Process*

Interdisciplinary team education is an increasingly important topic in an age when interdisciplinary teamwork is a fact of professional life. In many health, education, and social service settings, teams combine the expertise of individuals with specialized training in various professional disciplines. The objectives of this project are to, examine the impact of participation in the interdisciplinary team instructional program associated with clinical practicum in the Human Development Center (HDC) Assessment Clinic on students' beliefs about teamwork, examine the extent to which participation in the program facilitates attainment of specified student learning outcomes and, explore differences in beliefs and outcome attainment as a function of students' professional discipline. Data for this study is being collected through two survey instruments. These surveys will be adapted from (Bronstein, L.R. 2002) Index of Interdisciplinary Collaboration, which requires respondents to indicate, using a 5-point Likert scale, the extent to which they agree with 49 statements about interdisciplinary teamwork. All students from communication disorders, curriculum and instruction (reading/literacy studies), family health nursing, school psychology, and special education who are participating in the interdisciplinary assessment teams during the fall 2003 semester will serve as subjects for this study.

Kinesiology & Athletics

Shelly Loomis (145)Faculty Advisor/Collaborator: **Sean Bulger***Evaluation of a Professional Development Curricular Strand within an Undergraduate Kinesiology Program*

The purpose of this research project is to formatively evaluate a professional development curricular strand that has been systematically infused into the exercise management curriculum within the Department of Kinesiology and Athletics. This professional development initiative has been designed to accomplish the following three educational objectives: (a) To facilitate the students' transition to postcollege life; (b) to provide regular opportunities for self-reflection regarding one's professional readiness; and (c) to help integrate and bring successful closure to the undergraduate experience (Gardner & Van der Veer, 1997). The curricular strand was developed

collaboratively by University faculty members and career services personnel with feedback from participating undergraduate students and has been pilot tested across the past three semesters. A focus group protocol involving student participants in the professional development initiative will be used to obtain qualitative data which will then be transcribed and analyzed thematically in order to identify emergent ideas or issues from the discussions (Myers, 1999). A survey relating to career services and professional development will also be administered to all participants and triangulated with focus group results.

Mathematics

Elizabeth Burgener (146)

Faculty Advisor/Collaborator: **Alex Smith** and **Don Reynolds**

Widening the Scope of Peer Mentoring in the Mathematics Curriculum

Traditionally undergraduate mathematics majors are paid to grade homework papers for students in introductory mathematics courses. Recent advances in symbolic computation provide an opportunity to have students do their homework online at a level that is higher than mere multiple choice questions, and to then have their work immediately graded by software. This provides faculty an opportunity to find ways to employ undergraduate mathematics majors more effectively. We experimented with using MapleTA in a Calculus II class to grade homework involving symbolic integration and infinite series, and studied the effect of using this software, in conjunction with a peer mentor, on student attitudes and student learning.

Special Education

Jackie Herpel and Rebecca Schumitsch (144)

Faculty Advisor/Collaborator: **Vicki Snider**

Teacher Beliefs Study

We are examining the underlying beliefs that guide instructional practices in teaching. Our hope is that by understanding teachers beliefs we will be able to identify an outlet and context for change. We have prepared and distributed surveys to K-12 teachers in schools and to teacher educators at the public universities throughout Wisconsin, Minnesota, and Iowa. With the results of our survey, we will be comparing and analyzing the beliefs of teachers in various educational areas, such as between elementary and special education. We will be looking at current research and popular teaching methods to see if what is actually being done in the schools aligns with teachers' beliefs about best teaching practices.

Women's Studies / Psychology

Meghan Matt (147)

Faculty Advisor/Collaborator: **Susan Turell**

Assessing Program Effectiveness for Inmates in the Eau Claire Jail

This research project asked the question, Does jail programming directly affect recidivism? There is not much documented research on this topic already. I came across many studies on alternatives to jail and treatments for people in jail, but not about the actual effect of the program on the number of repeat offenses that end in jail terms. By April I will have analyzed the data regarding people who participate in these programs and their recidivism rate and compare it to those that do not and their recidivism rate. I hypothesized that participation in IDIP program and the Jail Program will decrease recidivism.

Natural and Physical Sciences

Biology

Marie Butchert, Melissa Fraaza, Lindsay Entringer, Wendy Parker, and Kristi Stubbe (41)

Faculty Advisor/Collaborator: **Evan Weiher**

Mycorrhizal Fungal Colonization Rates Along Multiple Gradients in Prairies, Oak Savannas, and Forests

Vesicular-arbuscular mycorrhizal fungi play an important role in facilitating plant nutrient uptake, and because of this they can affect plant diversity, dominance, and community composition. Little is known about how the strength of plant – VAM fungal interactions vary along natural gradients in extant vegetation. In order to begin to understand how plant – fungal interactions vary, we collected 235 soil cores from 11 remnants that graded from open prairies, through oak savannas to dry oak and wet maple forests. In the field, we

collected data on plant above-ground biomass to estimate production, tree canopy cover, and soil moisture. In the lab, we cleared and stained root samples with trypan blue and counted VAM colonization on gridded plates. We also measured soil pH, organic content, and conductivity. Colonization rates were highest at intermediate production, low tree canopy cover, and low soil moisture. The next step is to assess the relative importance of these factors using structural equation modeling.

Nick Cartwright (2)

Faculty Advisor/Collaborator: **Daniel Janik**

Body Weight and Circadian Clock Resetting in Syrian Hamsters

Hamsters awakened in the day and allowed to exercise in a novel running wheel reset their circadian clock by about 3 hrs if they run vigorously. About 50% of hamsters show this response. Previous work has shown that food restriction boosts the total amount of activity that hamsters show. We tested the idea that food restriction would lead to more running in a novel wheel and therefore more clock resetting. We selected animals that, under ad-lib feeding, were shown to be poor runners and resetters. When these animals were food restricted for 24 hr, they showed no increase in resetting, but did show an increase after 48 hrs of food restriction. We further asked whether increased food intake decreases the amount of running and resetting shown by hamsters that were good runners and resetters under ad-lib feeding conditions. To do this, we fed these hamsters a high calorie diet with a variety of foods that changed on a daily basis. This increased body weight by 10% over that of controls, but there was no decrease in running and resetting. These results suggest that the change in body weight associated with food restriction is not the critical factor increasing running and clock resetting.

Micah Daniels (20)

Faculty Advisor/Collaborator: **Sasha Showsh**

*Structural Analysis of a Bacteriocin Protein Isolated from *Enterococcus faecalis**

Some bacteria are capable of producing and secreting chemicals called bacteriocins. These bacteriocins are proteins that generally exhibit a narrow spectrum of antimicrobial activity. Because of these antimicrobial properties bacteriocins are potentially applicable for use in treating infections and as food preservatives. *Enterococcus faecalis*_SAS66 contains a conjugative plasmid (pAM369) that encodes for production of bacteriocin and resistance to antibiotics gentamicin and erythromycin. Analysis of the bacteriocin revealed that it is a heat labile protein with bacteriostatic activity against *E. faecalis* and other Gram-positive bacteria. The bacteriocin is active over a wide pH range (pH=5 to pH=10) and is inactivated at temperatures above 40°C. We developed a procedure to isolate and purify the bacteriocin from *E. faecalis*, allowing us to perform structural analysis on the protein.

Ryan DeChaine (25)

Faculty Advisor/Collaborator: **Kristina Beuning**

Temporal Trends in Lake Water Temperature in the 20th Century: A Case for Global Warming?

Historical and modern (2003) summer lake water temperature data were collected on eight Wisconsin lakes. These data were used 1) to evaluate whether lake water temperature fluctuations are correlated with air temperature change; and 2) to assess whether any temporal trends in lake water temperature have occurred over the last 62 years. Our results indicate that lake water temperature variability closely follow air temperature fluctuations during June, July and August for the temperature records. This finding confirms that air temperature changes are indicative of lake water temperature changes. However, regression line slopes reveal negligible changes in water and air temperature over the periods of investigation. These results were surprising given that mean global temperatures have risen by 0.6°C during the last century (IPCC, 2001). We attribute the relatively constant mean summer air and lake water temperatures in Wisconsin to the limited length of record. To further investigate potential lake water warming due to global warming, long-term continuous datasets are needed.

Lacey Eveland and Stephanie Haas (22)

Faculty Advisor/Collaborator: **Amy Krist**

Parasitism and Life-History Traits in a Freshwater Snail

Life-history traits are characteristics of an organism that are closely linked to survival and reproduction. Life-history theory states that parasites cause these traits of hosts to evolve. Specifically, age of maturity should evolve to be earlier and reproductive output should evolve to be higher in snail intermediate hosts from populations with a high prevalence, the proportion of infected individuals. In this study, we examined the predictions of life-history theory and controlled for environmental effects by investigating whether parasite prevalence predicted age at maturity and number of offspring in freshwater snails from twelve populations. We found no significant relationship between the mean prevalence of castrating trematodes and age at maturity or reproductive output among populations of snail hosts. There are several possible reasons for these unexpected results. First, there may be other agents that cause selection on snail life-history traits. Second, our estimate of prevalence from two years may not reflect long term prevalence. Finally, trade-offs among life-history traits may constrain natural selection.

Nick Freiburger (26)Faculty Advisor/Collaborator: **Kristina Beuning***Widespread Drought in Tropical East Africa During the Grand Solar Maximum*

New multi-proxy data from Lakes Edward, George and Kyoga, East Africa document significantly reduced lake levels between 1000 and 750 cal. years before present (BP). In the shallow lakes basins of George (central basin) and Kyoga, evidence for aridity is provided by a distinct desiccation surface of gray mottled clay with organic matter content below 20% and water content values of 60%, both well below typical values for the biogenic oozes that overlay these surfaces. Dates from these surfaces suggest that they may be linked to geochemical evidence for increased aridity around Lake Edward, which is hydrologically connected to Lake George. In Lake Edward sediments, a large positive spike in the % Mg in inorganic calcite occurs from 940 to 790 cal. years BP. The timing of all of these events, particularly the Edward record, corresponds closely with the Grand Solar Maximum and supports solar forcing of increased aridity in tropical East Africa at this time. Following this period of aridity, sedimentological evidence and biogenic silica profiles from George and Kyoga indicate that both basins supported a shallow marsh prior to a return to open water conditions dominated by non-silicic algal populations.

Justin Frey and Molly Ferron (1)Faculty Advisor/Collaborator: **Daniel Janik***Locomotor Activity and Circadian Entrainment to a Short Photoperiod*

We examined the effect of running activity on circadian rhythms of hamsters in a short (6h light: 18h dark) photoperiod. Hamsters in this light cycle begin their activity 5-6h following darkness onset. We shifted hamsters' nightly activity onset to within 2h of darkness onset by allowing them to exercise soon after lights out. After their circadian rhythm had stabilized at the new earlier phase, we took away their exercise wheels for 28 days and continued to monitor their circadian activity rhythm with passive infrared detectors. The activity rhythm of these animals shifted about 1.5h back toward the original pre-novel wheel stimulus onset and shifted forward again when the wheels were returned. The results indicate that the animals' own daily activity plays an essential role in circadian stabilization.

Emily Hockman (44)Faculty Advisor/Collaborator: **Tali Lee***The Effect of Atmospheric Carbon Dioxide on Photosynthesis and Water Use Efficiency in Across 13 Prairie Species*

It has been documented that, largely due to the increased burning of fossil fuels, the amount of carbon dioxide in the environment is rising. This study focused on how plants respond photosynthetically to such an increase, by looking between and within two functional groups. Free-Air CO₂ Enrichment technology was used to grow three species of C₄ grasses and ten species of C₃ forbs and legumes in both ambient (360 ppm) and elevated (560 ppm) CO₂ levels. Net photosynthetic rates (umol CO₂ m⁻²s⁻¹) and water-use efficiency (mmolCO₂/molH₂O) responses to atmospheric CO₂ were determined by leaf level CO₂ gas exchange. C₃ plants grown in elevated CO₂ increased their mean photosynthetic rate by 20% compared to those grown in ambient conditions, however C₄ plants showed no response to increased CO₂. The mean water-use efficiency for C₃ plants increased by 45% under elevated CO₂, and the change between the mean water-use efficiency of C₄ plants between ambient and elevated CO₂ was more than double than that of C₃ plants. These results suggest that C₃ plants will benefit from increased amounts of CO₂ in the atmosphere. Whereas, C₄ plants are generally able to more efficiently use water at higher levels of CO₂, but the extra CO₂ should not affect their already efficient photosynthetic pathway.

Tracy Hoke (47)Faculty Advisor/Collaborator: **Paula Kleintjes***NABA 2003 Butterfly Count at Beaver Creek Reserve*

The North American Butterfly Association conducts an annual butterfly count each year during the first two weeks of July. The purpose of the count is to document species distributions across North America and Mexico and to educate the public about butterflies. Each count occurs within a 15-mile radius of a designated point and all butterflies observed are identified and counted. For the past three years, Beaver Creek Reserve has served as a count center and I served as the count coordinator for 2003. On July 12, 2003, seventeen volunteers counted 1780 individual butterflies belong to 44 species. The most commonly observed species included the common wood nymph, clouded sulfur and aphrodite fritillary. We observed one federally endangered species, the Karner blue butterfly. The butterfly count and the BCR butterfly house provide an opportunity for the public to develop a greater understanding and appreciation of these beautiful and beneficial insects.

Sarah Ivory (48)Faculty Advisor/Collaborator: **Joseph Rohrer***Relationships Among Species of North American Plums Inferred from DNA Sequences*

Fourteen species of wild plums (*Prunus* sect. *Prunocerasus*, Rosaceae) are native to North America, north of Mexico. Many of them are very similar in appearance, and the relationships among the species are unclear. We are using gene nucleotide sequences to analyze these relationships. Two genes are from the nuclear DNA: *s6pdh* which codes for the enzyme sorbital-6-phosphate dehydrogenase, and *LFY* which regulates conversion of a leafy shoot into a flowering shoot. To results presented last spring, this year we have added the *trnL-trnF* intergenic spacer DNA from the chloroplast genome, as well as DNA sequences from two more native plums, thus completing our collection of all North American species. Sequences for all three gene fragments are very similar among the native plums, much more so than among other species of the same genus, suggesting a very close relationship. Most distinct is *Prunus subcordata*, the only species growing west of the Rocky Mountains, which is a sister group to the rest of the American plums in analysis of all three genes. The eastern species form several clades, but the groupings of species vary with each gene. Hybridization among native plum species has made elucidation of their evolutionary history more difficult, but the relationships among species are becoming clearer.

Rebecca Kitzmann and David Koenig (65)Faculty Advisor/Collaborator: **Paula Kleintjes and David Lonzarich***A Comparison Among Coral Reefs of San Salvador, Bahamas: Perceived Quality and Fish Species Composition*

We conducted studies on fish species composition and coral reef habitat quality, as perceived by Biology 320 students, for seven reefs on Sal Salvador Island, Bahamas. In January 2000 and 2004, students snorkeled reefs and recorded all fish species observed. We calculated and compared species richness, fish feeding guilds and fish family associations among reefs. We observed a range of 42-64 species/reef out of nearly 100 species possible. Values varied according to time, weather and identification skills and not necessarily reef type. The majority of species were planktivores and invertivores with significantly greater numbers of each on the patch and barrier reefs compared to fringing reefs. The damselfish family (*Pomacanthidae*) had the greatest species richness but representation of all 40 families observed did not vary among reefs. In 2004, we had students rank each reef on a scale of 1-3, with 1 being the best in quality. The class chose ten variables including: low algae cover, coral health, low sediment, water clarity, coral and fish species richness, aesthetic color, beauty of fish, numerous niches, age, and size of coral. Gaulin Cay, a barrier reef, ranked best at 1.2 and Grahams Harbor, an old pier, ranked worst at 2.3. Fish richness and beauty were of the greatest value to the class.

Lauren Losek (43)Faculty Advisor/Collaborator: **Tali Lee***Contrasting C3 and C4 Prairie Species Response to Atmospheric CO₂ Over a Growing Season*

C3 and C4 species response to atmospheric CO₂ can differ due to differing photosynthetic pathways and a species ability to respond to CO₂ can depend on other factors, such as time of year. The objective of this study was to compare the CO₂ response of C3 and C4 prairie species and to determine if this response depends on the time of year that measurements are taken. In a controlled field experiment, we measured leaf net photosynthetic rates (umolCO₂m⁻²s⁻¹) and aboveground biomass (g) for *Bromus inermis* (C3), *Andropogon gerardii* (C4) and *Solidago rigida* (C3) grown in monoculture plots several times across the growing season. In terms of photosynthesis, the three species responded differently in respect to too late versus early in the growing season (*Andropogon* -40%, *Bromus* and *Solidago* no change) as well as in elevated versus ambient CO₂ (*Andropogon* and *Solidago* no change, *Bromus* +23%). Biomass responses did not necessarily follow photosynthetic responses. Two species demonstrated significant interaction between CO₂ and time such that their CO₂ response ranged from minimal to +53% depending on time of year. These findings show that C3 and C4 species do not always respond as predicted based on their photosynthetic pathways. Therefore, it is crucial to measure species throughout the growing season to accurately predict plant response to atmospheric CO₂.

Sara Mickelson (21)Faculty Advisor/Collaborator: **Julie Anderson***DNA Transfer Between Bacteria and Yeast Via the Conjugative Transposon, Tn916*

The transfer of DNA between distantly related species could be a significant factor in evolution and may help to explain discrepancies in phylogenetic trees. In addition, successful transfer raises the possibility of productive interactions between bacteria and mammalian cells including the transfer of DNA-protein complexes, naked DNA, or even DNA-free proteins. One example of gene transmission occurs between bacteria and certain plant species. This DNA transfer is mechanistically similar to the process of bacterial conjugation. Bacterial conjugation (genetic transfer requiring cell-to-cell contact) has been known to exist among gram-negative or gram-positive bacteria since the 1950s. Tn916 is a conjugative transposon originally identified in a gram-positive bacterium (*Enterococcus faecalis*) and is capable of transfer between gram-positive and gram-negative bacteria. Recently transkingdom gene transfer between a gram-

negative bacterium (*E. coli*) and a eukaryote, yeast (*S. cerevisiae*), has been demonstrated. This indicates that the elements necessary for transfer are compatible between the two systems. To date, the transfer of Tn916 between more primitive gram-positive bacteria and microbial eukaryotes has not been demonstrated. The proposed project is designed to demonstrate the transmission of genetic material between prokaryotes and eukaryotes and to investigate the underlying mechanisms of this transfer.

Trina Nowak (23)

Faculty Advisor/Collaborator: **Amy Krist**

*Trade-Offs Among Life-History Traits in the Freshwater Snail, *Helisoma anceps**

Life history traits explain the broad features of an organism's life cycle, such as age at first reproduction, reproductive output, and survival. Trade-offs exist when a life-history trait that is beneficial to the fitness of an organism is linked to a trait that is costly. In our study, we investigated whether trade-offs existed among a number of major life-history traits in the freshwater snail *Helisoma anceps*. Specifically, we examined whether there were trade-offs between size and age at maturity and reproductive output and growth. These potential trade-offs were examined both within and among populations of *H. anceps*. We found that trade-offs exist between size and age at maturity both among and within most populations. We also found a significant trade-off between growth rate and reproductive output when all populations were combined. However, when we examined populations individually, we found variation in these relationships. A trade-off between growth rate and reproductive output was present in only about half of the populations. In the populations in which trade-offs exist, they should constrain the evolution of life-history traits, including evolution in response to parasitism.

Michael Orysen (13)

Faculty Advisor/Collaborator: **Tali Lee**

Role of Endogenous Neuropeptide Y (NPY) in the Neural Control of Blood Pressure

There is evidence that supports the regulation of sympathetic outflow through the inhibitory neurotransmitter, nitric oxide (NO) and neuropeptide Y (NPY), when it is released from hypothalamic neurons. We used LNAME, a nitric oxide synthase inhibitor which raises blood pressure, to test whether overexpression of NPY can reduce or compensate for hypertension induced by central NO deficiency. We used Sprague-Dawley, NPY transgenic (extra copies of NPY transgene) and non-transgenic rats. Blood pressure was recorded continuously for 3 days before LNAME infusion, 14 days during the infusion and 7 days after. There was no significant difference ($p=0.43$) in the mean blood pressures between genotypes. There was a significant increase ($p<0.01$) in the mean blood pressures with respect to time ($n=5-6$). These data did not support the hypothesis that NPY overexpression can compensate for the hypertensive effects of central NO deficiency. A trend suggested that NPY did affect central NO deficient hypertension but was not significant. The difference in the mean blood pressures with time showed that LNAME treatment significantly raised the blood pressure for both genotypes. More studies are needed to conclude whether NPY upregulation reduces sympathetic outflow to the cardiovascular system and reduces hypertension induced by low central NO.

Jenifer Schwartzhoff (4)

Faculty Advisor/Collaborator: **Lloyd W. Turtinen**

The Effect of Amphotericin B on the Respiratory Burst in Activated Macrophages

During phagocytosis, a metabolic process known as respiratory burst occurs in activated macrophages. The process results in the reduction of oxygen to superoxide anion (SA) that is extremely toxic to ingested microbes including fungi. Members of the protein kinase C (PKC) family play a key role in this process. To simulate phagocytosis, we generated respiratory burst curves using an inducer of PKC called tumor promoting phorbol ester (TPA), and measured the ability of four different antifungal amphotericin B (AMB) formulations to modulate the production of SA. As an indicator of the respiratory burst, SA was measured by luminol-enhanced chemiluminescence. One AMB preparation, Fungizone, significantly inhibited SA production, while Abelcet significantly enhanced SA production. Two other AMB preparations, Ambisome and Amphotec had less of an effect. To establish a molecular explanation for this phenomenon, we developed a western blot assay to detect and quantify PKC using CCD camera based chemiluminescent imaging. We are currently assessing whether increased levels of SA correlate with increased PKC production.

Jodi Swanson (46)

Faculty Advisor/Collaborator: **Paula Kleintjes**

Blister Beetle Associations with Wild Lupine and the Karner Blue Butterfly in Wisconsin

The primary reason for the decline in the Federally listed endangered Karner blue butterfly *Lycaeides melissa samuelis* (Lepidoptera: Lycaenidae) has been the loss of habitat. Karner larvae feed on only one species of plant, wild lupine *Lupinus perennis*, which grows in oak savanna/pine barren ecosystems. This host plant specificity may increase competition between Karners and other herbivores. The purpose of this study was to investigate the biology of the blister beetle *Lytta sayi* (Coleoptera: Meloidae), an herbivore of lupine. My goal was to determine, through field observations, if Karners are affected by the presence of beetles on wild lupine. During

the summer of 2003, I collected field data, including population size of both species, and beetle feeding, mating and dispersal behavior in a Karner occupied site in Fall Creek, WI. Results indicate that, due to the timing and behavior of the blister beetle, a possible consequence of the beetle presence is a change in oviposition site selection by Karners. This summer, I will further investigate the relationship between the choice of lupine plant by the beetles and the butterflies by comparing the distribution of adult beetles and Karner eggs, larva and adults within occupied sites.

Dustin VanOverbeke (66)

Faculty Advisor/Collaborator: **Paula Kleintjes**

*Effects of Elk Browsing on *Potentilla fruticosa* and Adult Butterflies*

In the Jemez Mountains of northern New Mexico, we have observed over 100 butterflies, belonging to five species, nectaring on shrubby potentilla (*Potentilla fruticosa*) and spending up to 30% of their foraging time on its flowers compared to adjacent nectar species. Little is known about *P. fruticosa* ecology and no documentation confirms it as a nectar source for butterflies. In one of our study sites, we found elk (*Cervus elaphus*) to preferentially browse upon *P. fruticosa* and to significantly reduce flower abundance outside of the enclosure (mean of 0.27 flowers/plant outside and 283.1 flowers/plant inside). Within the enclosure we also had a mean of 4.2 butterflies (3 species)/3600m² and 1.2 butterflies (2 species) outside it over 5 sampling periods. Our study suggests that browsing of *P. fruticosa* by elk may limit nectar availability and therefore may affect butterfly foraging behavior and abundance. In 2004, we will expand our study area and sampling effort to document nectar quantity and quality of *P. fruticosa* to gain a better understanding of its use by adult butterflies.

Michelle Washebek (45)

Faculty Advisor/Collaborator: **Paula Kleintjes**

Do Elk and Fire Suppress Aspen Regeneration?

In Bandelier National Monument, New Mexico, the combination of fire and browsing by high numbers of elk is suppressing aspen regeneration. Aspen is clonal and when weakened by fire and repeated browsing by elk, root systems weaken and the clone dies. During the summer of 2003, I assisted monument staff with an assessment of elk and aspen sprout presence in areas observed to be lacking aspen regeneration. I used a ©Garmin global positioning system to find over 50 randomized points spread across 8 km² of burned and unburned areas of the 2000 Cerro Grande Fire. At each point, I recorded the presence of the closet elk pellet pile and aspen sprout in each of four quartiles. Data and National Park Service maps were spatially analyzed with ArcMap GIS software. Numbers of elk did not differ between the burned and unburned sites, however, aspen regeneration was significantly lower in the burned area. Even though I studied a limited area, the results suggest the combination of elk and fire hinders aspen regeneration.

Kally Worm (42)

Faculty Advisor/Collaborator: **Tali Lee**

Lupinus (N₂-fixer) and Andropogon (C₄ grass) in Multi-Species Communities: Varying Photosynthetic and Biomass Responses to Atmospheric CO₂ and Soil N

N₂-fixing species share the unique ability to access a form of N that is unusable by other plants while C₄ grasses are generally more efficient in using available soil N. When these species are grown in mixtures, their unique functional attributes may differentially affect photosynthetic and biomass responses to atmospheric CO₂ and soil N altering competitive interactions. We measured leaf net photosynthetic rates (umolCO₂m⁻²s⁻¹) and above-ground biomass (g) of *Lupinus perennis* and *Andropogon gerardii* grown in 16-species mixtures. We tested the hypotheses that: (1) biomass production of a C₄ grass is stimulated in enriched N communities where it can efficiently utilize the additional N as compared to *Lupinus* which loses its competitive advantage under enriched N and (2) legumes respond positively to CO₂ due to the ability to fix N as compared to *Andropogon*. *Andropogon* biomass grown in enriched compared to low N was higher (+22%, P=0.03). *Lupinus* biomass was not affected by enriched N. Net photosynthetic rates and biomass were higher in *Lupinus* grown in elevated CO₂ (+19%, P=0.01; +28%, P=0.02, respectively). These trends suggest that due to high N efficiency of *Andropogon* and loss of *Lupinus* competitive advantage in elevated N environments, *Andropogon* outcompetes *Lupinus* in multi-species communities where N is no longer a limiting resource.

Biology / Chemistry

Miranda Lu Bader and Philip Cannon (19)

Faculty Advisor/Collaborator: **Wilson Taylor**

Characterization of Toxic-Stage Amyloid-Beta Fibril Formation Using Transmission Electron Microscopy

The pathology of Alzheimer's disease is characterized by self-assembly of f3-amyloid peptides in the brain, leading to fibril formation. Changes in fibril morphology, in a series of stages from nonfibrillar aggregates, the development of protofilaments and their assembly into fibrils, and finally the rearrangement of the fibrils into well-ordered highly twisted structures, were examined as part of a timed

study using transmission electron microscopy (TEM). Each stage will be characterized in terms of shape, diameter, time of development, and prevalence of aggregation. Our principal stage of interest will be the nonfibrillar amorphous aggregates, considered the toxic stage of development.

Chemistry

Logan Ausman and Emily Gilles (51)

Faculty Advisor/Collaborator: **Stephen Drucker**

Ultraviolet Cavity Ringdown Spectrum of 2-Cyclohexen-1-one

The ultraviolet absorption spectrum of 2-cyclohexen-1-one vapor is reported for the first time. Cavity ringdown spectra were recorded in the vicinity of the S1 origin band, which is located at 26,089.1 cm⁻¹. Observation of hot bands has permitted the determination of several low-frequency fundamentals and overtones in the ground electronic state. The lowest two excited quantum states for the inversion vibration, ν_{39} , were found to be at 99.0 and 197.0 cm⁻¹. These values drop to 94.8 and 188.2 cm⁻¹ for the deuterated derivative 2-cyclohexen-1-one-2,2,6-d₃. Fundamental frequencies for ν_{39} , ν_{38} , and ν_{37} have also been determined for both undeuterated and trideuterated species.

Christopher Conklin and Sara Chamberlin (60)

Faculty Advisor/Collaborator: **Marc McEllistrem** and **Doug Dunham**

Etching of GaN Surfaces

Gallium nitride-based LEDs have found application in signing (traffic lights, vehicle indicator lights, commercial signs, etc.) and residential lighting (white lights). Further improvement in performance and cost for these LEDs will require improved understanding of the gallium nitride material, its growth, and etching. These concerns motivate our study of how bromine etches the gallium nitride surface. Our prior results indicated that bromine helps to remove gallium from the surface, and that nitrogen desorbs as N₂. Results from our current studies reflect how surface composition changes with bromine dose. We correlate these results with our prior studies of how surface structure changes with etching.

Matthew Giese (38)

Faculty Advisor/Collaborator: **Warren Gallagher**

Monitoring Amyloid Fibril Formation by Fourier Transform Infrared Spectroscopy

The amyloid diseases include Alzheimer's disease, type-II diabetes, and the spongiform encephalopathies such as mad cow disease, chronic wasting disease in deer, and Creutzfeld-Jakob disease in humans. These diseases are associated with the abnormal aggregation of proteinaceous material into ordered structures called beta-fibrils. The source of the proteinaceous materials are proteins, or pieces of proteins, that are normally non-deleterious, but which become agents for these diseases upon self-assembling into the large, insoluble, fibril aggregates. The polypeptide backbone of the protein in fibrils has what is called an antiparallel beta-sheet secondary structure. Protein secondary structure describes the local structure of the polypeptide backbone. Other types of secondary structure include alpha-helix and parallel beta-sheet structures. Fourier transform infrared spectroscopy (FTIR) is a method that can be used to determine the presence and amounts of the different secondary structures in proteins. We will be reporting on a project to develop methods for using FTIR to monitor beta-fibril formation in real-time. FTIR can also be used to monitor a process called hydrogen/deuterium exchange in proteins. We will be reporting on our use of hydrogen/deuterium isotope exchange to assess the formation of well-ordered structures such as beta-fibrils. Having a tool that can measure beta-fibril formation in real time will open the door to a wide range of experiments that can be carried out to investigate underlying causes of amyloid diseases.

Glen Gullickson and Jessica Walters (17)

Faculty Advisor/Collaborator: **David Lewis**

Synthesis and Cyclization of beta-Hydroxyanilides: 3,4-Dialkyl-3,4-dihydro-2(1H)quinolones

The aldol addition reaction of propionanilide dianions and aldehydes gives a mixture of beta-hydroxyanilides from which the anti isomer is readily obtained crystalline. On heating under reflux with formic acid, these hydroxyanilides cyclize to a mixture of stereoisomeric dihydroquinolones. The scope and limitations of both reactions in the sequence will be discussed.

B. J. Huettl (27)

Faculty Advisor/Collaborator: **Alan Gengenbach**

Mixed-Metal Metalloporphyrin Catalysts for Reductive Dechlorination of PCE

Chlorinated ethylenes are hazardous industrial pollutants commonly found in the environment. These compounds are resistant to oxidation reactions and as such, degradation usually occurs through reductive processes. Vitamin-B12 is the most widely studied

catalyst for the degradation of perchloroethylene (PCE) but the products of this reaction include dichloroethylene (DCE) and vinyl chloride (VC) and are also hazardous substances. The usefulness of vitamin-B12 as a bioremediation reagent is limited due to the slow reaction rates of these less chlorinated molecules. A more useful catalytic system would completely degrade PCE into ethylene without production of chlorinated organics. Recent work focused on reductive dechlorination reactions catalyzed by metalloporphyrins and the stoichiometric reactions of bulk metals with PCE. The results of those studies suggest that mixtures of metalloporphyrins and/or dimeric metalloporphyrins could efficiently catalyze the complete dechlorination of PCE. The work presented here describes the synthesis and characterization of monomeric porphyrins and their metal derivatives. These monomeric porphyrins contain the same functional groups as potential dimeric catalysts and therefore form a model system for the dimeric catalysts.

Christopher Knutson (29)

Faculty Advisor/Collaborator: **James Phillips**

Vibrational Frequencies of H_3N-SO_2 and H_3N-SO_3 : Implications for Matrix Effects on Structure and Bonding

Previous studies have shown that the structures of amine-SO₂ and SO₃ complexes are quite sensitive to chemical medium. For example, H₃N-SO₃ has an N-S distance of 1.957 Å in the gas phase, but the bond compresses to a value of 1.771 Å in the crystal. Such observations raise the question as to what extent such complexes are affected by a bulk, condensed-phase medium such as solvent, or cryogenic rare gas matrix. In this study, we focus on H₃N-SO₂ and H₃N-SO₃. Vibrational frequencies of these compounds have been observed in both nitrogen and argon matrices, and in the latter case, a crystal structure has been determined and solid-state IR spectra have been measured. We have reexamined the gas phase properties of these complexes with B3LYP calculations and basis sets ranging from 6-31G* to 6-311+G**. For H₃N-SO₃, comparisons of gas phase, crystal, and matrix vibrational frequencies indicate that the matrix environment does cause a significant contraction of the N-S bond, though not to the extent of the crystalline complex. Similar effects are inferred for H₃N-SO₂, though there are no solid-state data with which to compare. Recent attempts to obtain these data will also be discussed.

Chong Hoong Leong (39)

Faculty Advisor/Collaborator: **Fred King**

Analysis of the Auxiliary Functions Arising in Atomic Three-Electron Integrals

The mathematical approach to calculating the properties of lithium and other three-electron atomic species is to determine a quantity known as the wave function. To determine this wave function, we need to evaluate the atomic three-electron integrals, which contain factors representing the distances between electrons. This work considers an alternative expansion of these factors and investigates the auxiliary functions that arise as a result of this expansion.

Michael Mbughuni (18)

Faculty Advisor/Collaborator: **Marcia Miller-Rodeberg**

Peroxidase Catalyzed Oxidation of Azo-dyes

Azo-dyes are chromophoric aromatic compounds with conjugated ring systems linked together by an azo (-N=N-) group. Due to the stable nature of this family of dyes and the lack of efficient treatment procedures, azo-dye environmental contamination poses ecotoxicity and bioaccumulation problems. Apart from current treatment procedures, research groups are exploring the idea of using peroxidase enzymes, capable of non-specific oxidation of organic molecules, as one possible aerobic treatment of azo-dye waste waters. But thus far, peroxidase oxidation of azo-dyes has proved to occur slowly with both lignin and horse radish peroxidases. As a result, the focus of our research is to determine the reaction mechanism for peroxidase oxidation of azo-dyes, to identify the reaction products, and finally to be able to explain why the reaction occurs slowly. This poster presentation outlines detailed kinetic studies results that have elucidated the chemistry and mechanism of peroxidase catalyzed oxidation of several azo-dyes.

Kristy McNitt and Nicholas Deprez (7)

Faculty Advisor/Collaborator: **David Lewis**

Synthesis and Characterization of Fluorescent Naphthalimide Analogs Troeger's Base

The treatment of N-alkyl-4-amino-1,8-naphthalimides with formalin and concentrated hydrochloric acid in ethanol gives a seco-Troeger's base when the reaction is carried out at ambient temperatures, and the Troeger's base when the reaction is carried out at elevated temperatures. These dimeric naphthalimides exhibit remarkable photophysical behavior in non-polar solvents. The synthesis and photophysics of these dimeric naphthalimide dyes will be discussed.

Elizabeth Ott, Damon Campbell, and Lori Scardino (6)Faculty Advisor/Collaborator: **Scott Hartsel** and **David Lewis***Got the Confocal Blues? Toward a Robust Series of Organelle-Specific Fluorescence Probes*

A chief problem of confocal and epifluorescence microscopy is the rapid fading of organelle-specific probes. Anti-fade agents may be used, but they are often toxic and not usable with live cells. We have synthesized a robust series of organelle-specific fluorescence probes based on the naphthalimide fluorophore. We have compared a designed lysosome specific naphthalimide, LT1, to commercially available lysosome probes. In experiments using live (and fixed) THP-1 monocytes, LT1 is fade resistant by more than an order of magnitude in comparison to commercial lysosome probes, shows co-localization with commercial probes, has low toxicity, is fixable, and can be used at concentrations of 50-100 nanomolar. The probe is excitable by either the argon 488nm line or by blue or violet excitation filters. We find that LT1 has a large Stoke's shift, high quantum yield and exhibits very little self-quenching, which ought to make it possible to design membrane potential sensing probes.

Nicholas Robertson (50)Faculty Advisor/Collaborator: **Michael Carney***Synthesis and Reactivity of Chromium, Vanadium, and Cobalt Complexes Supported by Bis(2-pyridylmethyl)amine*

Transition metal complexes catalyze numerous chemical reactions ranging from pollutant degradation to the polymerization (formation) of huge molecules. Chromium and vanadium complexes are used to produce billions of pounds of polyethylene each year, for use in a wide range of plastics applications. The mechanism of these metal mediated reactions is still poorly understood, which has driven many research groups to develop single site homogeneous catalysts as models to study this process. We have prepared a series of neutral chromium, cobalt, and vanadium complexes supported by various bis(2-pyridylmethyl)amine derivatives. These complexes have been characterized with x-ray crystallography, elemental analysis, magnetic susceptibility, and various spectroscopic methods. These results combined with polymerization data will be used to show how simple changes in ligand structure and metal choice can dramatically influence reactivity and polymer properties.

Benjamin Schmiede (49)Faculty Advisor/Collaborator: **Michael Carney***Synthesis, Structure, and Reactivity of Molybdenum Complexes Incorporating Bis(2-pyridylmethyl)amine Ligands*

Molybdenum catalysts are important for two applications. In the crude oil refining process they are used to remove sulfur and nitrogen atoms from the mixture that makes up crude oil; this ultimately leads to cleaner burning fuels. Molybdenum centers are also found in certain enzymes that add oxygen atoms to organic molecules. In both situations the molybdenum center contains one or more Mo=S (sulfido) or Mo=O (oxo) groups that promote the compounds reactivity. The Molybdenum complexes that we are studying contain either sulfido or oxo groups as well as tridentate nitrogen ligands (LN_3). Previous work with other metals has determined that these ligands adopt either facial (fac) or meridinal (mer) coordination geometry. We are trying to determine whether fac or mer binding of the ligand changes the reactivity of the sulfido and oxo groups in the complexes.

Corey Schuster (40)Faculty Advisor/Collaborator: **Fred King***Numerical Evaluation of Hilbert Transforms*

Using an eigenfunction approach in conjunction with function expansion and convergence acceleration techniques to determine the numerical evaluation of Hilbert transforms.

Grant Sormunen (16)Faculty Advisor/Collaborator: **David Lewis***The Barbier-Grignard Reaction: A Facile Method for the Synthesis of Homolallylic Alcohols*

The synthesis of allylmagnesium bromide requires particularly stringent conditions, and, for this reason, this useful reagent has not been used as widely as it might. We have discovered that the older Barbier-Grignard reaction, in which the organometallic reagent is formed and consumed simultaneously, provides a particularly facile method for the synthesis of homoallylic alcohols from any carbonyl precursor: aldehydes, ketones, and esters. With esters of aromatic acids, the isolation of the product is complicated by the facile dehydration of the product alcohol (which is doubly homoallylic and benzylic).

John Wrass (28)Faculty Advisor/Collaborator: **James Phillips***Structure, Bonding, and Vibrational Frequencies of Halo-acetonitrile-BF₃ Complexes: Solid-State IR Spectra, Crystal Structures, and Computations*

Nitrile-boron trifluoride complexes are now well known for their remarkable structural chemistry. Specifically, structures suggest that the B-N bonds are intermediate between bonding and non-bonding interactions. Furthermore, there are large structural differences between the gas and solid state. We have prepared F-CH₂CN-BF₃, Cl-CH₂CN-BF₃, Br-CH₂CN-BF₃, and I-CH₂CN-BF₃, and crystal structures all have B-N distances around 1.6 Å, much like solid state CH₃CN-BF₃. Also, we have conducted an extensive computational study of these complexes, using the B3LYP method with basis sets ranging from 6-31G* to 6-311+G**. The results from these calculations are fairly consistent with B-N distances around 2.5 Å and N-B-F angles of about 93°. Also of note, all are bent slightly about the B-N-C linkage. These calculated structures, however, differ dramatically from the measured solid-state structures. For example, the calculated B-N distance for F-CH₂CN-BF₃ is 2.44 Å, while the solid-state is only 1.65 Å. Consequently, the measured vibrational frequencies for the solid complexes differ distinctly from the computed frequencies. Recent frequencies from argon matrix experiments will be discussed in the context of this medium-dependent structural chemistry.

Chemistry / Biology

Rachel Nauss (5)

Faculty Advisor/Collaborator: **Scott Hartsel** and **Lloyd Turtinen**

What Mediates the Monocyte Response to Amphotericin B?

Amphotericin B is a membrane active antifungal antibiotic whose toxicity may be associated with cytokine release from monocytes. The stimulation of cytokine secretion by monocytes may be brought on by permeability changes of the cell membrane leading to calcium influx and subsequent IL-1 β expression. The Amphotericin B might directly cause calcium permeability or it may act through cell membrane depolarization, monovalent ion fluxes or activation of voltage gated channels. In another abstract, we show that cytokine response caused by different Amphotericin B preparations is correlated with relative monovalent cation permeability in model membranes. We show here, using fluorescence stopped-flow detection of calcium currents and potassium currents, that Amphotericin B has very little intrinsic ability to increase calcium permeability in model membrane systems at therapeutic levels. Amphotericin can, however, cause significant and rapid potassium and sodium permeability at the same concentrations. Thus it is possible that the response of monocytes to Amphotericin might involve membrane potential changes or cation (K⁺, Na⁺) permeability which may subsequently instigate calcium permeability and/or cytokine response.

Computer Science

Justin Ehlert (106)

Faculty Advisor/Collaborator: **Andrew Phillips**

A Performance Analysis of Coding Style Using the Verilog HDL

Verilog is a hardware description language that allows hardware designers to use a software style approach, via a high level programming language, to construct realizable hardware implementations reflected in a blueprint called a "netlist." This paper presents a study of the various software coding styles and constructs available in Verilog and the effect of those design style choices on the resulting hardware implementations. Using a Verilog compiler and a netlist viewer, we show that different software design constructs often result in radically different implementations. In particular, we show that when using the data flow and behavioral Verilog coding styles, it is not uncommon for significant cost increases to occur as a result of some common software design approaches. A collection of such inefficient software design techniques will be described and improved approaches will be demonstrated.

Michael LeMay (181)

Faculty Advisor/Collaborator: **Jack Tan**

Secure Email Transport Protocol-Software Design and Implementation

Email communications using the Internet or another public (untrusted) network as an underlying medium of transport are subject to a myriad of security and privacy vulnerabilities due to the inherent security shortcomings of SMTP. Various attributes of the message may be vulnerable to interception and modification. Legitimate email users may also sabotage communication by falsifying information or manipulating protocols. In this project, security guidelines for implementing and using common email protocols were created and implemented, along with a suite of companion protocols and MIME message formatting recommendations. A variety of system entities play important roles in the protocol. The first of these is the message sender. Existing email composition packages must be extended to interact with secure key servers and perform encryption and digital signature operations. Message recipients must also be able to interact with key servers and perform decryption operations. Finally, the secure key servers themselves must be designed and implemented to support secure message transmission. In this project, the construction of each of these entities was embarked upon.

Heidi Tessmer (105)Faculty Advisor/Collaborator: **Dan Stevenson***Preventing Detection of Steganographic Data in Image Files*

Steganography is the art of hiding secret information within blatantly unconcealed information. Currently steganography is being used to send hidden text messages and photos under the guise of audio files, pictures, and even movie scripts. However, steganography is not a perfect art form; using steganalysis, a combination of pattern recognition and statistical analysis, it is sometimes possible to detect the presence of these hidden messages. The objective of the current project is to create a steganographic method that will defeat current steganalysis techniques and improve the field of steganography as a whole.

Marcia Vaughn (104)Faculty Advisor/Collaborator: **Michael Wick** and **Paul Wagner***Developing an Intelligent Data Analysis Web Service with a Shared Knowledge Repository*

We have developed a software system that performs a probabilistic analysis of purchase records for multiple client companies, captures the results in a shared knowledge repository and generates suggestive sell information for other clients. The Market Basket Analysis (MBA) component accepts data analysis requests that include a collection of prior completed purchases and produces association rules for the purchase domain. The Suggestive Sell (SS) component takes the contents of a specific customer's partial purchase and produces a list of probabilistically suggested additional products. We have demonstrated the generic nature of this software system by developing it as a web service with clients in both Java and C# and the server side in C# within the Microsoft .NET framework. This research has three significant outcomes. First, it makes the powerful marketing tools of market basket analysis and suggestive sell available to even the smallest companies. Second, the development of a shared repository of purchase records that can be used by multiple simultaneous clients significantly increases the validity of the suggestive sell rules that are produced. Third, the centralized definition of the MBA and SS components offloads the responsibility for maintenance and improvement of the probabilistic algorithms to a single agent.

Geography & Anthropology**Bryan Girard Frenz (68)**Faculty Advisor/Collaborator: **Harry Jol***Searching for the Ancient Jewish City of Yavne –A Geophysical Survey of Tel Yavne, Israel*

Tel Yavne, Yavne, Israel is an area of land with monumental religious and historical significance. Reasons for pursuing excavation in Yavne are to uncover and accurately teach the Jewish heritage. By uncovering the past truths... the Jewish community can be further educated in understanding the Jewish roots and history. The geophysical survey of Tel Yavne conducted ground penetrating radar (GPR) data collection integrated with data collected from electro resistivity tomography (ERT). The combination of this data will allow the archaeologists to understand the resistivity of the underlying earth and give visual imagery of subsurface bedrock and sediment layering. Along with subsurface imagery are the applications of aerial photography to give a projected view for surface analysis. Elevation values are assigned through laser level survey techniques, and are spatially referenced through the use of a total station. The total station references data to known land marks by latitude and longitude. Referencing the data is necessary to ensure future data collection will not be jeopardized due to incorrect coordinates. The Tel Yavne project is the integration of data collection methods. It is a means to aid the archaeologists, preserve artifacts, reduce excavation cost, and eliminate unnecessary destruction through geophysically understanding the earth.

Tracey Gilbert, Beth Guse, and Megan Erickson (88)Faculty Advisor/Collaborator: **Harry Jol***Locating a Native Village Visited by Lewis and Clark Using Subsurface Investigations: A Focus on Laser Leveling*

Lewis and Clark reached the Pacific coast of Oregon in 1805 where they visited a Clatsop village. The location of this village is not known. The purpose of this poster is to present a portion of the results of a collaborative research project to locate this Clatsop village. Lewis and Clark's journal documents the location of the village in primary coastal sand dunes, along the shore of the Clatsop River south of its outlet to the sea. Based on these and other journal entries, we believe the village site is located on the western shore of what is now Slusher Lake in Camp Rilea, OR. Multiple Ground Penetrating Radar (GPR) lines were shot using different frequencies: 100MHz (pulseEKKO100 GPR system) and 225 MHz (pulseEKKO1000 GPR system). GPR has no method of determining relative elevation; therefore, a laser leveling survey system was used to measure changes in elevation. This poster will focus on changes of elevation paired with GPR subsurface investigations. Data collected by the laser level was taken along 4 transects. The results of these laser level measurements were entered into Microsoft Excel, which produced one graph for each transect. This information was then used to add topographic data to the GPR information. Though the location of the Clatsop village remains unknown, we now know that future investigators will need additional methods capable of deeper subsurface investigations.

Beth Guse and Sabrina Hicks (67)Faculty Advisor/Collaborator: **Harry Jol***Locating a Native Village Visited by Lewis and Clark: Literature Review and Subsurface Investigations*

Lewis and Clark reached the Pacific coast of Oregon in 1805 where they visited a Clatsop village—the location of which is unknown. The poster is a part of a collaborative research project to locate this Clatsop village. Lewis and Clark's journal documents the location of the village in primary coastal sand dunes, along the shore of the Clatsop River south of its outlet to the sea. Based on these and other journal entries we believe the village site is located on the western shore of what is now Slusher Lake (Camp Rilea, OR). We investigated the subsurface in this area using a sand auger and an Oakfield soil borer (21 cores, 6 m maximum recovery depth). No buried soils or cultural remains consistent with a Clatsop site were recovered, suggesting the deposits to be post Lewis and Clark in age. Therefore, the historic village is buried more than 6 m below the modern surface. Alternately, 100's of m of shoreline progradation has occurred since Lewis and Clark visited the site. Though the location of the Clatsop village remains unknown, we now know that future investigators will need methods capable of deeper subsurface investigations, such as hydraulic coring machines.

Erin Heidtke (64)Faculty Advisor/Collaborator: **Lisa Theo***A Study of Vegetation Inventory Methods for NatureMapping®: A Citizen Science Based Program*

In this research project, vegetation inventory methods were studied to determine a suitable protocol for use in NatureMapping® which is a citizen science based program. NatureMapping® was developed at the University of Washington and is a training program for average citizens to identify, locate and inventory vegetation. The importance of NatureMapping® is that ecologists and other scientists can locate appropriate sites for further research. Fauna is the principle aspect which is being inventoried; whereas this work aims at adding a flora component. Currently, only Iowa's NatureMapping® program employs a vegetative protocol, but only as an invasive plant species inventory. The amount of inventory methods existing is extensive and many can be complex, especially for citizens of various educational backgrounds. Thus, inventory methods were narrowed down to three choices: line transects, circle and point quadrates. These methods were tested in four areas (lowland savanna; woodland transition area; highland woodland; and dense shrubland) at Beaver Creek Reserve in Fall Creek, Wisconsin. Six study sites were delineated: two in the lowland savanna as well as the woodland transition area and one study site in each of the highland woodland and dense shrubland habitats. Within these study areas the three vegetation inventory methods were conducted.

Adam Lange (70)Faculty Advisor/Collaborator: **Garry Running and Karen Havholm***Origin and Distribution of Fluvial Terraces along the Saskatchewan and South Saskatchewan Rivers: A GIS and GPS Approach*

The project's purpose is to provide archaeologists and geoscientists seeking sites suitable for their investigations with a model of terraces (number, location and stratigraphy) and landscape evolution within the South Saskatchewan River Valley through post-glacial time. Research conducted in 2002 revealed four terraces (T1-T4) and an active floodplain (T0) within the study reach. Terrace ages were determined, and their aerial extent was mapped. This year, more sites were sampled using a Geoprobe and mapped using dGPS. Elevation data, dGPS transects, was also collected. Terraces, including a newly identified terrace (T5) were remapped using aerial photographs constrained by dGPS elevation data. T3 through T5, previously mapped together, are cut into till or glaciolacustrine deposits and are graded to terminal late-Pleistocene levels of glacial lakes Saskatchewan and Agassiz. T1 and T2 (<500->2000 BP, and <4000 to ~9200 BP respectively) are composed of a silty vertical accretion facies with numerous thin, weakly expressed buried soil profiles over sand and gravel lateral accretion facies. Abandonment of T1 and T2 and subsequent incision resulted from adjustments to local base level changes controlled by glacial Lake Agassiz. Geoarchaeological investigations should focus on T1 and T2 where deeply buried, stratified archaeological sites are to be expected.

Adam Lange (63)Faculty Advisor/Collaborator: **Douglas Faulkner***Recent Hydrographic Change in the Tiffany Bottoms, Lower Chippewa River, Wisconsin*

The Tiffany Bottoms is a complex mosaic of well drained floodplain surfaces, wetlands, sloughs, and small lakes along the lower Chippewa River. Resource managers are concerned that the lakes and wetlands of the Bottoms are filling with sediment, resulting in considerable loss of habitat for aquatic organisms. To quantify changes in the hydrography of the Bottoms, we conducted a GIS-based investigation using aerial photographs from the 1930s to the 1990s. We obtained photographs from 1939, 1951, 1958, and 1972, which we scanned and rectified in ArcMap. We also obtained digital orthophoto quadrangle maps of the Bottoms from the USGS, which were taken in 1992. Using these photos as base maps in ArcMap, we digitized sloughs and lakes to produce a time series of hydrographic change for the area. Based on our investigations, the extent of open water in the Bottoms was greatest in 1939 (9.6 square kilometers).

The total area of sloughs and lakes decreased to 1.8 square kilometers by 1958 and then subsequently increased. By 1992, the extent of open water was at 72% of its 1939 value (6.9 square kilometers). Given recent trends, water bodies in Tiffany Bottoms could soon be as extensive as they were in 1939.

Mark Nelson and Sarah Remkus (155)

Faculty Advisor/Collaborator: **Sean Hartnett**

Core Channel Survey of the Lower Chippewa

The drought conditions of the past fall in western Wisconsin have produced historically low flows on the Lower Chippewa River. The goal of this project is to survey the core channel location of the Lower Chippewa at low water levels. This survey will take three forms: First, in accessible areas, the channel will be surveyed with dGPS equipment that can plot the waterline with sub-meter accuracy. Over the past few months we have taken the GPS out and mapped out different areas along the shoreline along with several locations of pilings. A second aerial survey was taken via a flight over the Lower Chippewa taking a series of low-altitude aerial photographs. This will document the core channel location throughout the river. Aerial photographs will also show the location of relic logging structures in the river channel. The third method of survey has been to locate the channel on a current Landsat7 remote sensing image. This georeferenced image can also serve as a base map of channel positions with dGPS data plotted over the images. The resulting core channel survey will be an asset for examining past and future channel migrations, as well as serving as a navigational aid in times of normal flow levels.

Kali Pace-Graczyk (69)

Faculty Advisor/Collaborator: **Garry Running**

Karst Hydrogeology: An Investigation of the Origin of Lake "What-the-Hell" Wind Cave National Park, South Dakota

Wind Cave, located in the Black Hills of southwest South Dakota is an extensive, dry cave. Until recently, the cave intersected the Black Hills regional water table 160 m below the surface. Below 160 m the cave is flooded. In 1999, a mysterious influx of water raised the water level in the cave by 25 m, creating a new lake, informally referred to as Lake "What-the-Hell." The source of the floodwater is unknown. The purpose of this investigation is to contribute to ongoing investigations seeking to identify the source of the floodwater and the origin of Lake What-the-Hell. Lake What-the-Hell is one of many lakes within the cave that appear rapidly (days/weeks) and disappear over a period of years. Several hypotheses have been rejected, including the hypothesis that the lake originated as a result of a rise in the regional water table, formed from a seismic event, or was formed from meteoric waters infiltrating into the cave from above. Although the final answer is still unknown, the working hypothesis is that Lake What-the-Hell formed from an addition of water into the cave from adjacent bedrock sources.

Michael Selb, Rebecca Thorn, and Jeremy Treague (85)

Faculty Advisor/Collaborator: **Harry Jol**

A Ground Penetrating Radar Investigation of an 1805 Lewis and Clark Site, Oregon

During their stay along the Oregon coastline in 1805, Lewis and Clark visited and mapped many locations, including a native village just south of the Clatsop River's outlet to the Pacific Ocean. Investigations by previous researchers have been unsuccessful at finding the historical site, possibly due to the significant increase in sedimentation that most likely resulted from jetty construction along the mouth of the Columbia River. After reviewing Lewis and Clark's journals and maps, we selected a study area along the west shore of Slusher Lake, within Camp Rilea, near Warrenton, OR. Multiple ground penetrating radar (GPR) lines were collected using two antennae frequencies - 100 MHz and 225 MHz. Depths of up to 16 m were imaged, with a distinct water table interpreted on many of the profiles. GPR profiles run along the ridge west of Slusher Lake showed parallel to sub-parallel, semi-continuous reflection patterns, which are interpreted as representing a vertically accreting sand dune. A channel-form pattern was recognized northwest of Slusher Lake and is interpreted as the old, relict Clatsop River outlet originally mapped by Lewis and Clark. These significant results help narrow down the location of the historic native village and provide a foundation from which to base future geoarchaeological investigations.

Joel Stevens and Ryan Zahler (87)

Faculty Advisor/Collaborator: **Harry Jol**

Locating a Mapped Lewis and Clark Native Encampment, Oregon: A GIS and GPS Database

As part of a collaborative project, a detailed, multi-layered GIS site map was created for current and future efforts in trying to rediscover a mapped Lewis and Clark native encampment along the Oregon coastline. According to the Lewis and Clark journals from 1805, the village was located along the southwest bank of the Clatsop River as it entered the Pacific Ocean. A survey grade Trimble ProXR differential Global Positioning System (dGPS) with sub-meter positional accuracy was used in creating a spatial database for a site map. The database also incorporates: 1) laser level stations which provide accurate topography, 2) soil core locations and descriptions, 3) ground penetrating radar (GPR) transects that map stratigraphy, 4) infrastructure, and 5) other historical pieces of data important to

research conducted at the site. A high-resolution photo image was geo-referenced into the GIS to overlay the dGPS data. LIDAR data from recent coastal surveys will be incorporated into the database and provide a digital elevation model (DEM) of the research site. The GIS database and resulting maps will significantly aid our understanding of this historic site and provide researchers with the necessary tools to hopefully discover the encampment that Lewis and Clark originally mapped.

Adam Stokstad, Sabrina Hicks, and Brian Toioven (86)

Faculty Advisor/Collaborator: **Harry Jol**

Subsurface Search for Clatsop Village in Camp Rilea, Oregon

Lewis and Clark reached the Pacific coast of Oregon in 1805 where they visited and traded with a Clatsop village. The location of this village is unknown. The purpose of the poster is to present results from subsurface investigations by augering in an attempt to locate the village. Since the village remained in this area for a substantial period of time, there would likely be a layer of darker soil within the present-day sand dune that was the topmost layer in 1805. Lewis and Clark's journal documents the village location in primary coastal sand dunes, along the shore of the Clatsop River near the western shore of Slusher Lake. The area was narrowed down by the use of ground penetration radar determining the best places to auger. We investigated the subsurface in this area using an Australian sand auger and an Oakfield soil borer (21 cores, 6 m maximum recovery depth). No buried soils or cultural remains consistent with a Clatsop site were recovered. This suggests the deposits we investigated are post Lewis and Clark in age. Therefore, the village is buried below the modern surface. Alternately, 100's of m of shoreline progradation has occurred since Lewis and Clark visited.

Geography & Anthropology / Geology

Jennifer Thornburg (89)

Faculty Advisor/Collaborator: **Robert Barth and Phillip Ihinger**

Geochemical Characterization of Red Lithic Artifacts in the Chippewa Valley, WI

Surveys of an archaeological site in Chippewa Falls produced four broken artifacts and approximately 1100 flakes of a distinctive red lithic material. Examination of the archaeological literature and site collections at the University of Wisconsin-Eau Claire revealed that artifacts and flakes of visually similar red material had been recovered at other sites in both the Chippewa River Valley and the Red Cedar River Valley. This lithic material had been classified by various archaeologists as pipestone, hematite, jasper, jasper taconite, and red flint. Geochemical analysis identified the material from Chippewa Falls as a unique silicified siltstone whose origin appears to be the Blue Hills of Barron and Rusk Counties. Analysis of the red lithic material from the other sites should easily verify if they are from the same geological source.

Geology

Ian Anderson, Dan Hennessy, Jesse Bernhardt, and James Watkins (91)

Faculty Advisor/Collaborator: **Phillip Ihinger**

Origin of Felsic Segregations in Mafic Magma Chambers: Comparing Tholeiitic and Calc-Alkaline Intrusive Complexes

Magmas formed from the melting of Earth's mantle often crystallize within the crust before they reach the Earth's surface. These magmas crystallize as large layered intrusions that reflect the evolving magma composition. The stratified intrusions illustrate how these magmas solidified from a mineral mush with interstitial residual liquid. In this way, geochemical measurements document progressive changes in both mineral and melt composition throughout the growing crystal cumulate pile. We note that silica-rich pipes and pods (felsic segregations) that cut across the grain of the layered cumulate pile are universal features observed in tholeiitic intrusions. The segregations formed after a skeletal crystal network was developed, and arise from the buoyancy difference between the partially crystallized mineral mush and the residual interstitial liquid. The importance of felsic segregations to the evolution of the magma bodies has only recently been appreciated. We present a comparison of the character of felsic segregation bodies from two widely varying magma types: the calc-alkaline, high-K intrusions from the Montana alkaline magmatic province and the tholeiitic intrusions from the Skaergaard, Stillwater, and Bushveld complexes. In particular, we show that syenite, which is common in the upper layers of the high-K intrusions, is analogous to granophyric segregations in the tholeiitic intrusions.

Mark Ciardelli (109)

Faculty Advisor/Collaborator: **Phillip Ihinger**

Hydrous Impurities in Speleothems: Indicators of Growth Rates and Paleoenvironments?

Calcite crystals grown in the cave environment (speleothems) are abundant throughout the world and have been forming throughout much of earth history. Within the last ten years, research on caves has shown that speleothems are directly linked to the surficial conditions at the time of their formation. As such, they represent an exciting tool used for reconstructing climate change. Recently, our

group has documented that micro infra-red (IR) spectroscopy can be used to map the distribution of H-bearing impurities contained in quartz crystals. In particular, the abundances of H-bearing species reflect the growth rates of the individual growth faces as the crystal grew from a hydrothermal solution; that is, they serve as speedometers that monitor the rate of growth. We believe this technique can be used to determine the growth rates of calcite formed in speleothems. We have analyzed a number of samples (speleothems, calcite rhombs, dolomite, and aragonite) using micro-IR, and show that H-bearing species are indeed present in single crystals of carbonate. Furthermore, the abundances vary greatly between samples. In future studies, we will apply our technique to well dated speleothems in order to calibrate the IR speedometer.

Ryan Dayton and Karilyn Niss (114)

Faculty Advisor/Collaborator: **Colin Shaw**

Mesoproterozoic Deformation and Metamorphism at Cerro Colorado, NM: Insights into the Rheology of the Brittle-Plastic Transition

The Proterozoic lithosphere of the Southwestern U.S. was affected by a 1.4 Ga thermal event that is not widely understood. Mineral assemblages in the pelitic rocks of the Vadito Group in Cerro Colorado, New Mexico record the pressures and temperatures of amphibolite-grade metamorphism during this enigmatic event. Mineral assemblages were found using a petrographic microscope, plotted on an AFM diagram and placed on a petrogenetic grid to constrain the pressure and temperature at which these assemblages are in stable equilibrium. Typical assemblages include: garnet-biotite, garnet-biotite-staurolite, garnet-sillimanite, garnet-biotite-sillimanite, cordierite-sillimanite and staurolite-sillimanite. Preliminary estimates of metamorphic conditions range from temperatures of 550° C to 650° C with pressures ranging from 0.25 GPa to 0.5 GPa. Microprobe data from sample RD03CC01B can be used to estimate temperatures using the garnet-biotite (GARb) geothermometer and pressure using garnet-plagioclase (GASP) geobarometers. Style of deformation was interpreted from a foliation map of the area with insets of sketched thin sections placed in their field orientations. A NE-SW shortening direction prevails in the study area. Microstructures from porphyroblasts, matrix fabrics and structures from the map can be used to compile a kinematic history of deformation.

Chris Fell, Scott Formolo, and Kali Pace-Graczyk (129)

Faculty Advisor/Collaborator: **Colin Shaw**

Ancestry and Reactivation of the Homestake Shear Zone

The Homestake Shear Zone (HSSZ) records ~1.7 Ga deformation associated with continental assembly and ~1.4 Ga reactivation during intracontinental orogeny. We have used geologic mapping, geochemistry, petrology, and ⁴⁰Ar/³⁹Ar thermochronology to constrain the tectonic history of the HSSZ. A package of mafic rocks near the HSSZ appears to be arc-related. XRF analysis of hornblende pods, hornblende diorite and calc-silicate rocks show Nb deficiency, and Cr values running as high as 1370-2640ppm. Mg numbers for Hornblende and amphibolite samples range from 43-66 suggesting genesis from a primitive mantle source. AFM and MnO-TiO₂-P₂O₅ diagrams plot hornblende, hornblende diorite, and amphibolite rocks in continental and oceanic arc fields. ⁴⁰Ar/³⁹Ar ages suggest the northern and southern sides of the HSSZ experienced different cooling histories; hornblende is older in the north while the micas are younger. The HSSZ contains both pseudotachylite (pst), produced by frictional melting during earthquakes, and mylonite produced by slow creep. Cross-cutting relationships indicate synchronous brittle and plastic deformation indicating deformation near the base of the seismogenic layer. SEM and EDX analysis will be used to characterize pst, and how its genesis relates to ductile mylonites. Ancestry of the HSSZ is integral to understanding how the brittle-ductile transition occurs in the middle crust and the role of reactivation of pre-existing structures in intracontinental deformation.

Scott Formolo (108)

Faculty Advisor/Collaborator: **Phillip Ihinger**

Micro-IR Investigation of Apatite Crystals

Apatite has recently become an important tool in the Earth sciences. It is found in igneous, metamorphic, and sedimentary environments, and is produced organically by many organisms. Small amounts of impurities contained within apatite crystals allow them to be used for determining when their host rock formed, as well as for determining when the rock was exposed on the Earth's surface. These techniques treat individual apatite crystals as homogeneous domains. Recently, Infrared (IR) spectroscopic measurements on quartz crystals have delineated distinct sector zones that contain order-of-magnitude variations in impurity concentrations. The rate of a growing crystal face controls the abundance of impurities trapped in the crystal structure. The sector zones represent regions within the crystal that grew from different growth faces. Because apatite crystals grow in similar fashion to quartz crystals, we ask whether large variations in impurity concentrations exist within single apatite crystals. We present micro-IR measurements of apatite crystals from a variety of geologic environments and show that, indeed, they possess observable differences in H-bearing impurities. This indicates that there were significant variations in growth rates on individual growth faces. Our results must be accounted for by researchers utilizing apatite crystals in the dating applications described above.

Lisa Grosvold (107)Faculty Advisor/Collaborator: **Phillip Ihinger***Micro-IR Investigation of Doubly-Terminated Gemmy Quartz Crystals*

Minerals provide important insights into the processes that shape the evolution of the Earth. Quartz is an abundant mineral in the Earth's crust that is found commonly in igneous, metamorphic, and sedimentary environments. The familiar gemmy quartz crystals grow in fluid-filled fractures as a product of the precipitation from: 1) hydrothermal fluids released from pro-grade metamorphic environments, and 2) deuteritic fluids released from degassing magmas in the igneous environment. Hydrothermal quartz crystals are composed of sector zones that are distinguished by different trace element concentrations. The sector zones are regions within the crystal that correspond to growth on different crystal faces such that faster growing faces trap higher concentrations of impurities. If the crystal is later subjected to higher temperatures, impurity concentrations will define a diffusion profile that reflects the timing of the thermal event. Deuteritic quartz crystals have, as yet, not been analyzed for their impurities. In this study, we show that a gemmy deuteritic crystal sampled from a Namibian lamprophyre has similar characteristics to previously studied hydrothermal quartz crystals. The doubly-terminated crystal shows distinctive sector zoning with diffusion profiles, which together delineate both the morphologic evolution and subsequent thermal history of the crystal. Our results provide new insights into how such doubly-terminated crystals form.

Emily Hauser (111)Faculty Advisor/Collaborator: **J. Brian Mahoney** and **Sarah Gordec** (University of British Columbia)*Magmatic Evolution of Central Coast Plutonic Complex*

About 200 million years ago, coincident with the spreading of the north Atlantic, subduction began along the western edge of North America. The evolution of the magmatic arc is reflected in the petrographic and geochemical characteristics of a number of different plutons composing the Coast Plutonic Complex. Geologic mapping, geochronology, and geochemistry demonstrate that at least five episodes of magmatism occurred between 185-60 Ma. Petrographic and geochemical analyses are used to characterize five plutonic suites of intermediate to felsic composition, including Howe Lake (ca. 189-183 Ma), a diorite-tonalite characterized by metavolcanic screens and xenoliths; Firvale (ca. 133-149 Ma), a granodiorite-granite with a distinct pink and green color; Desire (ca. 123-110 Ma), a diorite-tonalite containing metavolcanic screens and several comagmatic intrusive dikes; Fougner (ca. 68 Ma) a sphene bearing diorite-granodiorite; and Four Mile (ca. 73-51 Ma), a garnet bearing two mica granite. The geochemistry of the five plutonic suites shows three distinct trends. The first four suites display very similar geochemical trends, with the strongly spiked trace element pattern characteristic of subduction-related magmatism. Conversely, the Four Mile suite, which overlaps geochronologically with the Fougner suite, displays a very erratic trace element pattern including a depletion in Ba, Sr, Ti, and Eu. This pattern suggests a high degree of crustal contamination during genesis of Four Mile plutonic suite.

Morgan Herrick (130)Faculty Advisor/Collaborator: **Robert Hooper***Crystal Structure of a Pyroxene, $CaFe_3+[Fe_3+SiO_6]$, with Significant Tetrahedrally Coordinated Fe^{3+}*

Buchites resulting from partially fused calcareous shale/siltstone formed by the combustion of the Healy coal seam near Buffalo, Wyoming have generated Fe^{3+} and Al-rich, Si-poor pyroxenes, which have yet to be reported as occurring naturally. Of the pyroxenes found within these buchites, those of importance exhibit significant tetrahedrally coordinated Fe^{3+} . However, the presence of tetrahedrally coordinated Fe^{3+} is an uncommon occurrence in almost all silicates. As a result of Fe^{3+} enrichment, the pyroxenes within this sample are restricted to the DI-FATS-FTS field, which requires the presence of tetrahedrally coordinated Fe^{3+} (Hooper and Foit, 1986). The preliminary samples do not represent an end-member composition, however, one sample (Pyx5a) has nearly entered the end-member composition field. Its formula is: $(Ca_{0.864}Na_{0.13})(Ca_{0.084}Mg_{0.130}Fe_{0.748})[Fe_{0.314}Al_{0.406}Si_{1.28}O_6]$, which correlates to ~17% tetrahedrally coordinated Fe^{3+} . Structural analysis of this mineral sample has generated the following unit cell dimensions: $a=9.8172(9)$, $b=8.8506(5)$, $c=5.3656(7)$ Å and $\beta=105.76(1)^\circ$ Although preliminary sampling has not entered an end-member composition field, the samples have plotted in a new mineral composition field that requires tetrahedrally coordinated Fe^{3+} . Essonite, the last reported pyroxene like this by definition, has no tetrahedrally coordinated Fe^{3+} .

Christopher Kohel and Kali Pace-Graczyk (113)Faculty Advisor/Collaborator: **J. Brian Mahoney***Geochemical and Geochronologic Analysis of Volcanic Suites of the Bella Coola Region, West-Central British Columbia*

Geological mapping in the Bella Coola area in west-central British Columbia, Canada has identified three distinct volcanic groups, including the Hazelton Group, Monarch volcanics, and unknown volcanics of Albian age. Geochemical and geochronologic analyses of these three units will provide constraints on arc magmatism from the Jurassic to Cretaceous time periods. The Hazelton Group is an early Jurassic (ca 180 Ma) package of basalt, rhyolite, and associated sediments that form a northwest trending belt on the east side of

the map area. Geochemically, the Hazelton Group exhibits a strong linear trend on major element Harker diagrams and displays a strongly spiked trace element pattern characteristic of an uncontaminated island arc signature. The Monarch volcanics are Valanginian in age (ca 137-132 Ma) and are described as a thick succession of andesitic flows, fragmental rocks, volcanic sandstone, tuff, and argillite that occur as a northwest trending package that spans the entire map area. An unknown package of Ablian aged volcanic rocks is characterized by basal andesitic flows and overlying pyroclastic rocks that form isolated exposures between the Hazelton and Monarch outcrop belts. These and the Monarch volcanics are geochemically very similar, displaying a restricted SiO₂ range of 48 to 55% and contain high Mg values relative to the Hazelton group.

Kelly Plathe (131)

Faculty Advisor/Collaborator: **Robert Hooper**

Using Transmission Electron Microscopy to Determine Arsenic Speciation in Mine Contaminated Sediment in the Lower Coeur d'Alene River Valley in Northern Idaho

Lakes in the lower CDA river system, Idaho, have been contaminated with high concentrations of metals from over 100 years of sulfide mining. To elucidate downstream variation in arsenic speciation, sediment cores from three different lakes (Killarney, Swan, and Thompson) were analyzed using HR-ICPMS on sequentially extracted (SE) samples and TEM. Unlike Swan Lake, whose only inlet is dammed, Killarney and Thompson are both connected to the main channel by distributaries, providing an inlet for sediment recharge during high water events. Arsenic SE patterns for Killarney and Thompson lakes are similar, showing increasing As in the exchangeable fraction with depth. Swan Lake, in contrast, shows negligible As in the exchangeable fraction, but indicates an increase in the detrital fraction with depth. TEM results show both Killarney and Thompson lakes having considerable As in both detrital (3.61 wt %) and biogenic (1.91 wt %) sulfidic phases. Near the pre-mining surface, detrital sulfides become rare and biogenic sulfidic phases are the primary form of As sequestration. Swan Lakes shows greater biogenic sequestration in the upper third of the contaminated column associated with ZnS and metal-rich sulfidic nano-particles up to 2.44 wt% As. The differences in As speciation are presumably due to periodic oxygenation of sediment in Killarney and Thompson during low water level periods.

Sarah Prindiville (112)

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

Geochemical Characteristics of Glaciogenic Sediments, Puget Lowland, Washington

Quaternary sediments in the Puget Lowland comprise a complex succession of intercalated glacial, glaciofluvial, and glaciomarine sediments deposited during repetitive glacial and interglacial periods. The primary source regions are the southern Canadian Cordillera (SCC), the Cascade Range and Olympic Mountains. Major glacial advances provided sediment from the SCC, and interglacial periods were dominated by locally derived Cascadian/Olympic sediments, but complex interfingering sedimentation over extended time periods and sediment reworking makes comprehensive basin analysis difficult. Major and trace element geochemistry from throughout the Puget Lowland suggest that it is possible to discriminate glacial and interglacial sedimentation events through bulk sediment composition. Major glacial advances produce sediment that is high in SiO₂, Ba, Sr, Cr, Ni, and Cr/V, and low in TiO₂, Nb, Ce, V, La, Zr and Th/Sc. These values suggest a source from continental arc plutons in southern British Columbia. Conversely, sediments deposited during interglacial periods were derived from Cascade volcanic rocks, and are correspondingly higher in TiO₂, Nb, Ce, V, and La. However, sediment mixing, elemental division and element mobility can produce misleading geochemical signatures. Multiple geochemical indicators permit discrimination between glacial and non-glacial sediments, and permit stratigraphic correlations in complex Quaternary sediments of the Puget Lowland.

Laura Strumness and Jennifer Thornburg (132)

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

Speciation and Mobility of Trace Metal Contamination in the Lower Coeur d'Alene River Valley, Idaho

Remediating fluvial systems impacted by sulfide mining requires characterization of contaminant mobility and trace metal speciation. Sequential extraction and electron microscopy (SEM and TEM) procedures provide unprecedented insight into metal speciation and behavior in different fluvial subenvironments. Three complete transects, including river channel, levee, wetland and lacustrine environments, along the lower Coeur d'Alene (CdA) River valley were studied. This investigation was designed to specifically test previously proposed speciation models (Hooper and Mahoney, 2000) along the entire length of the CdA River system. CdA River channel sediments contain abundant detrital and authigenic sulfide minerals (PbS, FeS₂, ZnS), carbonates (PbCO₃, FeCO₃), and locally sulfide encrusted organic matter. During flooding, river bottom sediments are remobilized and supply trace metal contamination into adjacent fluvial subenvironments. River sediments are rapidly oxidized within the levee environment, resulting in extensive precipitation of oxy-

hydroxides with subsequent dissolution of carbonate minerals. Both detrital and authigenic sulfides and oxy-hydroxides supply trace metals to adjacent wetland and lacustrine environments. The anaerobic conditions of the wetlands and lacustrine environments yield abundant biogenic sulfides. Analysis of three transects along the length of the lower CdA system indicates that there is minimal downstream variation within fluvial subenvironments but large differences between environments. Effective remediation in the lower CdA river valley requires limiting the disturbance of river bottom sediments during flood events.

Jeremy Treague (90)

Faculty Advisor/Collaborator: **Steve Abbott** (Southern Cross University Lismore, Australia)

Geological Context of Peat Deposition in Cumbebin Swamp, Northeast New South Wales, Australia: A Geological Framework for Carbon Sequestration Studies

Throughout the Twentieth Century, human activities have heavily impacted coastal wetland environments. Drainage and filling, clearing of vegetation, and pollution are a few of such activities that have contributed towards the loss of these habitats. The purpose of this project was to determine the geological origin and evolution of Cumbebin Swamp, a low-lying, estuarine/alluvial flood plain that is situated southwest of the township of Byron Bay along the northern New South Wales coastline, and to provide a geological framework for carbon sequestration studies. Vibracore equipment was used to collect a 53 cm-long, 12 cm-diameter wetland core. Swamp sediments were characterized in terms of thickness, location within the swamp stratigraphy, and environment of deposition. Detailed geology and soils maps of Cumbebin Swamp and surrounding coastal plain were compiled using NSW Department of Mineral Resources data and ArcView 8 software. Acidic, water-saturated, oxygen-poor conditions are responsible for peat deposition since the last high sea level (which peaked 1 m APSL and occurred 6.5 ka). This sediment was found up to 20 cm below the swamp surface. Fine-grained quartz sand was found 20-34 cm below the swamp surface and overlies a 6-cm thick bed of angular quartz gravel. This material may represent weathered Paleozoic rocks.

James Watkins (92)

Faculty Advisor/Collaborator: **Phillip Ihinger**

Major Element Characterization of OIB Source Regions: Insights from the Hawaiian-Emperor Hotspot Chain

Magmatism on Earth's surface provides clues to the origin, evolution, and present state of Earth's interior. Mid-plate volcanoes on the ocean floor (OIB) directly reflect their mantle source characteristics because they are not influenced by significant contamination. Variations in trace element and isotope concentrations of OIB identify several different mantle reservoirs, each with a unique chemical composition. Complete characterization of these reservoirs is necessary in order to fully understand mantle dynamics; however, few attempts have been made to elicit the major element composition of OIB source regions. We note that geochemical measurements of Hawaiian lavas show correlations between isotope ratios and major element concentrations along the "Loa" segment of the Hawaiian-Emperor seamount chain. These systematic variations cannot be accounted for by common processes that affect magma composition, such as crystal fractionation, crustal contamination, alteration, or variable degrees of partial melting. Rather, these variations represent mixing between two or more distinct OIB mantle source regions. A multi-dimensional fit of Hawaiian geochemical data provides estimable major element abundances between OIB source regions represented by shield-stage lavas from Koolau and Loihi volcanoes. We demonstrate a method of calculating major element compositions for OIB source regions that can be applied to other centers of mid-plate volcanism.

James Watkins, Breck Johnson, and Jesse Bernhardt (110)

Faculty Advisor/Collaborator: **Phillip Ihinger**

Origin of North American Cordillera: Lithospheric Response to Plume-Slab Interaction

Over the last 200 million years, the geologic evolution of western North America has been dominated by active subduction of the Farallon plate. During the early stages of its formation, the active plate boundary produced features similar to typical subduction margins. However, beginning ~80 million years ago, the style of magmatism and structural deformation changed abruptly, producing several enigmatic features: (1) the eruption of large, explosive volcanoes in New Mexico, (2) the formation of the Rocky Mountains in Montana, Wyoming, and Colorado, (3) the carving of the Grand Canyon in Arizona, (4) the formation of the unusual Basin and Range topography throughout Nevada and Utah, (5) the large outpouring of basalt lavas in Oregon, Washington, and Idaho, (6) the eastern extent of structural deformation, and (7) the coeval emplacement of two magma types derived from markedly different mantle source regions throughout the western US. Previous models for the geologic evolution of the western US cannot reconcile all of the observed features. We present a new model for the geologic evolution of the North American Cordillera that complies with existing observations of the structural and magmatic evolution of the region.

Geology / Computer Science

Ryan Prechel (183)

Faculty Advisor/Collaborator: **Phillip Ihinger** and **Daniel Stevenson**

Visual Simulation of Quartz Crystal Growth

Crystal growth in the natural environment is a poorly understood process. Analogous to snowflakes, every crystal has a unique size and shape. Although it has long been known that the angles between faces within a given mineral are invariant, what determines the final size and shape of a crystal is unclear. Recent measurements of chemical impurities within natural crystals offer important clues toward understanding crystal growth. In natural crystals, chemical heterogeneities are generated during growth because different crystal faces grow at different rates and therefore trap different amounts of impurities. Thus the relative growth rate of each face is recorded within the crystal, and the impurities act as a speedometer for the growth rate of the face. We present a visual simulation of a single quartz crystal growing in a hydrothermal solution. Our simulation mimics the morphologic and chemical characteristics observed in crystals grown in the natural environment. We show how growth on different crystal faces leads to chemically distinguishable sector zones inside the crystal. Our simulations generate the order-of-magnitude variations across sharp sector zone boundaries that are observed in natural crystals. Our visual simulation illustrates the morphologic evolution of a crystal as it grows from hydrothermal solution.

Geology / Geography & Anthropology

Breck Johnson (184)

Faculty Advisor/Collaborator: **Phillip Ihinger** and **J. Brady Foust**

Visual Display of the Cenozoic Evolution of the North American Cordillera

The North American (NA) Cordillera is represented by the mountainous region that extends more than 1000 km eastward from its western margin. The region has experienced extensive magmatic and tectonic activity over the last 80 million years, the origin of which is controversial. Any successful model for the evolution of the Cordillera must explain the wide variety of magma compositions and styles of structural deformation observed in it. The character of tectonic activity varied spatially and temporally across the region. No current model can account for all available observations. We have developed an interactive time progressive map that incorporates each of the tectonic attributes over the last 80 million years. We utilize a variety of colors in a time series that illustrates the changing magma compositions and deformational styles as a ‘movie’. The movie allows for clear visualization of the evolution of the region. Our approach is advantageous in that it allows us to image trends in tectonic activity. In a companion abstract, we present a new model for the evolution of the NA Cordillera, which can account for the unique tectonic events that shaped this region. Here, we utilize the movie to test the viability of this model.

Mathematics

Elizabeth Burgener (84)

Faculty Advisor/Collaborator: **Mohamed Elgindi**

Optimum Flow in a Membrane Trough

A fluid flows down an inclined membrane trough. The membrane shape and the fluid velocity are solved numerically. The optimum opening width for maximum flow is found to be 0.651 of the membrane perimeter.

Chong Hoong Leong (93)

Faculty Advisor/Collaborator: **Mohamed Elgindi**

Temperature Balance of Polymer Flow Through Pipe

A nonlinear parabolic equation is derived to model the temperature balance of polymer flow with viscous dissipation inside a pipe. This equation cannot be solved in closed form. In this project, we derive a Finite Difference scheme and approximate the solution of the nonlinear parabolic equation. The results obtained using this scheme are compared to the results calculated using the computer software Maple for the case when the flow is Newtonian.

Darin Mohr (95)

Faculty Advisor/Collaborator: **Alex Smith**

One-Parameter Isometric Deformations of Minimal Surfaces

The study of soap films leads to a ubiquitous partial differential equation called the “minimal surface” equation. One method of representing solutions, that relies on complex numbers, is called the “Weierstrass-Enneper” representation. Using this technique, one

finds a natural one-parameter family of minimal surfaces. As a special instance of this, we find that the catenoid can be deformed into the helicoid.

Darin Mohr and Elizabeth Burgener (94)

Faculty Advisor/Collaborator: **Robert Langer** and **Mohamed Elgindi**

Body Profile Design for Extrusion Dies

In the manufacture of plastic sheets, a melted polymer is forced through an extrusion die at extremely high pressure and then extruded through a narrow slit. The internal geometry of the die is designed so that the flow rate and pressure of the melt are uniform across the width of the die as the material exits the slit. However, extreme pressure inside the die combined with the internal die geometry causes the slit to open unevenly resulting in unevenness in the thickness of the product. Recent analysis has suggested that varying the thickness of the die body could correct this unevenness. Through computer simulation using mathematical models of polymer flow and die deflection, a die body profile is determined that will result in a more uniform opening and consequently a better product.

Mathematics / Biology

Laura Tamm and Trina Nowak (24)

Faculty Advisor/Collaborator: **Vicki Whitley** and **David Lonzarich**

Fish Community Modeling Project

The organization of fish communities in streams varies remarkably across habitats (e.g. pools, riffles), even at the scale of tens of meters. For some time, this spatial variability in community organization was attributed to local-scale factors (e.g. predator densities, depth, current, food abundance). This original proposal suggested that fish occupied very small home ranges and that fish assemblages in different habitats could be considered discrete ecological units. However, recent research on fish movement has shaken the foundations of this argument. It now appears that many fish undertake considerable daily excursions across habitats. In this project, we utilized a mathematical model that explores the possible effects of fish movement and partial habitat barriers (e.g. riffles) on the structure of stream pool communities, and the extinction and colonization rates of individual species. This is the second generation of the model, incorporating new parameters (e.g. riffle length, pool area) into the original program. This ongoing research collaboration will hopefully further advance our understanding of the role that is played by fish movement on the structure and dynamics of fish communities in streams.

Mathematics / Physics & Astronomy

Alex Kruse (83)

Faculty Advisor/Collaborator: **Simei Tong** and **J. Erik Hendrickson**

Least Resistance of a Solid of Revolution Moving in a Rare Medium

This paper explains the least resistance of a solid of revolution moving in a rare medium, with a math model and using algebraic and geometric analysis to obtain least resistance. It also explains the general case by using the Lagrange principle. The results were tested in a lab using aluminum models in water.

Physics & Astronomy

Andy Anderson (73)

Faculty Advisor/Collaborator: **George Stecher**

Measuring Flight Parameters of Flying Discs

Two digital cameras were used to record the flight of a Frisbee disc. Data taken from individual frames were used to determine the position, speed, rotation, and orientation of the disc during its flight. The results are explained by simple physical models.

Brian Krosschell (72)

Faculty Advisor/Collaborator: **Scott Whitfield**

Photoelectron Spectrometry of the Valence Subshells of Atomic Chromium Following 3p to nd, ms Excitation and Decay

A determination of the angular distributions and the relative partial photoionization cross sections of the 3d and 4s mainlines and the largest satellite line of atomic chromium in the region of the 3p to nd, ms excitations has been carried out using electron spectrometry in conjunction with monochromatized synchrotron radiation. We observe strong deviations of beta from expected values of 2.0 for the 4s mainline at many of the 3p to nd, ms resonances. This indicates the importance of relativistic effects in the autoionization of this half-

filled subshell atom. High resolution constant-ionic-state spectra are comparable with previous high resolution absorption measurements. A comparison of our 3d beta values with recent spin-polarized random phase approximation calculations generally shows good accord with some exceptions.

Ryan Prechel (182)

Faculty Advisor/Collaborator: **Jin Huang**

Computational Modeling of Electronic and Structural Properties of Heavy Element Ions in Solids Using the C++ Programming Language

Experiments utilizing laser and X-ray spectroscopic techniques are conducted at Argonne National Laboratory to reveal electronic energy level structures and excited state dynamics of the heavy element ions in various host materials. The experimental results are analyzed and theoretically modeled based on such fundamental physical interactions as electron-electron, electron-phonon, and electron-nuclear couplings. Computer code generated from our project using the C++ programming language will be used to computationally model the experimental results.

Justin Reiter (82)

Faculty Advisor/Collaborator: **Nathan Miller**

Extracting Spectra and Identifying Emission Lines from a Highly-Ionized Plasma: First Results From a Chandra Observation of the Cygnus OB2 Association

Using data telemetered from the Chandra Space Telescope, we have analyzed high-energy radiation from the Cygnus OB2 stellar association, a family of stars containing super-heated plasma and violent stellar winds. We have extracted the dispersed X-ray spectra of four stars, Nos. 5, 8a, 9, and 12. Part of the stars' winds have temperatures in the millions of degrees, resulting in the formation of ions including Ne-like Fe, and H- and He-like species of sulfur, silicon, neon, and oxygen. These observations help determine not only which ions are present, but also the temperature and location of X-ray emitting material in the stars' winds. Because these winds' outflow velocities are roughly 1% the speed of light, the High-Energy Transmission Grating Spectrometer is able to resolve the Doppler-broadened profiles of the emission lines, giving us information about the winds' velocity structures. The underlying mechanisms of X-ray emission are not yet fully understood, but the results of this investigation have yielded meaningful spectra that are useful for future study.

Shantih Spanton (62)

Faculty Advisor/Collaborator: **Matt Evans**

Interfacial Reactions and Determination of Diffusion Coefficients and Activation Energies of Thin Mn Films on GaAs(100)

Ex-situ post-growth anneals of Al(50Å)/Mn(2000Å)/GaAs(100) structures at temperatures of 200, 300, 350, 400, and 500 °C for time ranges of 1-30 hours were performed to characterize the intermixing of Mn with GaAs substrates. Prior to annealing, Mn films on GaAs appeared polycrystalline from high energy electron diffraction and x-ray diffraction (XRD) data. Also, pre-anneal Rutherford Backscattering Spectrometry (RBS) indicated no extensive interfacial reactions occurred during the growth of the Mn film. After anneals above 200 °C, RBS data indicated significant Mn-Ga-As reactions and the formulation of a region of Mn_{0.6}Ga_{0.2}As_{0.2} composition. Higher temperature anneals resulted in the dissociation of this region into a MnGa-like region near the surface and a Mn₂As-like region near the substrate. RBS measurements of the reaction layer thickness for various annealing times at 300 °C indicated the interfacial reactions to be diffusion controlled. Utilizing the relationship between reacted layer thickness and time, Mn-GaAs diffusion coefficients at specific temperatures were determined. Once the diffusion coefficient over a range of temperatures was established the activation energy of the Mn-GaAs system was calculated.

David Wattenford and Dustin Kasel (71)

Faculty Advisor/Collaborator: **Kim Pierson**

Low Temperature Epitaxial Growth of Thin Silicon Films for Semiconductor Devices: Contamination Elimination

This project is the next step in a long-term research goal of developing a technique to deposit thin perfect crystalline silicon films at low process temperatures. There are a number of different areas of semiconductor device performance that would benefit from such a technique. We are taking advantage of the unique properties of an ion source that has been developed here at UW-Eau Claire. This ion source is used in the deposition process and theoretically gives us an advantage over commercial thin film deposition systems. The current project is directed at solving two contamination problems that have halted the investigation of the process parameter space for the deposition technique. Student Dustin Kasel has been investigating various methods to clean the silicon substrates that are the base material for the thin silicon films. Student Dave Wattenford has designed and fabricated changes to the deposition system that were required to solve the contamination problem that occurs inside the vacuum system during film deposition. Results of recent thin film deposition experiments are presented.

Physics & Astronomy / Chemistry

Sara Chamberlin and Christopher Conklin (61)

Faculty Advisor/Collaborator: **Douglas Dunham** and **Marcus McEllistrem**

Investigating Indium Nitride Protective Layers for Gallium Nitride by X-ray Photoelectron Spectroscopy

Gallium nitride (GaN) is a compound wide band gap semiconductor that has many technological applications. It has been the focus of current research due to applications in UV photodetectors, light emitting and laser diodes, and high performance transistors. GaN light emitting diodes can be made to emit green, blue, and violet light, and have been proposed as a solid state white light source for residential and industrial lighting. Preventing contamination and preserving high quality surfaces of the gallium nitride between the time the gallium nitride crystals are grown and the time they can be used in devices has been problematic. In order to protect the gallium nitride surface, an indium nitride layer is deposited on the surface. We investigated the effectiveness of a thin layer of indium nitride deposited on the surface to prevent contamination from the air. The indium nitride was removed by heating. Using X-ray Photoelectron Spectroscopy (XPS) and Scanning Tunneling Microscopy (STM), we have determined that the indium nitride layer neither protects the surface from contamination nor results in a well ordered GaN surface after its removal.

Graduate Entries

Allied Health

Julie Freidhoff, graduate student, **Alison Deneen** and **Ashley La Casse**, undergraduate students (157)

Faculty Advisor/Collaborator: **Crispin Pierce**

Toxicokinetics of MTBE in Human Subjects

Millions of people are exposed to the gasoline additive MTBE (methyl tertiary butyl ether) while filling their gas tanks and through ground water in contact with leaking underground storage tanks, in all 50 US States. The Congress is currently debating an energy bill with a provision to indemnify MTBE producers from lawsuits claiming health damages from exposure. Moreover, this bill contains price supports for Midwest farmers to produce ethanol, as an alternative fuel additive. With such attention, an understanding of how the human body handles MTBE is crucial. Concentrations of MTBE, another fuel additive, ETBE (ethyl tertiary butyl ether), and their metabolites in blood, breath and urine from eight controlled human exposures were examined. Declining levels of each chemical were fit with zero-, first-, and second-order equations, as well as with a physiologically-based kinetic model. The most stable and easily measured of these chemicals were identified, in order to provide markers of human exposure to MTBE and ETBE.

Laura Schrage, graduate student, **Karen Bartosh** and **Mia Jewell**, undergraduate students (153)

Faculty Advisor/Collaborator: **Crispin Pierce**

Toxicokinetics of 13C- and 2H-Toluene

Toluene is the most widely-used chemical solvent, with widespread occupational exposure. To understand how the human body handles this chemical, without background exposure, we studied blood, breath, and urine concentrations from seven human exposures to stable isotope-labeled 13C- and 2H-toluene. While both isomers were metabolized at the same rate, 13C-toluene formed much more hippuric acid metabolite, whereas 2H-toluene formed much more of the o-, m-, and p-cresol metabolites, documenting an isotope effect. In examining inter-individual differences, we found that breathing rate, body weight, body fat percentage, height, and age were significant predictors of how quickly toluene was eliminated.

Biology

Kathleen Miller (154)

Faculty Advisor/Collaborator: **Paula Kleintjes** and **David Lonzarich**

*Characteristics of *Ocyopode quadrata* Burrows and their Relationship to Beach Topography on a Bahamian Island*

The ghost crab (*Ocyopode quadrata*) inhabits burrows on beaches along warm coastal waters. Though data have been collected on behavior, explanations for the characteristics of ghost crab burrows are limited. To determine if relationships exist among burrow characteristics, island topography, and ocean direction, we collected measurements in regards to direction and diameter of burrow entrance, distance to neighboring hole, and distance to vegetation and water on San Salvador Island, Bahamas, in January 2004. Results show that ghost crab holes generally face the ocean and slight changes in degree correlate with the curve of the beach. Hole placement by all ghost crabs is similar within the study area. All burrows are between 8.10 - 13.90 M from the water-beach transition

zone, having a mean of 8.73 +/- 1.72(sd). Location from the beach-vegetation transition zone, and distance between uninterrupted holes shows a similar trend. Crab size is positively correlated with hole diameter, but has no significant relationship with the distance between burrows. These results suggest that ghost crabs strategically place and orient their burrows toward the ocean.

Curriculum & Instruction

Sunshine Mc Faul and Annelies Slack (136)

Faculty Advisor/Collaborator: **Maureen Mack**

Wisconsin Rural School Teachers 1880-1950

Why is there such interest and nostalgia for rural schoolhouses? As one meanders through a one-room schoolhouse, the mind struggles to picture what the life of a rural teacher must have been like in the late 1800s and during the first half of the 1900s. Some "museum" schoolhouses attempt to relive the life of a rural Wisconsin teacher but most attempts are sentimental and trite. Who were these teachers? What features did they have in common? What impact (both positive and negative) did they have on the students they taught and in the communities they served? How did gender roles play in the selection of teachers; of the selection of rural teachers' supervisors? What was the core curriculum? These are but a few of the musings that trigger interest in researching the topic of rural Wisconsin schoolteachers. The research methods included a review of the literature, resources from the Wisconsin Historical Society, digital photography from the period and interviews of persons connected to three rural teachers who were targeted for in-depth study.

Human Development Center

Krista Bowman, Taryn Jones, Sarah Wiinamaki, and Kelly Sykes (135)

Faculty Advisor/Collaborator: **William Frankenberger**

Program Evaluation of Tutor/Mentor Services for At-Risk Students

School is a frustrating experience for a child who is constantly struggling to keep up with the rest of the class. Approximately 55 children are expected to participate in the Tutor/Mentor program at Lakeshore and Lincoln Elementary schools. The Lakeshore and Lincoln school areas were selected because they serve the largest population of low income and Hmong students in the city and no other tutoring services were available to these children. This project specifically targets minority and at-risk students who are displaying academic difficulties or achievement lags. The project is designed to determine whether: enrolled children increase their academic achievement, enrolled students increase their self-esteem, and enrolled students increase their social skills. Tutor/Mentors will assist students with homework, complete remedial projects that are directed by the classroom teacher, and work with the children on the development of appropriate social and peer interaction skills. Specifically, 12 upper level undergraduate and graduate students will be employed as Tutors/Mentors on Tuesday and Thursday afternoons immediately after school. Each tutor will work with one to three students depending on degree of assistance that the student may need. The project began Fall semester (Sept. 2003) and will conclude at the end of the school term (May 2004).

Psychology

Aimee Beth Hogan (134)

Faculty Advisor/Collaborator: **Mickey Crothers**

Suicide Prevention Programs in Wisconsin High Schools

Suicide is the second leading cause of death among adolescents in the United States today. The suicide death rate for 15-24 year-olds in Wisconsin is 12.9 per 100,000, which is larger than the national average of 10.3 suicides per 100,000. Data indicate that in the past year more than 22% of high school students contemplated suicide. This study used questionnaires to elicit information regarding the characteristics of current suicide prevention programs in Wisconsin schools as well as characteristics that school professionals would like to see in future suicide prevention programs. Surveys were sent to teachers, school psychologists, counselors, principals, and nurses from different counties. School professionals were randomly sampled from a CD provided by the Department of Public Instruction. Out of the 478 surveys disseminated, 26% responded. 34.1% of participants reported having a suicide prevention program at their school and 65.9 % of participants reported no such program. Participants who reported having a suicide prevention program had significantly more in-service training hours on the topic of suicide prevention and felt significantly more prepared to identify and refer suicidal students than participants who reported they did not have a suicide prevention program.

Heather Hunt (133)Faculty Advisor/Collaborator: **Allen Keniston***No Teacher Left Behind: Wisconsin Teachers' Perceptions of the Effects of Statewide Testing on Instruction and Learning*

The implementation of the No Child Left Behind Act (NCLB) of 2001 requires states to develop systems of accountability to be measured by annual assessments in reading and mathematics in grades 3 through 8 and at least once in grades 10 through 12. Research indicates that the consequences attached to this accountability movement have adverse effects on teachers' instructional choices and teaching strategies as well as on the quality of student learning. The purpose of this study was to examine how implementation of new testing standards in accordance with No Child Left Behind legislation affects Wisconsin teachers in the following areas: a) attitudes toward state-mandated testing programs; b) choices in curriculum ; c) amount of time spent on teaching of test-taking skills and strategies; and d) choices and teaching strategies for children based on student demographics. Participants were a random sample of fourth, eighth, and tenth grade teachers from all public schools in the state of Wisconsin. A 67-item questionnaire developed by the National Board on Educational Testing and Public Policy was administered.

Special Education**Tammy VanBlarcom (158)**Faculty Advisor/Collaborator: **Rose Battalio***Promoting School Success for Students at Risk of Failure*

There are students in school districts who fail academically and behaviorally who do not qualify for special education services and therefore they may potentially receive minimal individualized education. Behavioral concerns are particularly worrisome because of the impact on students' future academic success. It has been noted that early intervention is key to changing the outcomes of students who are at risk for school failure. Walker, Colvin, & Ramsey (1995) stated, "If antisocial behavior is not changed by the end of grade 3, it should be treated as a chronic condition much like diabetes. That is, it cannot be cured, but managed with the appropriate supports and continuing intervention" (p.6). No Child Left Behind legislation states that "every child should be educated to his or her full potential" (p.3). Educational performance is lacking in students who have great potential to succeed in school due to inappropriate classroom behavior. The purpose of this study is to assess the effectiveness of research based interventions such as proactive measures, positive behavioral support, and early interventions (Sugai and Horner, 2002) that are intended to increase "students in progress" success in their educational performance as measured by decreased discipline referrals, increased school attendance, and increased academic performance.

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