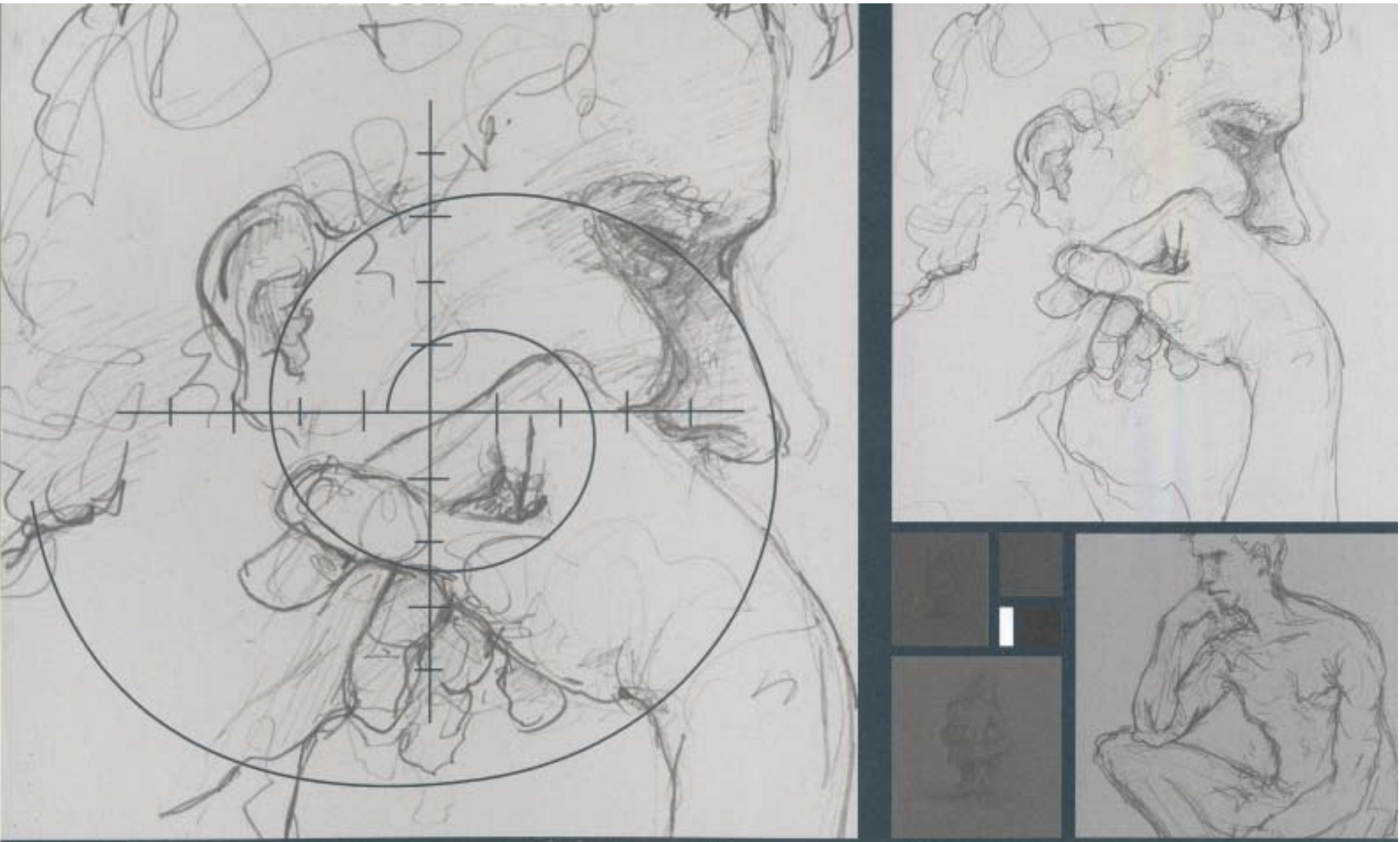

thirteenth annual

UNDERGRADUATE RESEARCH SYMPOSIUM

march 22, 2000

student union

2000 Truman State University Undergraduate Research Symposium

Truman State University has a well-deserved reputation for excellence in undergraduate scholarship. The Undergraduate Research Symposium is a university-wide, interdisciplinary event that showcases scientific research, literary review, artistic performance, and other forms of undergraduate scholarship from a wide variety of academic programs.

Special thanks to the University Publications and Printing Services, the staff of the Student Union, the Instructional Technology Center, Sodexho, and the Vice-President for Academic Affairs' office. Gratitude is also expressed to the members of the 1999-2000 Undergraduate Research Committee:

Donna Bailey, Math & Computer Science

Wynona Black, student representative

Janet Gooch, Human Potential & Performance

Brian Lamp, Science

Betty McLane-Iles, Language & Literature

Kyung Mun, Business & Accountancy

Sara Orel, Fine Arts

Fred Shaffer, Social Science

Congratulations to the outstanding students and faculty mentors for their involvement in and support of the Thirteenth Annual Undergraduate Research Symposium.

James Padfield, Chair
Undergraduate Research Committee

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Cover/ Poster Design

This year's poster and abstract program cover was designed by John J. Balven, an undergraduate Visual Communication student from Washington, Mo.

Phi Kappa Phi Interdisciplinary Section

The "Kreutzer" Sonate

Joseph Fear
Dr. Shannon Jumper, *Faculty Mentor*

In her essay, "*The Kreutzer Sonata: Tolstoy and Beethoven,*" Dorothy Green suggests that there is a closer affinity between Tolstoy's "The Kreutzer Sonata" and the violin sonata by Beethoven that inspired it than might be expected. Although Green suggests this affinity between the two works and states that she considers these ties important, she does not make more than the vaguest comments as to how the structures of these works are comparable. She does encourage others to examine other parts of the works more closely for more structural parallels. In this paper, a close formal comparison of the two "middle movements" of these works was made in order to apply Green's suggestion and determine the usefulness of its application to Tolstoy's text. The result is a mixture of art forms that Tolstoy uses to comment both upon art and upon the human condition.

Computer Modeling of Natural Language Syntax**

Nate Sternberg
Dr. Mary Shapiro, *Faculty Mentor*

I've developed a computer program that uses rule-based processing of natural language to generate and display the corresponding phrase structure tree for a given English sentence. I have tried to make the system robust enough to handle the structural and lexical ambiguity of human language and flexible enough to analyze any natural language, given the appropriate grammar and dictionary file. The system will be deployed via a web interface and will be incorporated as part of classroom instruction in introductory linguistics courses. My presentation will include a demonstration of the system as well as a discussion of the strengths and the shortcomings of a rule-based model of grammar processing.

**This project was supported by a 1999 Undergraduate Research Stipend.

Crime and Heredity: A Study of Eugenic Criminology in Progressive Era America

Jared Swanegan
Dr. Philip K. Wilson (Shimer College) and
Dr. Scott Ellis (Truman State University)

Crime in the twentieth century created an unprecedented burden on American taxpayers. To alleviate this problem, eugenic leaders, including Henry Goddard, Charles Davenport, and Harry Laughlin, focused efforts toward improving the breeding stock of America based upon Mendelian Genetics. Their goal was to eradicate crime by "breeding out", segregating, or sterilizing criminals. Other eugenicists, such as Harry Olson and William Hickson, searched for brain-based causes of crime by employing various psychiatric evaluations. Throughout the progressive era, these two theories of crime vied for societal, scientific, and legal support. This paper analyzes what led to these ideas and their impact on society.

Business & Accountancy

Trade Problems in the Toy Industry

Julie Balling
Dr. Jeff Romine and Dr. Neil Gilchrist,
Faculty Mentors

In recent years, advances in technology and communications have facilitated trade between countries that once did not have trade relations. However, the increased trade opportunities have also brought problems. There are many things a firm must consider before going international, including the cultural, economic and legal systems of the target country. A careful analysis of social customs, education levels and the economic environment can provide valuable information about a potential market. Companies that fail to do their homework find great difficulty in making inroads into a new marketplace. The purpose of this paper is to examine the problems that companies experience when going global. The toy industry is one example of an industry that has been affected by the changes and improvements in technology and communications. Problems of product distribution, views on toy safety, and the media all inhibit international toy trade. How do companies respond to these problems? The research investigates company responses exhibited in this industry. In order to reduce the problems associated with international trade, companies have begun to standardize regulations. The formation of a worldwide toy association has also brought increased communication and facilitated trade between countries. Once the problems of global trade in the toy industry have been clearly identified, companies can begin to work more diligently to overcome them, and the industry can enjoy increased free trade.

Underpricing of Initial Public Offerings

Jessica Callow and Kim West
Dr. Andrew Mun, *Faculty Mentor*

The underpricing of initial public offerings (IPO) is a common phenomenon. It occurs in almost every industry. This project attempts to measure the extent to which underpricing occurs in eight industries. The industries are examined using three companies as a representative of each industry. The excess return for each industry and the S&P 500 is found by subtracting the three month Treasury bill rate, which is commonly used as the risk free rate, from each of the calculated returns. Linear regression is then used to find the alpha and beta of each industry and the cumulative average abnormal return is calculated. Findings indicate that seven of the eight industries sampled underprice their IPO's. In addition, the hotel and network communications industries are underpriced by the greatest amount compared to the other five underpriced industries. The online security and commodity brokerage industry are the only industries studied that are overvalued.

The Potential Formation of Another Economic Trading Block in the Asia-Pacific Region**

Lawrence Chui
Dr. Jason Lin, *Faculty Mentor*

The core of this research project is to study the potential formation of another economic trading blocks in the Asia-Pacific region. The goal of Asia-Pacific Economic Cooperation (APEC) is to create a free trade zone in the Asia-Pacific region. The APEC member economies account for nearly one half of the world's economy. Incorporating with the vast consumer market of China and the strong economic muscles of

Japan and the United States, APEC would certainly bring prosperity to the region economies. Allowing trade liberation to take place in the world's fastest growing region will not only benefit its economies but it could also bring forth political stability into this region.

**This project was supported by a 1999 Undergraduate Research Stipend.

What Specific Computer Skills Do Business Professionals Need?

Pam Dangremond
Dr. Jeff Romine and Cathy Poyner, *Faculty Mentors*

Companies spend millions of dollars each year in training their employees to utilize the computer and appropriate software. Computer proficiency can make a great difference in the ability of a first-hire to contribute to an organization. This research has implications for college students and their preparation, as well. Is the same preparation appropriate for everyone? The purpose of this research is to investigate the computer skills that are necessary for business professionals to function in their position. The investigation also seeks to answer questions like: do marketing professionals utilize different skills than accounting or production professionals? The researchers developed a survey instrument, which was used to collect information from a sample of 650 randomly selected business professionals who are employed in positions categorized as marketing and sales, accounting, production and operations, human resources, and finance.

Dell Computer Corporation: A Case Study**

Sarah Fluegel
Dr. Jason Lin, *Faculty Mentor*

Since its founding in the early 1980s, Dell Computer Corp. has been a company that has revolutionized the computer industry. With its bold initiative to sell computers directly to the end user, it has been one of the most emulated companies to date. Other companies, including those within the computer industry but not limited to, have realized the benefits direct selling provides and have chosen to implement this system to increase their own efficiency. Thus, Dell has constantly had to improve upon its direct selling method. One of these methods was by offering leasing programs to its customers. Dell's rivals followed suit shortly after by offering their own leasing programs. This research is a study of Dell's leasing program compared to its main competitors of Compaq, IBM, and Gateway. A time value of money analysis was conducted to compare the leasing alternative of each company. The net advantage to leasing was computed and Compaq was found to offer the best leasing program. The results of this analysis show that while Dell was the innovator in direct selling, it has lost its competitive advantage.

**This project was supported by a 1999 Undergraduate Research Stipend.

Consumer Awareness of and Interest in Purchasing Locally-Produced Food Products

Gina Garrett* and Heather Adams
Dr. Michael Seipel, *Faculty Mentor*

Shoppers at the Kirksville Hy-Vee were surveyed November 9-16, 1999 to determine their awareness of and interest in purchasing locally produced food products. One hundred seventy-two consumers, aged 17-84, participated in the survey. Results showed that consumers were highly aware of locally produced vegetables, fruits, eggs, beef, and pork. The results also showed that consumers had a high interest in purchasing locally produced fruits or vegetables and a moderate interest in purchasing locally produced eggs and meat. We determined a target market for locally produced beef, pork, and poultry after further analysis of the survey results. Those highly interested in purchasing meat live in larger households outside of Kirksville, have a lower level of formal education, and are willing to pay more for local products. We also defined a target market for locally produced fruits and vegetables. These consumers live in larger households and are female.

The Importance of Knowledge Management

David Hedrick
Dr. Nabil Alghalith, *Faculty Mentor*

Knowledge Management, which can be defined as organizing, processing, and distributing knowledge in an efficient and effective manner, is a relatively new topic that is of growing importance in business. Being able to define knowledge is a challenge itself. Knowledge is more complex than data or information because it is a method of synthesizing and analyzing the information to make it useful and, more importantly, valuable. The management of knowledge is essential to a company that is trying to achieve and maintain a competitive market share. Access to information is now easier and faster than ever before, and new methods of transforming information into knowledge are crucial. As vast and multifaceted as this subject appears to be, it is not limited to multi-national corporations' use. Small companies are beginning to implement knowledge management programs and the results are quite astounding. It no longer seems that a company must be a sprawling corporation to compete in the global market.

The Job Skill Survey**

Turan Hirji*, Julia Bender and Nicole Winters
Dr. Pyung E. Han, *Faculty Mentor*

Today's workplace has become increasingly competitive, especially with regard to the required job skills one must posses. Through careful examination of the job descriptions for various business-related jobs, it was found that most job openings required at least some minimum computer knowledge. A survey questionnaire regarding the relative importance of various computer skills for business majors was administered to 160 Truman State University alumni out of which 71 usable responses were obtained. The findings indicated that word processing skills were most in demand with a mean score of 4.6 out of 5. This was followed by spreadsheets (4.52/5), Internet applications (4.24/5) was the third highest, knowledge of presentation softwares (3.9/5) was also considered very important by most of the respondents. Databases (3.48/5) were not as important as presentation softwares. Desktop publishing packages (2.66/5) was sixth in line programming languages (2.3/5), statistical packages (2.11), and flowcharting (2.01) were all rated as somewhat important. In general, MSOffice was the most widely used.

**This project was supported by a 1999 Undergraduate Research Stipend.

Valuation of High-Tech Businesses

Jacob Pfeuffer
Dr. Jeff Romine and Dr. Neil Gilchrist, *Faculty Mentors*

In recent years the financial headlines have blazed with stories of the exchange of businesses for high prices. Information technology firms such as Cisco, Lucent, and Nortel have been purchasing firms in the market place for amounts that seem outrageous and unreasonable. This research examines several of these instances. The

investigator examines the rationale behind the apparent high prices reported in the press. Traditionally, professionals attaching value to companies have utilized one of three approaches to accomplish the valuation. These approaches are the net asset, the market comparison, and income capitalization methods. The traditional approaches appear to fail in the reported stories. The research examines the failure of the traditional valuation methods and strives to explain the phenomenon.

On Developing a Search Engine Efficiency Model and Its Application

Donald Wray
Dr. Stephen Allen, Faculty Mentor

As the volume of data, sources and resources explode on the Internet, users need to be able to access data in a very timely, orderly and efficient manner while avoiding data overload. Information vendors have begun to help users sift through the multitude of data by offering a variety of methods that are free for public use and intended for less sophisticated users-specifically Internet search engines and directories. Unfortunately, the search methods of the various information vendors lack consistency in their approach. Oftentimes, there is also a clear lack of public accessibility to the descriptions of methods deployed. To address these oft confusing user issues of search engines and directories, this study attempts to categorize many of the more popular, often-used search engines based on methods and tools. While many search engines provide a likeliness hit ratio or some other index, often these data are unused or of unknown relative strength. To address this issue an efficiency index model is developed to measure search engine efficiency and applied to six different search engines and directories with specific reference to the area of business finance. The search engines are then ranked based upon how well they retrieve information that would be helpful to a user researching business finance topics. Recommendations will also be provided on construction of a successful search. Additionally, user limitations of Internet search engines will be provided.

Fine Art

Teaching Northern Renaissance Art**

Bryna Campbell
Dr. Julia DeLancey, *Faculty Mentor*

The Northern Renaissance — the time of Albrecht Dürer and HansHolbein — is one of the most intriguing eras in art history because the Protestant Reformation impacted artists greatly. The issues surrounding the period are incredibly interdisciplinary in nature. They relate to contemporary ideas as well as historical ones, and can be used in high school art and humanities classes to teach students about aesthetic and social issues. My paper presents highlights from a high school unit plan on the Northern Renaissance created as a fulfillment of an undergraduate research stipend proposal. Lessons include a variety of hands-on approaches that make art work more accessible to different learning styles. By teaching art history in this way to high school students, they can more easily relate to and understand complex issues that impact them not only in art classes but in other areas of their lives as well.

**This project was supported by a 1999 Undergraduate Research Stipend.

SUITE POUR LE KORG: An Exploration of MIDI Techniques for Synthesizer**

Gregory Cornelius
Dr. Warren Gooch, *Faculty Mentor*

SUITE POUR LE KORG, a composition in four movements for synthesizer, explores the different sound parameters available on the Korg M1 and X5D synthesizers. Two synthesizers were used for the sake of timbral variety and in order to expand the number of available effect processors. By using a sound palate containing a combination of Korg factory sounds, altered factory sounds, and completely original sounds, I sequenced MIDI events to construct a specified sound catalog of timbres, pitches, dynamics, and stereophonic elements. My presentation will consist of: (1) a taped realization of the composition; (2) an analysis of selected MIDI events employed and their cumulative musical effect; (3) a discussion of the compositional techniques involved; and (4) an overview of unique problems inherent in composing for the electronic medium alone.

**This project was supported by a 1999 Undergraduate Research Stipend.

Adventures in Set Theory: A Creative Approach to Music Set Theory Instruction

Karen Keagy
Dr. Warren Gooch, *Faculty Mentor*

Around 1950, musician and mathematician Allen Forte adapted certain principles of mathematical set theory to music, in order to provide analytical tools applicable to the study of atonal music. While the use of set theory provides tremendous benefits to musicians, it also appears intimidating and foreign to some musicians who are not used to dealing with their art in such terms. I have developed a workbook of creative games and activities to teach the general concepts of music set theory in an interesting, non-threatening manner. Current music curricula were investigated to help me devise a sequential order for workbook activities, and a visual art student assisted in preparing the layout and graphics for the workbook. The workbook was then tested on music students at Truman State and in the Kirksville community at large. My presentation will provide (1) A brief background on music set theory; (2) A discussion of the workbook;

and (3) A summary of the results gained from testing the effectiveness of the workbook on live subjects.

The Shift in Printmaking From a Utilitarian Process to a Fine Art Endeavor

Nancy L. Lamon
Dr. Sara Orel, *Faculty Mentor*

Until the end of the nineteenth century, artists in America did not view printmaking as a fine art medium. Instead, printmaking was used only for utilitarian purposes by printmakers who were not trained as artists. Eventually, however, artists in the United States began to realize the possibilities of using printmaking as a fine art tool. The 1876 Centennial International Exposition in Philadelphia caused this paradigm shift. The art gallery at the Exposition included American and foreign art. Seeing the innovative art from Europe at this exhibition forced Americans to reevaluate their definitions of fine art. The few American artists who had begun to use printmaking seized this opportunity to validate printmaking as an art form. They started etching clubs to have access to the presses, groups to hold exhibitions with, and fellow artists to offer artistic feedback. This period established printmaking as a fine art medium in the United States.

The Migration of Baroque and Rococo art from France to Prussia in the time of Frederick the Great

Christian J. Naffziger
Dr. Julia DeLancey, *Faculty Mentor*

How do artistic styles make their way from one country to another? The Late Baroque and Rococo of the eighteenth century contain examples of artistic migrations that we can study to answer this question. One area of art during this time period, the reign of Frederick the Great of Prussia, who ruled the beginnings of a unified German state during the middle part of the 1700's, is an excellent place to focus. Frederick the Great is known today as one of the most enlightened and successful leaders of modern Europe, and his love of French culture influenced many of his intellectual and artistic pursuits. This paper explores the way in which his Francophilia transferred into the hiring and introduction of French artists and styles into Prussia, as well as the various artistic decisions Frederick the Great made while commissioning his favorite palace, Sanssouci. By studying how Baroque and Rococo arts moved from France to Prussia, we can infer in general how these cultural transmissions occur elsewhere in Europe.

Nike Corporate Identity, 1975-1998

Travis Nichols
Dr. Julia De Lancey and Dr. Sara Orel, *Faculty Mentors*

The way that a company presents itself to the public is its corporate identity. Nike, Inc.'s corporate identity, with the Swoosh trademark at its center, is amongst the most widely recognized and evocative in the world. This research isolated and identified the factors that created such a strong corporate identity, using print advertisements as concrete evidence of Nike's intent. Every Nike advertisement in *Sports Illustrated* from 1975 to 1998 was documented, and advertisements which had significant importance to the development of Nike's corporate identity were analyzed in depth. This visual analysis of primary graphic design sources revealed the consistent themes of technology and performance, celebrity endorsement, heroic inspiration, environmental liberalism, design, and hardcore athleticism. These consistent themes are what created Nike's strong corporate identity, and allowed Nike to make a great impact on both popular American culture and American advertising.

Solo Cantata #189: *Meine Seele ruhmt und preist* (My soul glorifies and praises), by J. S. Bach (1685-1750)

Aaron G. Schiltz, tenor*
Juanita Becker, harpsichord; Elaine Boda, cello; Sheri Mattson, oboe; Julianna Moore, flute; and Jennifer Floyd, violin
Dr. Thomas Hueber, *Faculty Mentor*

Paraphrase of translated text:
Mvmt 1) Aria: My soul glorifies and praises you God. My spirit, heart and mind rejoice. I must proclaim all the wondrous things you have done for me.
Mvmt 2) Recitative: I need a thousand tongues to fully protray how good you are. Let your praises be sung!
Mvmt 3) Aria: God has placed himself on high and looks down upon us. He has raised me from my lowliness.
Mvmt 4) Recitative: What great things I find all about me. Through his graciousness he has blessed me.
Mvmt 5) Aria: Your kindness and compassion endure forever, oh God! You show mercy to the humble.

Impressionism: Origins, Ideas, and Application**

David Seabaugh
Dr. Warren Gooch, *Faculty Mentor*

One way to test one's comprehension of an artistic style would be to produce an original creative artifact which idiomatically incorporates that style. My research has involved interdisciplinary study of the relationships extant between musical and artistic impressionism and poetic symbolism. *Impressionism: Sunrise* is a woodwind duet that serves as the culmination of this study. This musical piece blends impressionistic techniques with my own individual compositional style. The work is in four movements, each depicting an aspect of sunrise. "First Light" represents the changing of black night into hazy, gray images. "Pastel Illusions" introduces beams of pastel light. "Crimson-Soaked Horizon" illustrates beautiful colors viewed in the clouds before the sun rises. "Ascension" follows the sun from the moment it breaks the horizon to the white light of day. A discussion of the musical techniques employed in this work will follow a performance of the composition.

**This project was supported by a 1999 Undergraduate Research Stipend.

Human Potential & Performance

Why Must We See "Must See T.V."?

Ellen Axmear, Maggie Grady, Tenishia Milligan, Kirsten Moder, Erica Poeschel, Amy Voiles, and Carla Youngdahl
Dr. Paula Cochran, *Faculty Mentor*

The purpose of this pilot project was to examine the degree to which previous knowledge influences viewer perception of humor in a television situation comedy. Two familiar and six novice viewers of the situation comedy "Friends" used a software program to code humorous events. It is hypothesized that regular viewers will perceive more humor due to familiarity with the show. In addition, this undergraduate/graduate student research team wanted to gain experience with new event-analysis software. Dyalog (Parrot) allows for easy timing of events or communication acts within a pre-determined interval. For example, it would be possible to use Dyalog to time the instances of stuttering in a five minute conversation. Dyalog tracks both duration and frequency of target events or behaviors. Coding is accomplished by a researcher observing in real time or observing previously recorded tape.

Faculty Attitudes Toward Male Division II Student-Athletes

Chris Baucom
Dr. Christopher D. Lantz, *Faculty Mentor*

The purpose of this study was to examine faculty attitudes and stereotypes of athletes at an NCAA Division II school. The entire (N = 409) faculty of a highly selective Midwestern university with a NCAA Division II athletic program were mailed the Revised Situational Attitudes Scale (SAS) with 119 (27%) returning usable instruments. A 3 x 10 (form by situation) MANOVA revealed a significant main effect for athletic status (Wilks' lambda = .495, $p<.001$). Follow-up univariate ANOVAs indicated that faculty harbor negative, prejudicial attitudes towards both revenue and non-revenue athletes in the areas of class achievement, admission to the university, reception of full scholarships, and expanded tutoring services.

A Qualitative Analysis of Student Perceptions of Effective Professorial Instruction

Lindsay Benson
Pete Schroeder and Chris Lantz, *Faculty Mentors*

Prater et. al. (1995) suggested that certain characteristics of students' professors make learning more effective and enjoyable. Recent research by Benson (1999) identified several of these behaviors including using humor, showing respect for students, and being concerned about student well-being. The purpose of the current study was to expand on Benson's previous methodological approach by employing a qualitative design. Students (n = 10) were selected from a list of all Exercise Science majors of at least junior standing to participate in an interview session. Students were asked several open-ended questions regarding their perceptions of effective professor instruction. A qualitative analysis (Goetz & LeCompte, 1985) revealed that student's perceptions of effective professorial behavior included demonstrating interest and excitement for the subject matter, providing real life examples, and demonstrating a sense of concern for the students. These data can be useful in helping faculty present course content in an effective manner and to assist in fostering positive student relations. Understanding Academic Motivation: A Test of the Theory of Planned Behavior

Components of Fastball Pitching Among College and High School Softball Pitchers**

Caroline Conley and Stephanie Summers
Dr. Michael Bird, *Faculty Mentor*

The goal of this research was to determine the variables affecting windmill pitching performance among high school and college pitchers. Twenty-three pitchers (10 college level and 13 high school level) participated. Four strikes from each player were analyzed using a Peak Performance Motion Analysis System. A principle component analysis statistically analyzed the chosen variables. The results indicated 57.6% of the variance was attributed to three separate components. The first component (26.6% of the variance) described velocity magnitude and timing. It was comprised of peak ball velocity, peak angular velocities of the shoulder and elbow, and sectional and somatic timing. The second component (16.4% of the variance) described arm coordination. It was comprised of the sequence and timing of the shoulder, elbow, and wrist velocities. The final component (14.6% of the variance) described somatic motion. It was comprised of vertical body displacement and horizontal body velocity. These results may provide the coach and pitcher with a better understanding of the factors important for success.

**This project was supported by a 1999 Undergraduate Research Stipend.

Nutritional Risks of Elderly Nursing Home Residents

Shannon Donald and Connie Wysocki
Dr. Ranjita Misra, *Faculty Mentor*

The purpose of this paper was to evaluate the nutritional risk among nursing home elders. Nutrition Screening Initiative Checklist (DETERMINE) was used to measure the participants' nutritional risk over a 5-year period. Information was elicited by personal interviews. Respondents were categorized into three groups: no nutritional risk, moderate nutritional risk, and high nutritional risk. Subjects consisted of 275 nursing home elders in Adair County, Missouri. Mean age was 83.26 years. The majority of elders were females and Caucasians. Approximately 8.6% were underweight (Body Mass Index (BMI) < 19) and 40.2% overweight (BMI > 25). The results showed a significant difference in the nutritional risk by the respondent's BMI (F-value = 9.52, $p<0.001$). Respondent's who were overweight or obese had higher nutritional risk compared to those who were underweight or in the normal range. Nutritional risk did not vary by gender or show any particular trend over the five years studied.

Physiologic Performance Profile of Female Collegiate Cheerleaders

Sara Fincham
Dr. James Padfield, *Faculty Mentor*

Cheerleading is receiving increasing recognition as an athletic activity. To investigate the athletic characteristics of collegiate cheerleading, we tested 7 female collegiate cheerleaders in the percentage of body fat, the maximal aerobic capacity (bicycle ergometer), hamstring flexibility (sit and reach test), maximal anaerobic power (Wingate), and maximal explosive power (jump height). Average percentage of body fat was 22.6%, average maximal aerobic capacity was 34.3 ml/kg/min, average hamstring flexibility was 24 inches past heel level, maximal anaerobic power was 339 W, and maximal explosive power was 795 W. All of these values compared favorably with the average college-age female with the exception of flexibility, which was markedly higher than average. These data seem to suggest that cheerleading requires a certain degree of physical fitness, but high-level success in the sport may have a greater relationship to skill development.

The Relationship Between the Margaria-Kalamen Power Test and a 20-Second Anaerobic Step Test

Emily Fridlington and Julie Fridlington
Larry Boleach and Dr. Jerry Mayhew,
Faculty Mentors

The purpose of this study was to determine the relationship between the Margaria-Kalamen Power Test and the 20-Second Anaerobic Step Test. Twenty-six college males and 33 college females were tested on the Margaria-Kalamen Power Test and a 20-Second Anaerobic Step Test. The best time of the 3 trials of the Margaria-Kalamen Power Test was recorded to the nearest 0.01 second for analysis. Power was computed by the equation: weight (kg) x vertical distance (1.02m)/ time seconds. The 20-Second Anaerobic Step Test involved1 trial of 20 seconds of stepping up and down on a bleacher 39cm high. The number of repetitions was recorded for analysis. A Pearson's Correlation Coefficient revealed an r of 0.356 which was significant at .006. However, the 20-Second Anaerobic Step Test was considered to be an unacceptable substitute for the Margaria-Kalamen Power Test because it failed to meet the predetermined criteria of r=0.60.

The Effect of Residence, Gender and Academic Major on the Dietary Practices of Truman State University Students

Kristi Goldsmith, Heather Rasmussen and Tanya Starkovich
Dr. Jerry Mayhew, *Faculty Mentor*

College students are notorious for skipping meals, making poor food choices, and dieting excessively. Nutritionists are concerned that college students may not be consuming adequate amounts of nutrients and calories essential to their health. This study assessed the effects of student residence, gender, and academic major on food choices and dietary practices of students at Truman State University. Two hundred and eighty-eight volunteers (90 M, 198 F) completed a fifteen item diet survey that assessed food choices, dietary practices, and exercise patterns. A gender by residence by major (2x2x2) MANOVA was used to evaluate the data ($p>0.05$). The results suggest that on-campus students consumed significantly more fruits, vegetables, and meats and ate breakfast more often. Off-campus students consumed significantly more alcohol and ate at fast food restaurants more frequently. Males ate significantly more meats and dairy products than females. Health and Exercise Science majors exercised significantly more often than other majors, ate less often at fast food restaurants, and ate breakfast more often than other majors. The current results are in harmony with previous research.

Effect of Altitude Upon Maximal Aerobic Power and Fine-Motor Coordination**

Jamie Hassler and Edward Sutton
Dr. James Padfield, *Faculty Mentor*

Fatigue and exposure to altitude have been shown to have independent, detrimental effects upon rifle marksmanship. To investigate the effect of exercise and altitude upon other measures of fine motor coordination, eight subjects acclimatized to low altitudes performed a standardized maximal exercise test on a bicycle ergometer at both 3700 m and 300 m elevations. In addition, each subject was tested for fine motor performance in both resting and post-exercise trials using a randomized cross-over design. Maximum performance on the bicycle ergometer declined 26% at altitude. Fine motor performance (speed at performing a complex, fine-motor task) declined 17% at altitude, and 10% following exercise. Data were analyzed using a repeated measures analysis of variance. The results of this study indicate that altitude ($p<.01$) and fatigue ($p<.05$) had significant independent, negative effects upon fine motor performance, and that altitude had a significant ($p<.01$) negative effect upon aerobic performance.

**This project was supported by a 1999 Undergraduate Research Stipend.

Understanding Acdemic Motivation: A Test of the Theory of Planned Behavior

Christina Hunter
Dr. Christopher Lantz, *Faculty Mentor*

The Theory of Planned Behavior posits that attitude (ATT), social norm (SN) and perceived behavioral control (PBC) serve to influence behavioral intention. Behavioral intention (BI) is then seen as a direct predictor of actual behavior. This study examines the validity of the Theory of Planned Behavior to predict academic performance. Phase One of the project included item development and modification. Confirmatory factor analyses and internal consistencies were used to determine item retention, deletion, or modification, and overall model fit. In addition, a new factor, Global Academic Experience, was created. Phase Two involved 112 undergraduate Exercise Science majors from three separate upper-level courses during the Fall, 1999 semester. Participants completed the items representing ATT, SN, PBC, and BI while actual behavior was determined by obtaining their course averages at the conclusion of the semester. Path analysis indicated an acceptable model fit with SN being the strongest indicator or BI and academic performance. ATT was shown to have almost no predictive value relative to BI and BI was shown to be negatively related to academic performance.

Impact of Institutional Variables on Student-Athlete Graduation Rates at NCAA Division I and II Institutions

Amy Jennemann, Michelle Rackers* and Carl Swenson*
Pete Schroeder, *Faculty Mentor*

The purpose of this project was to determine how four institutional variables impact student-athlete graduation rates at NCAA scholarship institutions.

The factors examined were institutional size, division (I or II), selectivity, and control (private vs. public). Data was collected from three sources. Graduation rates and division for 512 NCAA institutions were obtained from 1998 NCAA Graduation Rates Report. Size, control, and selectivity were obtained from *US News and World Report*'s website. Information unavailable on that website was garnered from the individual institution's website. A 9 (size category) x 2 (division) x 5 (selectivity) x 2 (institutional control) factorial ANOVA was used to analyze the effects of the institutional variables on graduation rates. Preliminary results indicate that all four variables combined to have a significant effect on student-athlete graduation rates. Several interactions and two main effects also emerged. Results will be discussed with respect to previous literature concerning student-athlete graduation.

Hand Washing Techniques Among Elementary Students

Christy Jensen and Maria Godefroid
Dr. Beverly Tremain, *Faculty Mentor*

The aim of this proposed research was to determine the effectiveness of teaching handwashing to elementary children. The purpose was to evaluate the knowledge and skill level of first grade students regarding handwashing. The research design involves Experimental, Comparison, and Control Groups. All groups were pre- and post-tested on knowledge of handwashing and handwashing skills. The Experimental Group watched a video and received a handwashing curriculum. The Comparison Group received only the video, while the Control Group received no intervention. Results indicated that no two groups were significantly different in their knowledge or handwashing scores at pretest ($p > .05$). The posttest results indicated significant differences between all groups on knowledge ($p = .001$) and skill ($p = .001$). Mean ranks for knowledge and skill scores were higher for the Experimental Group when compared to the Comparison and Control Groups at posttest.

An Investigation of Electromyographic Muscle Activity on Two Variations of the Lat-Pulldown Movement.* *

Chad Kerksick*, Julie Fridlington and Emily Fridlington
Michael Bird, *Faculty Mentor*

This study investigated the differences in muscle activity between two variations of the lat-pulldown movement. Thirty-four subjects (17M, 17F) participated. All subjects were experienced weightlifters with a minimum of three months experience. During the first test session each subject's 1-RM for the lat-pulldown movement was recorded in addition to descriptive data. During the second test session, approximately one week later, all subjects performed five repetitions using the lat pulldown behind their head and five repetitions in front of their head using 80% of their 1-RM. Data was measured with Coulbourn Instruments Bioamplifiers and DATAPAC software. All data was quantitatively analyzed for how long the muscle was active during the repetitions. Independent t-tests revealed that there was no significant difference between the two styles of lat-pulldown ($t = -1.680$, $p>0.05$) for all muscles tested. It should also be noted that for each individual muscle there was no significant difference in muscle activation time: Lattisimus dorsi ($t = -0.804$, $p>0.05$), posterior deltoid ($t = -1.375$, $p>0.05$), pectoralis major ($t = -1.956$, $p>0.05$). More conclusive data collection will determine how the front and rear lift variations affect muscle activity levels.

**This project was supported by a 1999 Undergraduate Research Stipend.

Contributing Factors To A Newborn's Birth Weight

Rebecca Light
Dr. Ranjita Misra, *Faculty Mentor*

The purpose of this paper was to determine (a) contributing factors to the birth weight of a newborn baby and (b) identify factors that are circumstantial and hence controlled or modified. Babies born with a low birth weight are typically born pre-term, promoting further complications and difficulties. The data for this study was the Pregnancy Nutrition Surveillance System in Missouri obtained from the Center for Disease Control. The sample consisted of 3500 pregnant women mostly between 20 to 29 years of age, unmarried, and with a high school level of education. Twenty seven percent smoked and 5% indicated they consumed alcohol during the last 3 months of their pregnancy. Results indicated incidence of previous pregnancy, mother's age, gestational age of baby, educational level of mother, and substance usage had a significant influence on the birth weight of the baby. Only marital status seems to have no effect. Many of these factors that influence the birth weight of a newborn are environmental and hence the mother has control over them. The results will help health professionals to educate and advice patients more suitably.

Effects of Exercise Order in Females upon Aerobic Capacity, Caloric Expenditure, and Respiratory Exchange Ratio

Meaghan Malloy,* Michelle Rackers* and Katie Quante
Dr. Jerry Mayhew, Faculty Mentor

The result of previous research has shown no significant difference in caloric measurements and fat oxidation when investigating the order of exercise (Egan & Head 1999). The objective of this study was to determine how changes in the order of exercise affects aerobic capacity and subsequent caloric measurements. Seven moderately trained college females who were of average age (20.1 years) and weight (125.4 pounds) participated in two trials, each with a different preliminary exercise. The first trial began with 20-minutes of resistance training as the preliminary exercise followed by a 20-minute aerobic run. The next trial's preliminary exercise began with a 20-minute aerobic run followed be a second 20-minute aerobic run. During the second aerobic run in both trials VO_2, VO_2 ml/kg, respiratory exchange ratio (RER), and calories expended (Kcal) were measured using a Sensor Medics 2900 metabolic cart. A paired t-test (>.05) indicated no significant difference between trials in the variables VO_2 ($t= -1.04$), VO_2 ml/kg ($t= -.46$), RER ($t= -1.47$), and Kcal ($t= -1.01$), whether using an aerobic run or resistance training as the preliminary exercise. These results indicate no significant difference in any of the variables tested, and are consistent with previous research.

Effect of Long-Term Creatine Supplementation on Liver and Kidney Function in College Football Players* *

David L. Mayhew and Thomas F. Satterly III
John S. Ware and Dr. Jerry L. Mayhew, *Faculty Mentors*

Anecdotal information has speculated that long-term ingestion of a creatine (Cr) supplement may result in kidney and liver damage. Limited laboratory data are available to support or refute those speculations. The purpose of this study was to determine the effect of long-term Cr supplementation on blood parameters reflecting liver and kidney function. Twenty-three college football players (ages = 19-24 yrs) with at least two years of strength training

experience had a venous blood sample taken at the end of their summer conditioning program. Subjects were divided into a Cr monohydrate group (CrM, n = 10) and a control group (CON, n = 13) who took no supplements. The CrM subjects had been on regular supplementation for 8 months to 4 years in daily doses of 5-20 g. Analysis for albumin, alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase, bilirubin, urea, and creatine produced no significant differences between the groups, and all values were within normal clinical limits. Therefore, it appears that oral supplementation with CrM has no long-term detrimental effects on kidney or liver functions in highly trained, well-hydrated college athletes.

**This project was supported by a 1999 Undergraduate Research Stipend.

Effect of Body Mass Index and Prior Exercise Upon Metabolic Rate During Repeated Cold Water Immersion**

Sabra Meyer and Jeff Klee
Dr. James Padfield, *Faculty Mentor*

Subjects with a standard body mass index (BMI) participated in two randomized testing sessions, wherein subjects were immersed to their collarbones in 16˚C water for three repeated trials of 15 minutes each. One testing session was preceded by 90 minutes of exercise at 80% to 90% of age-predicted maximum heart rate. There was no significant difference in oxygen consumption between the exercising and non-exercising sessions. Additional subjects were recruited for high BMI (31.23, std 1.45) and low BMI (19.62, std 0.61) groups, with 5 males and 5 females in each group. There was no significant difference in oxygen consumption between the two groups during the resting period or the first cold water immersion. Significant differences were found ($p<0.001$) between groups for the second and third immersions, with low BMI 10.93 ml/kg/min (std 2.22) and high BMI 5.16 ml/kg/min (std 2.22) by the end of the third trial. These data indicate that low BMI subjects had to expend more energy to maintain body temperature in a cold environment, and that relative energy expenditure for low BMI subjects increased with the degree of exposure.

**This project was supported by a 1999 Undergraduate Research Stipend.

Can African-American College Students Code-Switch?**

Teneshia Milligan
Dr. Janet Gooch, *Faculty Mentor*

Previous research has indicated that African-American Vernacular English (AAVE) may be viewed negatively by members of academia, particularly by non-African-American students and faculty members. This study examined the ability of African-American students at Truman State University to switch from African-American Vernacular English (AAVE) to Standard American English (SAE), an ability termed "code-switching" in the scientific literature. Two, fifteen-minute audio recorded interviews were conducted with 20 students. During the “formal” interview, each subject was told to speak using his or her best possible English. During the “informal” interview, subjects were instructed to talk casually. Results revealed no significant code switching between formal and informal interviews. However, a highly significant condition by order interaction was found, indicating that significantly fewer AAVE features were used when the formal interview was conducted first.

**This project was supported by a 1999 Undergraduate Research Stipend.

Factors Influencing the Prediction of 40 Yard Dash Times in Adolescent Athletes

Mandee Mitchell
Dr. Michael Bird and Dr. Jerry Mayhew, *Faculty Mentors*

Popular practice advocates the use of the 40 yard dash as a measure of speed and athletic ability. However, little literature exists emphasizing the need for a full 40 yard dash to determine an athlete's performance. The purpose of this study was to determine the predictability of 40 yard dash times from 10, 20, and 30 yard dash times, as well as to determine factors influencing the prediction of 40 yard dash times in adolescent sprinters. 168 subjects (102 M, 66 F; mean age 15.28) ran two trials each of a 40 yard dash. Times were recorded with timing lights at 10, 20, 30, and 40 yards. Linear regression was used to obtain a prediction equation for 40 yard dash times using age, gender, weight, height and 10, 20, and 30 yard dash scores. Weight was not an influential factor for predicting sprint times and was thus eliminated from the equation. The resulting equation using the 20 yard dash time accurately predicted 40 yard sprint times within 0.10 seconds (R=.98), while the equation using the 30 yard dash predicted within 0.05 seconds (R=.99). In conclusion, a full 40 yard dash may not be necessary when attempting to determine speed, since it can be predicted from the time of shorter distance runs.

Gender and Repetition Maximum Load as Factors in the Prediction of 1-RM Bench Press.

Amber Otte and Lynae Borter
Jack C. Bowen, John S. Ware and Dr. Jerry.L. Mayhew, *Faculty Mentors*

The purpose of this study was to determine the influence of gender and repetition maximum load (RM) on the accuracy of predicting one-repetition maximum (1-RM) bench press. College men (n=171) and women (n=96) were tested for 1-RM bench press and repetitions-to-fatigue at the conclusion of a six-week resistance training program. Both genders were divided into three RM groups (3-5-RM, 5-7-RM, and 7-10-RM) and regression equations for each gender and group produced accurate estimates of 1-RM ($r>0.94$, SEE<5.3 kg). Only the slope of the 7-10-RM regression line for men was significantly different from the other equation slopes. When the genders were combined, however, only the 7-10-RM load did not include a gender factor in the prediction equation. Thus, it appears that the 7-10-RM load can be used to accurately predict 1-RM bench press performance in either gender from the following equation: 1-RM(kg) = 1.28 7-10-RM(kg)-2.8 (R=0.99, SEE=4.1 kg)

Athletic Identity as a Moderator of the Body Image Disturbance - Eating Disorder Relationship

Amanda Wherry* and Christina Hunter
Dr. Christopher D. Lantz, *Faculty Mentor*

The purpose of this study was to determine the influence of external (social physique anxiety) and internal (body cathexis) conceptions of body image on the existence of disordered

eating behaviors. In addition, the role of athletic identity as a precipitating influence on body image was explored. Four hundred forty undergraduates from the Lifetime Health and Fitness course completed the Athletic Identity Measurement Scale (AIMS), Social Physique Anxiety Scale (SPAS), Body Cathexis Scale (BCS), and the Eating Attitudes Test (EAT). Path analysis revealed an acceptable model fit (cfi = 1.00, SRMR = .01, RMSEA = .01) with athletic identity being negatively related to SPA and BCS, with SPA being the strongest indicator of EAT. These results indicate that athletic identity may serve to influence both internal and external body image orientations and may, in turn, influence disordered eating behaviors.

Language & Literature

Coleridge, Conrad, and Campbell: Treatments of the Hero's Journey

Jeff Baum
Dr. Patricia Gately, *Faculty Mentor*

Two influential Western literary works of the Romantic and Modern eras are, respectively, Samuel Taylor Coleridge's narrative poem *The Rime of the Ancient Mariner* (1798) and Joseph Conrad's short novel (1899) H*eart of Darkness*. Despite differences of historical context and theme, these works are conspicuously similar. Both are about solitary figures who unwittingly embark on journeys into uncharted realms, and whose experience provides them with profound psychological and moral insight valuable to their cultures. Structurally, both stories parallel the hero's mythic journey described by Joseph Campbell in his work, *The Hero of a Thousand Faces* (1949). Campbell's paradigm provides a model for new readings of both works, in particular as the protagonists cross the threshold of common experience into obscure underworlds from which they will be reborn and return to renew their societies.

Wright Isn't Entirely Wrong

Lisa Berna
Dr. Alanna Preussner, *Faculty Mentor*

American architect Frank Lloyd Wright's critically acclaimed Fallingwater today is suffering from structural problems and rapid deterioration, which many blame on the architect. Critics often accuse Wright of taking too many structural risks, thus compromising the integrity of a high-quality lasting creation. I will present a compilation of research that supports the argument that structural deterioration at Fallingwater is not solely the fault of the architect's design but rather the conditions of the area, in conjunction with inexperienced builders and a demanding construction material. Based on published findings, the argument will be substantiated that these structural faults of the famous house should not take away from the overall achievement of Fallingwater as a revolutionary structure at its time in early twentieth century architectural history.

The Consequences Of Taking Art Out Of Context: William Blake's Songs

Ben Braun*
Dr. Alanna Preussner, *Faculty Mentor*

Art should be experienced in the context the artist intended. By removing elements of a work of art from the greater work and analyzing those elements alone without their intended context, important points of interpretation can and will be lost. The proof of this statement is provided via an analysis William Blake's poems. In Blake's method of poetry production, each poem was accompanied by a significant amount of illustration. The illustrations are intricately related to the individual poems. By studying the meaning of Blake's poetry from his text alone, without illustrations, there are many important facets of interpretation that can be missed. The presentation demonstrates how this ignorance of context has impacted interpretation in the past.

Comi-tragedy or Tragi-comedy?: The Importance of Platonism in Thomas Hardy's *The Well-Beloved***

Shalyn Claggett
Dr. Robert Mielke, *Faculty Mentor*

In a letter to George Douglas, Thomas Hardy defined his final published work of prose, *The Well-Beloved,* as "a fanciful, tragi-comic half allegorical tale of a poor Visionary pursuing a Vision." What is perplexing for any reader of the romance, however, is how such a tale can be defined as a "tragi-comedy." The genre has only one defining element: it must tend toward misfortune, but end happily. This structure hardly seems congruent with the plotline of *The Well-Beloved*, which progresses as a light romance, only to end in (apparent) misfortune. This does not, however, necessarily mean that *The Well-Beloved* must be re-defined as a "comi-tragedy." Hardy explains in the 1897 preface that the story is "by no means new to Platonic philosophers." If we view this work with an astute Platonic eye, the reasoning behind Hardy's choice genre definition becomes quite clear.

**This project was supported by a 1999 Undergraduate Research Stipend.

Nursing Homes and Interpersonal Communication

Jennifer Crow* and Shelby Twenter
Dr. Wenshan Jia, *Faculty Mentor*

American culture has traditionally shunned nursing homes for the elderly as being a detriment to the communication skills and to the general well being of their residents. Six residents of a local nursing home were observed once per week, at meal times, over a six-week period. Residents were selected as to

reflect varied lengths of time spent in the care center, as well as varied amounts of contact with family. Further, the staff of the home was surveyed on the attitudes and activities of the residents in question. It was found that the biggest contributor, in this case, to a deterioration of interpersonal communication skills was not the atmosphere of the nursing home itself, but a lack of contact with family.

Reading Sympathy: Juno's Wall in Carthage

Matthew Crutchfield
Dr. Bridget Thomas, *Faculty Mentor*

A critical point in interpreting Vergil's epic, the Aeneid, is the passage in which Aeneas encounters in Juno's temple the wall that portrays the events of the Trojan War. This passage not only provides a vehicle for Vergil to describe the Trojan War, but it also establishes the reader's sympathy towards Aeneas. The language used in this passage simultaneously emphasizes Aeneas' hopelessness created by his past experiences and the possibility of hope in Aeneas' future. This passage occurring in the first book is critical in determining how the reader will react to this new hero throughout the epic. Vergil's beautiful use of ecphrasis to narrate the events of the Aeneid creates a sympathetic mood toward Aeneas.

Taxonomy of the Cinema of Transgression**

Jennifer Davis
Dr. Bob Mielke, *Faculty Mentor*

I will be presenting the results of my research on the classification of transgressive cinema. The presentation will focus on how a transgressive aesthetic was defined (in terms of film form, content, and movements) using film theories ranging from Andrew Sarris's taxonomy of classical American cinema to Jack Sargeant's examination of the 1980's underground film movement. I will present the general classification system which resulted from the research – a system shaped using classical film taxonomies in combination with the *Diagnostic and Statistical Manual of Mental Disorders*. In addition, my presentation will provide examples of how specific films and directors are classified using the system – examples which will be taken from the syllabus of the ENG 401 *Undergraduate Readings: Transgressive Cinema* course offered fall of 1999. Also, I will be presenting examples of the critical sources and approaches that are essential to understanding the cinema of transgression. The presentation will cover the roots of transgressive cinema and how that cinema has evolved.

**This research was supported by a 1999 Undergraduate Research Stipend.

"American Foundations" and Artistic Reinscription

Sarah Dennis
Dr. Bob Mielke, *Faculty Mentor*

Each historical period necessitates the creation of a unique set of institutions to respond to the social and political needs of its population. The cultural environment of the time surfaces through the examination of these institutions, none of which prove more fluent in communicating this environment than art. Skylab by Minicam, a painting by Roger Brown, *Letters: a novel* by John Barth, and Four North American Ballads by Frederic Rzewski allow for a remarkable amount of audience interaction with the art, most notably through their use of older, socially identifiable forms. Yet each work also considers the affects of postmodernism and its affects on the whole of society.

The Need for a New Approach to Parody Rulings

Michelle Dierkes
Dr. Karon Speckman, *Faculty Mentor*

This study examines court cases involving true parodies and so-called parodies to establish why prohibiting so-called parodies is necessary and does not limit First Amendment rights and concludes with a new standard judges should follow when determining whether a parody has redeeming social value. Parodies have permeated our culture through television programs, literature, and political cartoons. Although meant to be humorous comments on important issues, sometimes parodies go too far and become personal attacks or cruel, crude jokes with no artistic, political, social or cultural value. When the creators of these so-called parodies are sued for libel, intentional infliction of emotional distress or invasion of privacy, judges tend not to rule against the creators for fear of limiting First Amendment rights for true parodies. A work should not be seen as a parody when it has no redeeming social value because this is the very definition of a parody.

The Importance of Juror Privacy Over Free Press

Leslie Dunn
Dr. Karon Speckman, *Faculty Mentor*

Based on an analysis of previous rulings, this study proposes a new model for the Supreme Court to follow in cases involving the First and Sixth Amendments and juror privacy. The war between the First and Sixth Amendments has raged for many decades. The media have continually been denied the right to freedom of the press in an effort to uphold a defendant's right to a fair trial. One of the battles of this war is between the right to privacy for jurors and the right to freedom of the press. The privacy of jurors supports the defendant's right to a fair trial by ensuring that other citizens will remain willing to sit on a jury to continue our judicial process. Many lower courts and the Supreme Court have ruled on this issue, but not everyone agrees on which right takes precedence. This study develops a new standard.

A Sociolinguistic Analysis of Public Health Discourse**

Ruthann Gagnon
Dr. Mary Shapiro, *Faculty Mentor*

This study is a sociolinguistic analysis of interactions between the workers with a non-profit health organization and the public they served in Guanajuato, Mexico, applying Brown and Levinson's (1987) Politeness Theory. Examples of failed communication not just due to lack of fluency in Spanish, but directly attributable to lack of contextual social information, and specifically ignorance of local politeness conventions, demonstrate that volunteers are not adequately equipped to evaluate the face-threat involved in certain messages, particularly those regarding money, immigration and gender roles. The analysis is based on my transcribed daily field notes as Assistant Project Director of Amigos de las Americas. The study points towards needed improvements in the organization's training procedures, providing volunteers with the social background to evaluate face-threatening messages and for effective cross-sex communication. I have concluded it is not sufficient to be linguistically competent in public health situations; sociolinguistic proficiency is mandatory for project sustainability.

**This project was supported by a 1999 Undergraduate Research Stipend.

A Critical Inquiry into Interpersonal Communication: How and Why Arguments occur in Intimate Relationships

Jennifer Happel,* Jessica Cinco and Tricia Boyle
Dr. Wenshan Jia, *Faculty Mentor*

Conflict is bound to be present in any type of relationship. The study looks at the possible cause of conflict, arguments. The objective of the inquiry was to see if differences in men and women's language and attitudes effect arguments in intimate relationships. Three heterosexual African Americans and three heterosexual Caucasian couples, ages ranging from 20-30, were given surveys with three different examples of an argument. The three types of arguments used were blaming, accusing, and resenting. The couples answered questions on the examples. Dehorah Tannen's research has found that in general women shy away from conflict in social settings. The present study found that women initiated more arguments than men in intimate relationships.

The Right to Defy the Law

Andrea Hein
Dr. Karon Speckman, *Faculty Mentor*

The purpose of this study was to explore the Collateral Bar Rule as applied to the mass media. The Collateral Bar Rule states that anyone violating a court order, even though it is later ruled unconstitutional, can be held in contempt of court. Knowledge of the history of the Rule and its evolution through the courts is necessary to understand why the courts have upheld and continue to uphold the Rule. The faults with the rationale behind the Rule also will be examined. A further synthesis of numerous court cases will be presented to argue the need for the elimination of the Collateral Bar Rule and to explore the positive aspects of the Rule's eradication when the press is serving to inform the public.

Former East German Women in Reunified Germany**

Lindsey Hewitt
Dr. Reuben Peterson, *Faculty Mentor*

Twelve women from the former East Germany responded to questionnaires asking about their lives since reunification and the changes they have experienced. Many related problems finding employment, finding child-care, and adjusting to their new society. After reunification, former East Germans often had difficulty identifying with former West Germans. Many former East Germans view Western women as lazy and rich, and yet may also feel inferior due to the (perceived) greater sophistication and knowledge of women from the former West Germany. Even though the great freedoms gained since the reunification of Germany have added new dimensions of joy to the lives of former East German women, problems in employment, family, and social roles have also added new degrees of sadness.

**This project was supported by a 1999 Undergraduate Research Stipend.

Should Hate Speech Codes Be Allowed on College Campuses?

Rebecca Howard
Dr. Karon Speckman, *Faculty Mentor*

This study examined court cases and showed that although hate speech is hateful and offensive, it must remain protected under the First Amendment. In recent years, many American colleges and universities have implemented hate speech codes in response to the increase of "bias incidents" occurring on their campuses. These codes are designed to ban speech that discriminates on the basis of race, ethnicity, gender, religion, sexual orientation and other such characteristics. However, the Supreme Court has traditionally upheld the notion that speech cannot be censored solely on the basis that it is offensive or repulsive. Courts have ruled that hate speech codes must be narrowly tailored, otherwise, they violate First Amendment rights by prohibiting protected speech. With hate speech codes, administrators impede the flow of ideas, a necessary element of the university system.

Sketches of the Queen: Characterization of Juno in Vergil's *Aeneid*

Jennifer Ice
Dr. Bridget Thomas, *Faculty Mentor*

Characterization of popular gods, goddesses, and mortals is quite varied in ancient Greek and Latin literature; more often than not, there is no universal characterization of any one character. Indeed the wide range of characterization is best illustrated in Vergil's *Aeneid*, for when one compares Vergil's Juno to Homer's Hera in the *Iliad*, one sees that Vergil has selectively borrowed elements of Homer's characterization of the goddess in order to create a uniquely different queen. While his predecessor portrayed Hera as a passive character described with such epithets as "white-armed" and "ox-eyed," Vergil describes his queen with active adjectives including "savage" and associates her with words denoting anger and resentment. I argue for the importance of this difference in Vergil's new characterization of the queen, specifically by examining Juno's relationships with Dido, Aeneas, Jupiter, and Aeolus; in doing so, I argue that like other ancient writers, Vergil's alteration of the Homeric queen is perhaps a result of the oral tradition.

Dictionary of the Old Spanish Language Project: *Agricultura de jardines***

Amanda Kliefoth

Dr. Tom Capuano, *Faculty Mentor*

The Dictionary of the Old Spanish Language Project is a collaborative work in which Truman is involved in the agricultural branch. In order to identify words that were used in Old Spanish, but that are not recognized today, medieval works are analyzed. A transcription of *Agricultura de jardines* by Gregorio de los Ríos was first completed. Following the transcription was a thorough analysis of the format of the text. Further research was conducted on the text in regard to the author's word choice and how that indicated his target audience. This consisted of an etymological study of the plant names used with the *Diccionario crítico etimológico de la lengua castellana y española* by Juan Corominas. It was observed that the majority of the words were derived from Latin, which demonstrated that the author used the more educated form of the words to appeal to a more educated and cultured class.

**This project was supported by a 1999 Undergraduate Research Stipend.

Understanding the Antagonist: How Vergilian Ambiguity Makes Us Feel About Turnus

Sean Larson
Dr. Bridget Thomas, *Faculty Mentor*

In recent years, scholars have noted a distinct ambiguity in the language of Vergil's *Aeneid*. This trend of opposing attributes compels careful consideration of Vergil's methods of characterization. There has been much

discussion already concerning Aeneas, so I am attending to the character of Turnus, Aeneas' main rival. Instead of depicting him in stark terms as an anti-Aeneas, I intend to argue that Vergil gives Turnus characteristics of both deserving foe and sympathetic victim. These conflicting attributes project both pity and contempt for the doomed antagonist. The choice of language that describes Turnus shows him not only as a typical obstacle to the epic hero, but also as a man caught in destiny. Vergil's deliberate ambiguity provides a more complex composition to Turnus' character, as attention to the language of the poem indicates.

Martin, Frank, and Frank: Neo-Romantics in the "Contemporary" Sense

Alice Lee
Dr. Robert Mielke, *Faculty Mentor*

The term "neo-romantic" is a starting point to examine the connections between the works of Mary Frank, Carl Martin, and Frank Zappa. In fact, none of them strictly adhere to the tenets of neo-romanticism. However, in a more liberal sense, they can be loosely grouped under this movement because they reinscribe myth, implementing highly expressive and unique styles, just as Shelley did with Prometheus Bound and other artists of the early 19th century. In his poem, *Minor Observances, Unnoticed Deaths*, Carl Martin uses myth as a construct of perception while Mary Frank, in *Untitled triptych*, hybridizes Christian archetypes with the primordial goddess. Frank Zappa's *N-Lite* satirizes myth, using emotions rather than lyrics to narrate the story.

Social and Economic Aspects of Sericulture in Late 16th Century New Spain**

Jeremy Loscheide
Dr. Thomas Capuano, *Faculty Mentor*

Silk production in colonial New Spain is a little explored but important subject in the development of Latin American history. The lack of publication upon this subject is especially surprising when one considers that the silk industry in New Spain developed methods of production that far exceeded those of mainland Europe for centuries. These methods of production, as well as the underlying philosophy, are outlined in the 1581 text *Arte nuevo para criar seda* by Gonçalo de las Casas. Through an in-depth study of the text in context with historical and social phenomena contemporary to publication of the text, and in comparison to similar sericultural texts of the era, the particular social and economic aspects of sericulture in New Spain come to light.

**This project was supported by a 1999 Undergraduate Research Stipend.

The Feminist Movement in Light of the Muted Group Theory

Gina Losito* and Keegan Henderson
Dr. Wenshan Jia, *Faculty Mentor*

The muted group theory is concerned with how power is used to silence certain groups of people. This study uses the theory in analyzing the feminist movement in the U.S. from a historical perspective. Even though women are less muted today, it is found that gender inequality still exists. It is concluded that the muted group theory still applies to women today. It is suggested that more efforts be made to empower women.

American Art, Literature, Music, and History of the 1850's

Lori Beth Meadows
Dr. Robert Mielke, *Faculty Mentor*

In what way most does *Home in the Woods* by Thomas Cole (1847), *Nature* by Ralph Waldo Emerson (1836) and *Night in the Tropics* by Louis Moreau Gottschalk (1859) reflect the relationship of man and nature? Investigative research into the interdisciplinary subjects reveals that each intricate piece illuminates the dynamic relationship during the American transcendentalist movement. Within this movement, one can understand the virtues of this man and nature by studying the biblical overtones, environmental references, and illustrations of self-reliance.

A Study and Semi-Paleographic Transcription of the Late Sixteenth Century Text: *Despertador, que trata de la gran fertilidad, riquezas, baratos, armas, y cavallos que España solia tener, y la causa de los daños y falta, con el remedio suficiente***

Stephanie Noll
Dr. Tom Capuano, *Faculty Mentor*

Despertador, que trata de la gran fertilidad, riquezas, baratos, armas, y cavallos que España solia tener, y la causa de los daños y falta, con el remedio suficiente by Juan Valverde de Arreta first appeared as an appendage to the 1598 edition of Alonso de Herrera's *Libro de Agricultura, que trata de la labranca, y crianca, y de muchas otras particularidades y provechos del campo*, a comprehensive manual on agriculture first published in 1513. This text possibly holds some of the first published incidences of certain Spanish agricultural terms, but has been previously electronically unavailable to the Spanish scholarly community. By semi-paleographically transcribing the text, it was made accessible in electronic form for the *Dictionary of the Old Spanish Language* project currently underway. Further study of the text revealed intense patriotism toward the land expressed in its characters' dialogue, especially through their allusions to other texts, adages, and folklore.

**This project was supported by a 1999 Undergraduate Research Stipend.

Ambivalence Towards the Veterans: Popular Culture's Affect on the Representation of the Vietnam Veteran in Film

Bhavini (Tina) Patel
Dr. Alanna Preusner, *Faculty Mentor*

Hollywood's representation of the Vietnam veteran has never enjoyed any form of constancy throughout the decades due to popular culture views. The period between the mid-1960s and the mid-1970s, as the war was still being waged, produced films that did not focus on the war but focused on the returning veteran. Throughout the late 1970s, the 1980s, and even into the early 1990s, Hollywood has never found a realistic representation of the soldier returning from the Vietnam War because of the changing ideology and culture of the times. Films such as *Welcome Home, Soldier Boys* (1972), *Coming Home* (1978), *Rambo: First Blood Part II* (1985), and *Born on the Fourth of July* (1990) paint varied pictures of the Vietnam veteran through the decades.

These images of the veterans were able to transcend the decades, though, in terms of a single commonality that was intertwined with the differences.

Cracking the Magic Kingdom

Joy Pfalzgraf
Dr. Alanna Preussner, *Faculty Mentor*

For years, the Walt Disney Company has been the target of rumors surrounding the question of hidden messages placed in their films. Although there is much skepticism about this topic, I believe recent Disney animated movies not only contain hidden messages which are sexual in nature, but also send subtle messages to society through their protrayal of women. I will use several sources of information to support my thesis. Some printed sources discussing this topic include newspaper articles, books, an anti-Disney company report, and two scholarly journal articles given to me by the authors themselves. I have found an extensive Internet site devoted to the myths surrounding Disney and the rationalization of these myths. I have also interviewed several professors at Truman State University who were able to give educated opinions about this topic.

An Athlete's Expectation of Privacy in the Locker Room: What Are Its Limits?

Chris Sauer
Dr. Karon Speckman, *Faculty Mentor*

This study examines whether athletes can expect the same degree of privacy in the locker room as in their homes. Instances in which the press have presumably overstepped privacy bounds occur quite often in the world of sports. One of the most highly publicized cases in sports occurred during the Major League Baseball home run race of 1998 when an Associated Press reporter found a bottle of a supplement drug in Mark McGwire's locker. The resulting article created a great controversy on whether the reporter invaded McGwire's privacy in the locker room. As a result of researching privacy cases, this study concluded that athletes should not expect full privacy rights in locker rooms; therefore, Mark McGwire would have had no grounds for an invasion of privacy suit.

Interpersonal Communication: Comparison Between Scandinavian, British, and American Cultures.

Ryan Swan and Heine Andersen
Dr. Wenshan Jia, *Faculty Mentor*

A lack of understanding of the differences in cultural communication styles can lead to a break down of communication process even among cultures within the west. College students from Scandinavia, Britain, and the US were surveyed regarding their observations of their own and that of the foreign cultures. Observations included use of personal space, speed of talk, relationship to communicator, and haptics. Our findings revealed differences in the desired space of interpersonal communication, and relationship to the communicator varies according to the communicator's cultural background. The British English language was found to have a stronger local flavor than that of in the US, which made the intercultural communication more difficult. Especially when the British are less willing to adapt to the American cultural due to their stronger sense of local identity. The survey also revealed that Scandinavians tend to keep communication on a literal level regardless of the language used.

Language Attitudes Toward Black English and its Use in the Classroom

Erin Wright
Dr. Mary Shapiro, *Faculty Mentor*

Black English has been a controversial and often misunderstood topic in recent years. In order to gauge local attitudes towards Black English and its use in the classroom, 267 members of the Kirksville community were surveyed. The subjects included students and faculty of Truman State University as well as other Kirksville residents. Subjects answered a variety of items designed to measure knowledge of and attitudes toward Black English, with special emphasis on its use in education. Based on information gleaned from previous research, minority subjects were expected to display more favorable attitudes towards Black English than white subjects, but little statistical difference in attitudes was found.

Science

Comparison of Methods for Amylose Screening Among ae Maize Starches from Exotic Backgrounds

Nurtay Abdubeck* and Brandy Fuller
Dr. Mark Campbell, *Faculty Mentor*

Breeding for high-amylose corn requires a rapid method for determining starch amylose so that generating chemistry values does not pose a major limitation in the volume of materials to be screened. Two recently described methods, one an iodine-based technique involving solubilizing ground whole corn in DMSO and one based on near-infrared transmittance spectroscopy (NITS) were compared to an older techniques known as the Williams' method. The NITS method showed poor correlation to the Williams' method ($r = 0.88$) however it did appear to discriminate corn having possessing the ae allele versus those having a normal or possibly segregating endosperm type. The DMSO-iodine method showed a much better correlation ($r = 0.92$) and appeared to better discriminate among samples having amylose values >65% from those near 55%. Finally, this study revealed that the exotic corn used in the study may be an important source of genes conditioning high amylose levels.

Evaluating the Interest Level of Local K-12 Teachers in Northeast Missouri for a Faculty Development Program in the Area of Plant Biology

Crystal Austin and Stephanie Mattull
Dr. Elisabeth Hooper and Dr. Dan Hite, *Faculty Mentors*

To evaluate interest for a development program between Truman State University science faculty and teachers of rural northeast Missouri, a survey was distributed to K-12 teachers to identify areas of interest in plant biology. The purpose of the survey was to determine whether a specific grade level or school district would be interested in participating in such a program. The survey data were used to determine areas of interest and teacher responsiveness in different school districts and at different age levels. In addition, to demonstrate the potential of such a program, an interactive teaching demonstration in the area of medicinal plant biology was developed and performed for K-12 students. Survey responses will assist in developing a faculty proposal to the Dwight D. Eisenhower Professional Development Program to establish such interactive learning programs. We will present the results of our survey as well as perform our interactive medicinal plant teaching demonstration.

Principal Component Analysis of Fatty Acids in Rhododendron Species in Bergen, Norway

Sarah M. Barnes, Joseph M. Chernich, Jodie Picart, Season Prewitt, and Kevin Punswick
Dr. Dean Van Galen, *Faculty Mentor*

Fatty acids constitute the key building blocks of lipids, a major class of molecules essential to membranes and energy storage. In this study, fatty acid distributions in leaves from three rhododendron species were determined. The three species, *Concinnum*, *Augustinii*, and their hybrid cross, were taken from the Botanical Garden of the University of Bergen, Norway. Fatty acids from leaves of these plants were esterified, extracted from hexane, and then separated and analyzed by gas chromatography (GC). From each chromatogram, eighteen GC peaks were compared by the statistical technique of principal component analysis (PCA). The PCA method successfully distinguished between fatty acid patterns for the three species, with the pattern in the hybrid being skewed towards *Concinnum*.

An Empirical Derivation of the Correction Term for the Length of a Pipe as Calculated by its Resonant Frequencies.

Kenneth Boyce
Dr. Michael Ottinger, *Faculty Mentor*

According to acoustical theory, an open-ended pipe has resonant frequencies given by f=(2n-1)V_s4L where V_s is the speed of sound, L is the length of the pipe and n is any integer from one to infinity. It has long been known, however, that the L in this equation is not the actual length of the pipe, but must have a correction term, Δ, added to it, and that Δ is approximately equal to the radius of the pipe. We set out to determine a more accurate approximation for Δ by measuring Δ as a function of the pipe length and resonant frequencies. We determined that Δ is equal to the radius of the pipe to a first order approximation, and will give the more accurate approximation in our presentation.

Parasitic Infections in a Small Teaching Collection of Herptiles

Christina Carr and Merina Foster
Dr. Donald A. Kangas, *Faculty Mentor*

At least seventy-five (75) species of reptiles and amphibians are maintained in the Science Division for teaching and demonstration in local primary and secondary schools. Abnormal and lethargic behavior of at least one of the lizards suggested that the animal was infected with a parasite. Potential infections were investigated by examination of fecal smears and sugar flotation methods. Permanent slides of parasites were prepared using trichrome staining techniques. Evidence of protistan parasites, platyhelminthes, nematoda and pentastomid infections were observed. Some animals did not have any parasites (or evidence of parasites) in their feces. Individuals with worm parasites were treated with vermicide and additional fecal samples were examined to document clearing of the parasites.

Determining the Value of Edible Oils as Herbicides

Mike Chen
Dr. Mark Campbell, *Faculty Mentor*

Oils have gained commercial use as weed killers around 1940. They act on contact and may be used either as selective or nonselective herbicides. Most oils used as herbicides are by-products of petroleum. For our experiment we will try to determine if normal vegetable oil could be used as a herbicides in place of petroleum-based oils. If successful, vegetable oils could replace petroleum oil which would be an environmentally friendlier alternative. For our experiment we will test the effects of vegetable oil on normal crops such as corn and peas. We will grow the crops for three weeks and then cover them thoroughly with vegetable oil. Our hypothesis is that the vegetable oil will cause substantial harm to the crops. We will measure the outcome by comparing the results of the crops given the oil treatment to control plants.

Antioxidant Enzyme Levels and Isozymes of Ascorbate Peroxidase and Gluta-thione Reductase Vary with Leaf Age and in Stem and Root of *Vicia faba* L.

Angela Coonley and Sara Schoomaker
Dr. Dan Hite, *Faculty Mentor*

Normal metabolism in plants produces reactive oxygen species, which breakdown biomolecules and can result in cell death. We have examined ascorbate peroxidase (APOX) and glutathione reductase (GR) activities in *Vicia faba* L. Located in the cytosol and chloroplasts, APOX and GR work together to reduce hydrogen peroxide, a reactive oxygen species, to water. We determined total activities and isozyme patterns for each enzyme in leaves at different developmental stages and in stem and root. We found that younger leaves had greater APOX and GR activities than mature leaves and that the isozyme pattern changed in the youngest leaf position. This increased total activity in younger leaves requires ascorbate, suggesting that isozymes may differ in stability. We have identified two isozymes of APOX, and

at least five isozymes of GR in leaves. When leaf, stem, and root were compared, differences in activity and isozyme patterns of APOX and GR were observed.

A Study of Coral Nutrition in a Closed Environment

Kimberly Cressman,* William Longmore and Leonard Sonnenschein
Dr. Nancy Sanders, *Faculty Mentor*

Coral nutrition is poorly understood. In an attempt to better maintain the 600-gallon coral reef tank at St. Louis Children's Aquarium, brown algae, green algae, and fish flake food homogenates were added, in separate trials, to the tank. The effects of these nutrients on four types of soft coral and five types of hard coral were assessed qualitatively through daily observations of the corals' visual appearance and quantitatively by soft-tissue volume measurements prior to, immediately after, and 24 hours after each treatment. Preliminary results indicate that certain feeding regimes can benefit coral health. Results also suggest possible pathways for future research on the nutrient uptake of captive corals.

Palatability of Sweet Feed, Strategy, Beet Pulp, and Beet Pulp with Molasses for Horses

Jennifer Crow,* Paul Pagano* and Michael Freiburg
Dr. Charlie Apter, *Faculty Mentor*

In order to determine the influence of molasses on feed palatability in horses, we tested the palatability of four types of horse feeds during a nine-week period using five Truman broodmares as test subjects. Feeds used in this study were sweet feed, Purina's Strategy, rehydrated beet pulp, and rehydrated beet pulp with molasses. Our hypothesis was that distinct palatability preferences between the feeds would exist in the following order: sweet feed (most preferred), Strategy, beet pulp with molasses, beet pulp (least preferred). Horses were presented with pairs of randomly selected feeds two-three times per week in stalls. Observations included the determination of which feed the horse ate first and how much of that feed it ate. Sweet feed was usually chosen first over any feed. Strategy was chosen over either form of beet pulp, and beet pulp with molasses was chosen over the plain form.

Localization of a Suppressor of *Segregation Distorter* on the X-chromosome of *Drosophila melanogaster*

James A. Cupples and Randi L. Culp
Janna McLean, *Faculty Mentor*

Segregation Distorter (SD) genes disrupt normal Mendelian genotypic ratios of progeny in *Drosophila melanogaster*. Disruption depends on the *Responder* allele present. A chromosome bearing the *Responder super sensitive* (Rsp^{ss}) allele is not transmitted in an *SD* fly, but one bearing the Responder insensitive (Rspi) allele is. We have discovered a suppressor of *SD* that is present on the X-chromosome. Recombination mapping of the suppressor on this X-chromosome has generated recombinant males that were tested for *SD* suppression. If a recombinant male transmits each chromosome equally, then we know the suppressor is present. If only one chromosome is being transmitted, then recombination has removed the suppressor. Comparison of these two groups and the markers present is used to determine the location of the suppressor. Initial tests have led to the conclusion that the suppressor is located on the right half of the chromosome, possibly near the genes for *vermilion* or *forked*.

Comparison Of Two Local Species Of Mosquito Larvae

John Dabrowski III* and Patrick Reed
Dr. George Shinn, *Faculty Mentor*

Bird baths and trash cans are inhabited by larvae of mosquitoes that potentially transmit diseases. Scanning electron microscopy was used to compare two species that differ in microhabitat and feeding behavior. *Anopheles punctipennis* hangs from the water surface and eats microorganisms living at the surface. The opening to its respiratory system is bordered by flat plates that hold the body close to the surface. *Culex restuans* spends most of its time at the bottom where it eats organic debris. A long breathing tube enables this species to hang well below the surface. These two species have the same mouth parts - palatal brushes and maxillae, both bearing hundreds of thin spines. The mouth parts of *Culex* are longer and the spines are more elaborately branched. Also, the lower lip (ventromentum) of *Culex restuans* bears closely packed brush-like spines. These observations provide a basis for more detailed comparisons of feeding biology.

Antioxidant Enzyme Activities and Isoforms of Catalase and Superoxide Dismutase in *Vicia faba* L. Root, Stem, and Leaf

Sarah Davenport
Dr. Daniel Hite, *Faculty Mentor*

Oxygen free radical production during normal metabolic processes is common to all organisms inhabiting oxygen-rich environments. In plants, photosynthesis, respiration, and photorespiration are major sources of oxygen free radicals. Left unchecked, free radicals can damage cells by destroying biomolecules. Two antioxidant enzymes in plants, catalase (CAT) and superoxide dismutase (SOD), work together to convert free radicals to water. Three CAT isoforms were visualized using gel electrophoresis and identified based upon differences in isoform expression at different developmental stages as previously established in maize. SOD and CAT activity were studied in three tissues: leaf, stem, and root. CAT activity was higher in leaf extracts than in stem and root extracts, suggesting that CAT activity correlates with photosynthetic activity. Therefore, catalase may play an important role in combating free radical production during photosynthesis and photorespiration. Four distinct SOD activities have been identified, which vary between leaf, stem, and root.

Distribution of Fishes in Relation to Ammonia Levels

Jason M. Drinen
Dr. Conrad Toepfer (Millikan University)

Ammonia has been identified as a common pollutant in aquatic environments, and the Missouri Department of Conservation has expressed concern with impacts in a local stream. We examined the potential impact of ammonia on distribution patterns of fish in Bear Creek which receives effluent from a water treatment plant. Fish were collected from five sites distributed above and below the plant. In addition, we measured stream depth, width, substrate concentration, canopy cover, pH, ammonia concentration, and turbidity at those sites. Although ammonia concentrations did differ among the sites, a principle components analysis indicated that environmental features such as stream width, canopy cover, and instream cover were more important in determining fish distribution. Since the ammonia levels were sublethal, we used the most common species, *Pimephales notatus*, in an oxygen consumption experiment to measure possible stress. We were unable to control ammonia concentrations in the lab, however, so

the stress study was discontinued. At this time, it appears that the effect of ammonia on fish communities in Bear Creek is limited.

Vicia faba L. Seed Respiration as a Laboratory Teaching Component

Angela Glascock
Dr. Dan Hite, *Faculty Mentor*

Given the dormant nature of seeds, many do not realize that they are alive. Seeds are alive; in fact, respiration can be witnessed almost immediately after the imbibition of seeds with water. An experimental method was developed to evaluate respiration through pH change. A colored pH indicator or a pH meter can be used to acquire these measurements. Respiration rate increases with time throughout a germination period, but eventually levels off. Seedlings were also examined under conditions of extended light and darkness. Respiration rate of cotyledons in seedlings grown in extended darkness was dramatically slower than seedlings grown in light. This experimental method can be effective in demonstrating and explaining various biological concepts at the upper elementary, high school, and college plant physiology levels. The colored pH indicator easily demonstrates evidence for life in seeds. Also, equilibrium of solutions and physiology of plant components can be discussed with students.

A Comparison of the Omega-3 Fatty Acid Content in Warm and Cold Water Fish

Jason Greene
Dr. Robert Libby, *Faculty Mentor*

Omega-3 fatty acids have been associated with a lower risk of heart disease. Fish oil is known to contain significant amounts of omega-3 fatty acids. Fish oils from various species of fish were first extracted then esterified using standard BF_3 and MeOH technique. The resulting fatty acid methyl esters were analyzed using temperature-programmed high-resolution capillary gas chromatography. A comparison of the fatty acid composition in fish who lived in cold, salty ocean water and warm, fresh water was performed. A significantly higher percentage of fatty acids were omega-3 in the fish that lived in colder water compared to the fish that lived in warmer water.

The Fluorescent Properties of the Chemical Fluorescein

Rob Groceman
Dr. Eduardo Velasco, *Faculty Mentor*

The purpose of this experiment is to further understand the nature of fluorescence in the compound fluorescein. Fluorescein is a chemical that is often used in biology to dye specimens. Light striking fluorescein causes its electrons to become excited and move to a higher energy level. When these electrons return to a lower energy level, energy is released in the form of light. This phenomenon is known as fluorescence. The lifetime of this fluorescence is the main focus of this experiment. The instrumentation used will allow for the determination of the intensity of light emitted from a sample of fluorescin per unit time. Since it decreases exponentially, the lifetime of the fluorescence will be ascertained.

Scanning electrochemical microscopy in the undergraduate research lab using LabVIEW.

Misha Golynskiy*, Michael Heien and J. Garrett Slaton
Dr. Brian D. Lamp, *Faculty Mentor*

One of the challenges in undergraduate research is the short period of time a student is involved with a project. In order to evoke a successful experience for the student and the mentor, it is important for the student to obtain a level of independence early in the project. In instrument-intensive projects this translates to a working understanding of the instrumentation used in the research. In cases where "home built" instruments are used, the user interface is critical to this understanding. National Instruments' LabVIEW environment was chosen for implementation of a scanning electrochemical microscope (SECM) for undergraduate research. The graphical programming environment is intuitive and requires no previous programming expertise. While the user environment is straightforward, the student-written SECM routines allow simultaneous control over a three-axis positioner and bipotentiostat. Examples will be shown to illustrate the flexibility of the SECM interface as well as other instrument control routines.

A Study of Induced Responses in Lima Beans *(Phaseolus lunatus)*

Erin Hagen, Troy Rahmig and Adrian Stone
Dr. Tom Bultman, *Faculty Mentor*

Herbivore damage induces plant chemical responses which can vary both temporally and spatially, reducing the herbivore's preference for the plant. Previously, artificial damage has been used to simulate herbivory, but few studies explored if plant responses vary with the method employed. Wounding and natural herbivory in many plants increases endogenous levels of jasmonic acid (JA). Jasmonates (JA and methyl jasmonate) have been identified as elicitor compounds that initiate induced responses. In lima beans (*Phaseolus lunatus*) it is unknown if JA is part of the induced responses, or if chemical responses are induced locally or systemically. We conducted bioassays using Mexican bean beetles (*Epilachna varivestis*) preference to compare effects of methyl jasmonate exposure, and natural and artificial wounding in plants, to unwounded plants. Preference tests also were used to compare the magnitude of the induced responses in leaves at varying distances from the site of damage. Results are currently being collected, and will be discussed in light of questions posed.

Changes in Parental Behavior in the Convict Cichlid, *Heros nigrofasciatus*, As a Result of Difference in Size Between the Male and the Female.

Steven Hanson
Dr. Nedra Klein, *Faculty Mentor*

Published material presents convict cichlids, *Heros nigrofasciatus*, as a model species for intersexual parental care of offspring. These mothers and fathers are reported to have distinct roles in the care of their offspring. This project tried to determine if the parental behavior of each parent correlates with the differences in size between the male and female. Small or large females were selectively mated with either large or small males. The results showed no significant change in most behaviors tested, with the exception of mouth and spitting in males. A factor in the lack of significance was small sample sizes resulting primarily from diseases afflicting the animals in the experiment.

Assessment of Genetic Variation Within and Among Clumps of *Andropogon gerardii* by RAPD Analysis

Ericka Havecker
Dr. Stephanie Foré and Dr. José Herrera, *Faculty Mentors*

Andropogon gerardii (big bluestem) is a prairie grass that is able to reproduce sexually and vegetatively, growing in discrete clumps. The purpose of this study is to determine the distribution of genetic variation within and among clumps of *A. gerardii*. Four 100m transects were established at Union Ridge Conservation Area, Mo. Two sets of two transects were established approximately 800m apart. Each set contained two parallel transects approximately 8m apart. Within each transect, a clump of *A. gerardii* and its nearest neighbor were arbitrarily selected at 0, 10, 50 and 100m. Leaf samples were collected from a center and peripheral shoot from each clump. From each leaf sample, DNA was isolated and genetic variation was assessed using randomly amplified polymorphic DNA (RAPD) markers. Data indicate that genetic variation can exist within and among transects, between nearest neighbor clumps, and within a clump of *A. gerardii*.

Characterization of Locally Active Sites on Anodized Glassy Carbon Electrodes Using Scanning Electrochemical Microscopy.

Michael Heien*, Misha Golynskiy and J. Garrett Slaton
Dr. Brian D. Lamp, *Faculty Mentor*

The design and characterization of surfaces with controlled microscopic regions of varying reactivity has become an area of increased interest in analytical chemistry and sensor design. Scanning electrochemical microscopy (SECM) is a promising technique for mapping reactivity at such heterogeneous surfaces. This paper presents the results of a series of experiments designed to characterize the local electrochemical activity of a glassy carbon (GC) electrode surface that has spatially controlled domains of reactivity. Following an initial deactivation by oxidation (anodization), the GC is reactivated in small (typically less than 100-micrometer diameter) regions using microelectrode techniques. The results of SECM imaging experiments using various redox probe molecules, combined with atomic force microscopy and fluorescence imaging data provide information on the topography and electron-transfer characteristics in and near these sites. Preliminary results for the characterization of metal islands that have been electrodeposited in the active sites will also be presented.

Determination of Vitamin B2 in various forms of milk, urine and human blood serum**

Kerry Hymes
Dr. Dana Delaware, *Faculty Mentor*

Vitamin B2, also known as riboflavin (RF), is an essential vitamin needed for life. Vitamin B2 is incorporated into two flavins, flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD). Using the speed and sensitivity of High Performance Capillary Electrophoresis (HPCE), a method has been developed to analyze RF, FMN, and FAD in many substances. Utilizing a laser induced fluorescence detector, the substances that have been analyzed include: bovine milk, lactose free milk, rice milk, soy milk, urine, artificial urine, and human blood serum. These methods have shown reproducibility for all three components and acceptable recovery of FAD and FMN. Standards of RF, FMN, and FAD have shown linearity over a large range of concentrations. Depending on the sample source, the separation of riboflavin and its two derivatives occurred between twelve and fifteen minutes. Aspects of the method developed have been incorporated into an undergraduate biochemistry course.

**This project was supported by a 1999 Undergraduate Research Stipend.

Isolation and Mapping of *Segregation Distorter* Suppressor Mutations

Erin Beth Keller
Dr. Janna McLean, *Faculty Mentor*

Segregation Distorter (SD) is a collection of genes located on the second chromosome in the fruit fly *Drosophila melanogaster* that causes one chromosome to be transmitted more than its homologous partner. In a strong case of distortion, one chromosome is transmitted to all of the progeny; with no distortion, each chromosome of the pair is transmitted to half of the progeny. Five suppressors of distortion have been isolated and mapped to the second chromosome. The strength of suppression has been measured and ranges from complete to partial suppression. Recombination analysis has been initiated to map the locations of the suppressor mutations. This process involved crossing flies carrying the desired mutation to flies with well-known and easily identifiable mutations. The suppression level of the recombinants is being tested by measuring the ratio of chromosome transmission. By comparing the suppression of the recombinants we will map the location of each suppressor.

Laser Cooling and Trapping of Atoms Using Electronic Detuning**

Kevin Koch
Dr. Michael Goggin and Dr. Maria Di Stefano, *Faculty Mentors*

In order to successfully implement laser cooling and trapping techniques on neutral atoms, one must have the means and ability to induce specific atomic transitions. The linewidth of these transitions is extremely narrow compared to the output linewidth of a typical diode laser system. Thus, one must devise a method which narrows the linewidth of the laser while actively correcting its frequency as it deviates from a desired atomic transition. Such a system has been constructed which accomplishes these tasks through servo-lock electronics, Diffraction Grating Feedback Tuning, and an altered form of Saturation Absorption Spectroscopy. The key to the setup is an applied external magnetic field which is used to split the magnetic sublevels of the atoms. This effect, along with manipulation of polarization characteristics of the laser beam, is used to create an absorption

signal which can be utilized as an electronically tunable frequency lock mechanism.

**This project was supported by a 1999 Undergraduate Research Stipend.

Investigation of Wound-Related Stress Signals in Maize Liquid Cell Culture**

Karista M. Koehler
Dr. Daniel Hite, *Faculty Mentor*

When a plant is damaged by herbivory, the levels of a wound-induced hormone, jasmonic acid (JA), in these cells rise, and JA serves as a signal throughout the plant. The JA signal ultimately regulates wound-induced proteins, which include antioxidant enzymes. One group of antioxidant enzymes, peroxidases, are involved in diverse wound-related processes both inside and outside of the cell. We have found through electrophoresis that two distinct isoforms of guiacol peroxidase (GPOX) are induced by the addition of JA to a Hi II maize culture. A water-stress hormone, abscisic acid (ABA), is known to induce expression of similar genes, but has also been shown to act antagonistically when combined with JA. In our cell culture, when the two were combined, ABA blocked the JA expression of the two isoforms.

**This project was supported by a 1999 Undergraduate Research Stipend.

Colorometric Detection of Chromium(VI) Using Sol-Gel Derived Glasses

Skylar A. Martin, Joshua D. Duncan, and Heather Frericks
Dr. David L. McCurdy, *Faculty Mentor*

Chromium occurs in nature mainly in two different oxidation states. Chromium(III) is nutritionally important, while chromium(VI) is both toxic and carcinogenic. There are many methods for the determination of total chromium at the trace level; though of those available, none are routinely able to determine part-per-billion level (ppb) chromium(VI) rapidly and simply. This presentation describes a sol-gel system designed for detection of chromium(VI) at the ppb level. It involves a newly modified form of the classic iodometric reaction. The reaction is initiated selectively by chromium(VI) in solution and ultimately forms hypoiodous acid (HOI_{aq}). The HOI then diffuses into a sol-gel monolith containing entrapped leuco crystal violet (LCV), converting LCV into crystal violet, which can be detected colorimetrically. Without the sol-gel trapped LCV, this reaction scheme results in detection limits as low as 9 ppb. When trapping LCV in the sol-gel matrix, preliminary results indicate sub-ppb level detection limits are possible.

Effect of Host Species, Fungal Endophyte Infection, and Damage on Aphid Reproduction.

Wendy Martin and Adrian Stone
Dr. Tom Bultman, *Faculty Mentor*

Tall fescue grass infected with its endophytic fungus produces loline alkaloids. In contrast, endophyte-infected perennial ryegrass does not produce lolines. We tested if either fungi mediate wound-induce resistance in their host by applying aphids (*Rhopalosiphum padi)* to damaged and undamaged plants of both infected and uninfected perennial ryegrass and tall fescue. Insects were counted after four days to determine their reproduction. Aphids had higher reproduction on uninfected compared to infected tall fescue (mean+SE=6.1+0.8; 1.3+0.3, respectively; $F_{1,100}$=61.4, $p<0.001$). We also found the treatments of infection status and damage interacted ($F_{1,100}$=8.7, $p<0.01$) such that aphid reproduction was enhanced by damage on infected plants, but reduced by damage on infected plants. Concentration of lolines was greater in damaged verses undamaged infected tall fescue, but was negligible in uninfected tall fescue. In perennial ryegrass there was no difference between any treatment. This suggests that the amount of lolines is a determining factor in aphid survival.

Survivorship of *Viola pedata* (Birdfoot Violet) in an Ephemeral Population

Jasen S. Matyas
Dr. Steven Carroll, *Faculty Mentor*

Viola pedata is a spring wildflower found in prairie edges and open woodlands throughout the eastern U.S. Populations generally include two flower color varieties, one in which all five petals are light lavender in color and one in which the upper two petals are dark violet and the lower three petals are lavender. An ephemeral population of *V. pedata* was located in a gap in the forest canopy in Big Creek Conservation Area, southwest of Kirksville, Mo. This population was censused from 1994 to 1999. A 30% decline in the population of adult plants occurred during this time, however no significant difference in survivorship was observed between the two color varieties.

Attitudes Toward and Understanding of the Theory of Evolution. Preliminary Survey Results

Melissa Mayo and Jennifer Stuart
Dr. Nancy Sanders, *Faculty Mentor*

Scientists consider the theory of evolution to be foundational to understanding and explaining the diversity of life on earth. The popular press, however, often presents evolution as a debatable topic, and presents other ideas, such as creationism, as viable alternatives. In order to elucidate the beliefs and understanding of Truman State University students with respect to this topic, a survey was administered to students enrolled in select biology classes in two separate semesters. The survey probed understanding of and attitudes towards evolution, understanding of the word theory, perceptions of creationism, and demographic information. Analyses of these preliminary data suggest trends showing differences among the biology classes surveyed. Survey analysis also provided insight on how to modify the survey tool to better address specific points of interest.

Effect of Male Flower Age on Number and Quality of Offspring in *Silene latifolia*

Sarah Morehouse* and Jeane Tompkins
Dr. Steven Carroll, *Faculty Mentor*

How long flowers last should be determined, in part, by the number and reproductive success of offspring produced by flowers of different ages. We analyzed male reproductive success in Silene latifolia by comparing the number and fitness of offspring sired by pollen from one-, two-, and three-day-old male flowers; all female flowers used were one-day old. Male flower age did not affect pollen viability, the number of seeds per fruit, the time required for seedling

emergence, or seedling mass. However, seeds sired by pollen from one-day-old male flowers were significantly heavier than those sired by pollen from older flowers. If large seed size is correlated with advantages later in a plant's life, natural selectio should minimize how long flowers last.

Investigation of the *y1-wmut* Allele of the *y1* Gene of Maize: An Investigative Laboratory Experience

Caroline Murphy*, Tina Patel and the 1999 Eukaryotic Molecular Genetics Class
Dr. Brent Buckner, *Faculty Mentor*

The *y1* gene of maize encodes phytoene synthase, which is the first enzyme dedicated to the carotenoid biosynthesis pathway. Mutants of the *y1 white mutable* (*y1-wmut*) allele exhibit endosperm and leaf phenotypes consistent with the allele containing a transposable element. The goal of this study was to locate the transposable element within this allele and ultimately to clone this mobile element. We designed oligonucleotide primers that could be used in the polymerase chain reaction to amplify overlapping segments of the *y1-wmut* allele. If a transposable element was present, it should be evident as a length polymorphism relative to the standard *y1* allele. Although we were not able to identify the precise location, we were able to determine that it was not present in any of the regions studied, accounting for 2/3 of the entire gene. This research was carried out by the students of the 1999 Eukaryotic Molecular Genetics course.

Presence of Erlichiosis and Hantaviral Antibodies in Northern Missouri Rodents

Andrea Newton and Erin Summers
Dr. Linda Twining and Dr. L. Scott Ellis, *Faculty Mentor*s

This project was designed to test the prevalence of antibodies to the bacterial agent that causes Human Granulocytic Erlichiosis (HGE) and the viral agent that causes Hantavirus Pulmonary Syndrome (HPS) in the wild population of rodents native to northern Missouri. The Hantavirus and Erlichia are among those considered as emerging infectious diseases that can harm humans. To obtain the rodents we used live trapping techniques at several locations. Blood samples were taken from each rodent through a retroorbital bleed. Tests for the HGE antibodies were done locally using immunofluorescence assays. Tests for the HPS antibodies were completed at the Centers for Disease Control in Atlanta. Last year, antibodies were detected for HGE in *Reithrodontomys megalotis* and for HPS in P*eromyscus leucopus*. Further sampling has now been done.

Salicylic-Acid-Induced Signal Transduction in Maize Cell Cultures

Katie ielsen*, Karista Koehler, Brian Moyer and Andrea Kahler
Dr. Daniel Hite, *Faculty Mentor*

Upon pathogen attack, plants activate defense mechanisms that stimulate broad-spectrum disease resistance and coordinate pathogen-related gene expression. In dicots, hydrogen peroxide (H_2O_2) and calcium (Ca^{++}) seem to be involved in salicylic-acid-induced signaling pathways. In dicot cell cultures, salicylic acid (SA) addition results in an increase in H_2O_2 that may be mediated by protein phosphorylation and followed by increased cytosolic Ca^{++} levels. In monocots, little is known about this signaling pathway. We will report results from studies of Black Mexican Sweet (BMS) maize cell culture, a monocot system, that show the potential involvement of H_2O_2, protein phosphorylation, and Ca^{++} in SA signaling. In addition, we will report differences in SA signaling between the BMS cell culture derived from mature stem tissue and the embryogenic Hi-II cell culture derived from maize embryos.

A Fluorescent Study of Chloroaluminate Ionic Liquids Using Probe Molecules

Alexis Niemeier
Dr. R. Griff Freeman, *Faculty Mentor*

Room temperature ionic liquids can be studied using spectroscopic techniques such as Raman Scattering, Nuclear Magnetic Resonance, and Fluorescence spectroscopy. 6-propionyl-2-dimethylaminonaphthelene, Prodan, and 2,6-diphenyl-4-(2,4,6-triphenylpyridino)phenolate, Reichardt's dye, were dissolved in ionic liquids prepared from either aluminum chloride and 1-butyl-3-methylimidazolium chloride ($AlCl_3$-BMIC) or aluminum chloride and N-butylpyridinium chloride ($AlCl_3$-BPC). Prodan and Reichardt's dye interact with the $AlCl_3$-BMIC and the $AlCl_3$-BPC and change their maximum emission or absorbance wavelength, respectively, as the ratio of $AlCl_3$ to organic cation changes. By examining the emission and/or absorbance wavelength of the probe molecules we can make statements about the polarity of the ionic liquid. In the course of the study, we have noticed that as the ionic liquid goes from acidic (excess $AlCl_3$) to basic (excess cation), a dramatic change in emission or absorbance occurs.

"Large" Alkanethiolate-Protected Gold Nanoparticles and Gold/Silver Nanoclusters

Rebecca Otte
Dr. R. Griffith Freeman, *Faculty Mentor*

The optical, electronic, and magnetic properties of metal nanoparticles (1-100 nm in size) have been studied extensively for possible use as substrates for surface enhanced Raman Scattering (SERS). Studies have shown that the physical and chemical properties can be manipulated by controlling the diameter of the metal and by the presence of different metals in the metal nanoparticles. We will discuss results obtained by the systematic variation (such as changes in the Au to S ratio) of the method of Leff et al. Also, we will present results of an in depth ^1H and ^{13}C NMR study of protected gold/silver metal nanoclusters with varying metal compositions. These alloy metal nanoclusters are of interest because they have chemical and physical properties that differ from those containing only one metal.

Adenoviral Techniques

Bhavini (Tina) Patel*, Mike Brown and Elizabeth Soda
Dr. James Bamburg (Colorado State University)

Adenoviral vectors are efficient tools for transfecting genes into neurons. Adenoviruses are relatively easy to manipulate and provide a highly stable environment for foreign genes because the viral genome does not rearrange at a significant rate through successive rounds of replication. Since adenoviral vectors are so useful, we attempted to make recombinant adenoviruses with wild type and mutant forms of cdc42 and rac1, GTPases that affect neurite growth, in order to ultimately be able to characterize the precise effects of protein expression in different neurons. Thus we began with

subcloning the cdc42 and rac1 cDNA inserts into the pML shuttling vector, which, along with the adenoviral pJM17 plasmid, we could cotransfect 293 cells. Our attempts led us to successfully subcloning the wild type form of both cdc42 and rac1 into the pML plasmid. As mentioned earlier, the ultimate goal of using adenoviral vectors is to characterize the effects of the protein expression in neurons. We examined the expression of the Ca(2+)-binding protein frequenin in rat corticals focusing on characterizing its effects on neurite length. Frequenin was found to increase the length of the neurite 1.21 times the length of the uninfected control neurite.

Initial Characterization of Somatostatin Receptor Four Null Mutant Mice

Brent Povis*
Dr. John Rutter, *Faculty Mentor*

A phylogenetically conserved neuropeptide, somatostatin is of integral importance to a vast array of cellular phenomena. It has been implicated in the regulation of developmental events, homeostasis, sensory perception, cognition, and memory, and also plays an apparent role in neuropsychiatric disorders such as Alzheimer's disease, schizophrenia, and depression. Recently, it has been discovered that somatostatin operates via five transmembrane receptors. This research program was undertaken to decipher the specific functions of somatostatin receptor four (sstr4). Previously, a strain of mice was engineered, using targeted mutagenesis in embryonic stem cells, which lack the allele for sstr4. Procedures were then conducted in a comparative manner, juxtaposing mutant versus wild-type subjects, to decipher its operative functions. Thus, by applying nucleic acid probe hybridization, radioimmunassay, histological examination, and behavioral screening, disparities in neural processing, gene expression, growth hormone and corticosterone secretion, and brain morphology were elucidated.

Effect of Chronic Methamphetamine on CNS Neurotransmitter Levels

Brent Povis*, Heidi Atwell and Jason Wagner
Dr. John Rutter, *Faculty Mentor*

Withdrawal following chronic stimulant use results in alterations in mood that resembles those seen in clinical depression. In an attempt to delineate the neurochemical ramifications of methamphetamine withdrawal in rodents, a protocol was established for the a) dosing regimen and b) subsequent electrochemical detection of serotonin, dopamine, and norepinephrine. Methamphetamine was administered (0-10 mg/kg IP) twice a day for five days. After a one week withdrawal period, rats were sacrificed and tissue samples were collected (olfactory bulb, striatum, nucleus accumbens, and parietal cortex). Preliminary results indicate that the treatment results in a dose-dependent depletion of neurotransmitters and their metabolites. Following the determination of an appropriate dosing regimen, future studies will be conducted in an attempt to elucidate the effects of methamphetamine on extracellular neurotransmitter levels and associated receptor response.

The Effect of Nutrient Level, Herbivory, and an Endophytic Fungus on and Insect Herbivore

Jeffrey A. Reed
Dr. Thomas L. Bultman, *Faculty Mentor*

I tested the effects of soil nutrient level, fungal infection, and herbivory on performance of the fall armyworm (*Spodoptera frugiperda*). Tall fescue plants (*Festuca arundinacea*) were grown in a controlled environment with all the possible combinations of the following treatments: infected or uninfected with an endophytic fungi (*Neotyphodium coenophialium*); nutrient level (high, medium, or low); and herbivory (control or clipped). When plants were 10 weeks old they were fed to third instar larvae. The larvae were left to develop to the fifth instar, and development time was measured. Data for development time showed faster larval development as fertilizer levels increased, and that status and herbivory had no effect. I will also discuss data on growth and efficiency of food utilization by the larvae. My results show that the effect of endophytic fungi on fall armyworm can be influenced by other environmental factors.

Relation Between Amylose Content of Pollen and Kernels of Corn

Cary Rivard
Dr. Mark Campbell, *Faculty Mentor*

Corn (Zea Mays) is often used for its amylose inside the kernel endosperm, which is used to make biodegradable plastics and other industrial products. Currently, many researchers are making an effort to isolate varieties of corn with starch possessing high levels of amylose. Because this valuable resource comes from within the kernel, the varieties must be harvested before they are tested which results in a long turnaround time. One of the ways to test for amylose is by dissolving the ground kernel into an iodine-DMSO solution and performing a colorometric assay on the solution. For this study, eight varieties of corn will be grown with known amylose values and the pollen will be tested using the same method in order to observe any correlation between the two methods. If successful, this method could become a more rapid means of determining amylose content of corn varieties in the future.

The Variance of Mini-Endplate Amplitudes of *mdx* Mice

Diana Roshek
Dr. C. George Carlson (Kirksville College of Osteopathic Medicine)

Duchenne Muscular Dystrophy (DMD) results from the absence of dystrophin. This absence produces terrible consequences for skeletal muscle, cardiac muscle, and the central nervous system. It leads to muscle necrosis, life-threatening cardiomyopathies, and mild mental retardation. In this study we take an electrophysiological approach to DMD by using the mouse model: *mdx*. Through intracellualar recordings we found that there is a substantial change in the variance of the amplitudes of the mini-endplate potentials (MEPPS) between young and adult mice. A MEPP is a quanta of acetylcholine fired across the synaptic cleft at the neuromuscular junction. Knowing this information it might lead to more knowledge of how the acetylcholine receptors are organized and how they function in the absence of dystrophin.

Evaluation of a White High-Aylose Corn Population After Two Cycles of Recurrent Selection

Brad Schottel

Dr. Mark Campbell, *Faculty Mentor*

Recurrent selection is a breeding method used to improve a trait in a population over a number of years. The corn population known as Hsyn 99w ae is a synthetic variety that possess white grain and is homozygous for the endosperm mutation known as amylose-extender (ae). The population was subjected to two cycles mass selection in which grain samples were selected for starch amylose content. For two cycles a number of selfed ears were analyzed for starch amylose content. The objective of the study was to determine if any changes in average amylose content and the dispersion of these values occurred over the two cycles of selection.

Activator Protein and Cross-Strain Communication in *Staphylococcus epidermidis*

Jennifer Smart

Dr. Neal Chamberlain (Kirksville College of Osteopathic Medicine)

Staphylococcus epidermidis is a gram-positive cocci that generally inhabits the skin. Fatty-acid modifying enzyme (*FAME*) may aid in its survival on skin by inhibiting the activity of bactericidal fatty acids by esterifying them to cholesterol. *S. epidermidis* has been found to produce a peptide, called an activator, which is able to activate or inhibit production of various virulence factors, including *FAME*. In some cases, this activation or inhibition is able to occur between strains. This study further investigated cross-strain communication by adding purified activator from one strain to another strain. *FAME* production was measured using radiolabeled cholesterol and column chromatography. It was found that *FAME* production was inhibited when activator from one strain of *S. epidermidis* was added to another strain of *S. epidermidis*. When activator from *Staphylococcus aureus* was added to S. epidermidis, *FAME* production by *S. epidermidis* was activated. However, when activator from *S. epidermidis* was added to *S. aureus*, the production of *FAME* by *S. aureus* was inhibited. Knowledge of cross-strain communication will provide a better understanding of *S. epidermidis'* pathogenicity.

Planetary Stability in a Three Body System

Daniel Smith

Dr. Michael Ottinger, *Faculty Mentor*

Unlike our solar system where planetary orbits are ellipses of arbitrary size about a fixed focus (the sun), the motion of the stars significantly affects the planetary orbits in a binary star system. Our primary area of research is finding stable planetary orbits passing between two suns and discovering the conditions under which they can exist. Since this is a three-body problem, the planetary orbits must be determined through numerical methods. Using a particle simulation code, which we developed based on a fourth order Runge-Kutta algorithm, we track the planetary orbits using Newtonian gravity. We have found that stable orbits do occur and how each parameter effects this stability. In the presentation we will present these findings and their significance.

The Use of Computational Chemistry to Model ABA Binding Requirements

Kendra Stiles

Dr. Ken Fountain and Dr. Dan Hite, *Faculty Mentors*

The plant hormone abscisic acid (ABA) mediates stress-induced responses when water availability is limited (e.g. drought, temperature extremes, and salinity stress). Abscisic acid mediates rapid stomatal closure, which limits further water loss, and over a longer period, causes changes in gene expression that enhance water-stress tolerance. These different responses may be mediated through different ABA receptor proteins. Generally, hormones transmit signals by binding receptors. Because normal biochemical procedures have not been successful in identifying ABA receptors, analogs of ABA have been produced to help determine receptor-binding requirements. Using computational chemistry, we are determining the molecualr similarities and differences between effective and non-effective ABA analogs. Using this approach, conclusions can be drawn regarding molecular shape and charge requirements for receptor binding. Modeling of ABA has revealed two minimal energy conformations. The significance of this finding, with regard to diverse modes of ABA action (receptors), will be discussed.

Cultural Evolution in Yellow Warblers

Julie Thien

Dr. Nedra Klein, *Faculty Mentor*

Population changes in bird songs may be considered a form of cultural evolution, in which cultural traits being passed down are influenced by processes similar to biological evolution. Song memes are the units of transmission, and thus the functional equivalent of genes. The meme, which may be a syllable, phrase, or whole song, can be a useful tool for understanding diversity and transmission of learned traits among populations. This memetic approach was used to study different populations of Yellow Warblers from the West Indies and Costa Rica, analyzing sonograms from previously recorded songs to determine the meme of the populations. Preliminary results suggest that the meme being passed from one generation to the next is the individual syllable. Results also suggest that the predominant meme or memes of each population differed among the studied populations, with isolation by distance and ocean barriers restricting the spread of the primary meme.

A Peer Mentoring Model for Biology 107

Julie Thien, Robin Perrtree, Elizabeth Hahn, Katie Krueger, Jennifer Stuart, Christine Gould, Melissa Mayo, Luke Andermann and Jill Franklin

Dr. Nancy Sanders, *Faculty Mentor*

Group work and peer mentoring has been demonstrated to be an effective teaching and learning tool. For this reason, the structure and style of peer mentoring of laboratory student groups in Biology 107 was re-examined during the fall of 1999 to find ways for peer mentors to improve student learning. Combining personal experience with research in science education literature we developed several recommendations on how to make the group and peer mentoring system more productive. Suggestions for facilitating group dynamics and accountability, the development of clear and concise rubrics, and providing clear examples of excellent student work and quality peer reviews will help improve the quality of group research projects. Student evaluations of the peer mentoring process also suggest that mentors must maintain clear communication

with both the professor and students, and advanced preparation for meetings to gain the trust and respect of their groups.

Sequence Analysis of a Recessive Allele of the y1 Gene of Maize**

Cindy Tochtrop
Dr. Brent Buckner, Faculty Mentor

The *y1* gene encodes phytoene synthase, the first enzyme committed to carotenoid biosynthesis. A standard dominant allele of *y1* was previously isolated, sequenced and shown to contain two transposable elements, *Stowaway* and *INS2*, immediately upstream of the *y1* coding sequence. Later studies identified a *Tekay* retrotransposon upstream of these transposable elements. These three mobile elements reside in a 1865-bp region upstream of the transcription initiation site of *y1*. This standard dominant allele of *y1* was shown to be expressed in leaf, embryo and endosperm as a 1.8-kb mRNA transcript while a standard recessive allele was expressed in the leaf and embryo, but not the endosperm, as a 2.0-kb mRNA transcript. We have now cloned and sequenced most of this standard recessive allele of *y1*. When comparing the dominant and recessive alleles, approximately five-fold more nucleotide substitutions occur intronic and upstream sequences than in exonic sequences. The exonic substitutions give rise to 4 amino acid substitutions, 2 of which are nonconservative. Small insertions and deletions are common in the introns and upstream sequences, but are not found in the exons. In addition, all exon/intron splice sites within these two alleles appear identical. A notable difference between the two alleles is that the *INS2* and *Tekay* mobile elements are not found upstream of the recessive alleles. It remains to be determined if any of the observed sequence polymorphisms of the presence or absence of the mobile elements influence the expression pattern or mRNA length differences that exist between these two alleles.

**This project was supported by a 1999 Undergraduate Research Stipend.

The Effect of an Endophytic Fungus on Performance of an Aphid Parasitoid

Kirk C. Tonkel
Dr. Thomas L. Bultman, *Faculty Mentor*

The fungus *Neotyphodium coenophialum* lives endophytically within tall fescue grass (*Festuca arudinacea*). This fungus produces alkaloids that appear to have detrimental effects on herbivores such as the aphid *Rhopadosiphum padi*. I evaluated the performance of the wasp *Aphelinus asychis*, which is a parasitoid of *R. padi*. Aphids were fed either infected or uninfected fescue, then parasitized by *A. asychis*. The control group (n=151) reared on uninfected fescue had a mean mass of 0.0187mg, while the mass(0.0143mg) of wasps in the experimental group (n=85) was significantly lower ($t=6.47$, $df=234$, $p=<0.001$). The endophyte also caused shortened development time of aphids, 227.1hr versus 202.1hr for control and experimental groups, respectively ($t=5.21$, $df=234$, $p<0.001$). These results indicate that wasp growth and development is affected by the prescence of *N. coenophialum* in its hosts' diet.

Atomic Spectroscopy Using An Echelle Monochromater And Digital Micromirror Array

Sam Valenti,* Grant Edwards, Janell Neulinger and John Hagen
Dr. David L. McCurdy (Truman State University) and Dr. William G. Fateley (Kansas State University)

A multi-element spectrometer utilizing a Digital Micromirror Array (DMM), made by Texas Instruments, is being developed. The use of the DMM as a wavelength selection device (similar to an exit slit) in a monochromator allows computer selection of wavelengths. The DMM is an 800x600 array of 16 mm square mirrors. Each mirror may be individually and selectively rotated to an on or off position. Our work has placed the DMM in the focal plane of a high-resolution Echelle monochromator, serving as multiple computer controlled exit slits. Light striking each mirror can be selectively reflected to the detector when the mirror is in the "on" position, or eliminated from the spectrum, by reflection away from the detector when the mirror is "off." In this way the DMM is used to select one or more wavelengths for detection in a extremely flexible manner, not possible in a traditional slit spectrometer.

Determination of Physiological Adaptation Against Aflatoxin B1 in Banner-tailed Kangaroo Rats (*Dipodomys spectabilis*)

Laura L. Walters
Dr. José Herrera, *Faculty Mentor*

Fungal contamination of food stores is currently a major health problem. However, unlike humans, some food-storing rodents suffer from no apparent ill effects after consuming fungally-infected food. I was interested in determining whether one such rodent species, the banner-tailed kangaroo rat (*Dipodomys spectabilis*), possesses a physiological mechanism that allows individuals to consume the fungal toxin, aflatoxin B_1 (a mycotoxin produced by *Aspergillus flavus*). I hypothesized that the liver homogenate from banner-tailed kangaroo rats, compared to that of white laboratory rats (*Rattus norvegicus*), is less efficient at converting aflatoxin to its corresponding toxic metabolites. My research uses the Ames test, a microbial assay, to compare the liver metabolic activity of kangaroo rats to that of laboratory rats. Results thus far indicate that, compared to the liver homogenate of laboratory rats, the liver homogenate of kangaroo rats is less efficient at inducing the conversion of aflatoxin to its corresponding metabolites.

The Effects of Fire on the Microfungi Living in the Prairie Grass, *Andropogon gerardii***

Jason Ward
Dr. Stephanie ForÈ and Dr. JosÈ Herrera, *Faculty Mentors*

Fire changes the dynamics of plant and microbial species within a prairie. We examined the changes that occurred to the fungal populations growing within the prairie grass, *Andropogon gerardii*. From leaf samples taken throughout the growing season of *A. gerardii*, fungi were cultured on corn meal and malt extract agars. After the fire fungal species growing within burned transects were significantly different from those growing in the unburned transects. As the growing season progressed, fungal species growing within *A. gerardii* became more and more alike in the burned and unburned transect, and by the end of the growing season, fungal species were almost identical in the two transects. This study will form the basis for a number of studies that could determine the effects that microfungi have on their hosts, and could explain the mechanism by which some plants, such as *Andropogon gerardii*, do so well after a fire.

**This project was supported by a 1999 Undergraduate Research Stipend.

Greenhouse Evaluation of Flax Germplasm

Tara Weeks
Dr. Mark Campbell, *Faculty Mentor*

Flax (Linum usitatissimum) is most widely recognized as a pioneer crop and has been grown for oil and fiber. The seed contains 35-45% oil and is marketed as linseed oil and is used in paints, varnishes and lacquers because of its drying quality. It is also used in the manufacturing of linoleum, imitation leather and inks. Oil cake consists of ~35% protein and is made into livestock feed in either pellet or meal form. In this study, seven flax accessions were obtained from the USDA National Plant Germplasm System. Seed was grown in a greenhouse and plants compared for vigor and other agronomic traits. Several accessions were then crosses to determine the feasibility of producing progeny seed in the greenhouse for future breeding studies.

The Evolution of Eugenics: Mapping the Main Motivations Supportive of Eugenics within the American Periodical Literature from 1890 to 1912**

David F. Widitz
Dr. Philip Wilson (Shimer College) and Dr. Scott Ellis (Truman State University)

In his 1869 *Hereditary Genius*, British polymath Francis Galton claimed that mental traits were hereditary and that society could be improved by regulating human reproduction in order to enhance the traits of future generations. Galton later described his idea under the name "Eugenics". The subsequent Eugenics Movement quickly grew popular in Progressive Era America, influencing marriage laws, immigration, mental health care, and intelligence testing. American periodical literature from 1890 to 1912 was analyzed to determine specific motivations underlying the Eugenics Movement. It was determined that up until the First International Congress of Eugenics in 1912, the primary motivations supportive of Eugenics were altruistic, economic, scientific, classist, racist, and elitist. Understanding the particular appeal to Eugenics at the start of the 20th century can help today's society reflect upon the analogous contemporary movements of genetic counseling, genetic engineering, and cloning.

**This project was supported by a 1999 Undergraduate Research Stipend.

Spatiotemporal Chaos in a Numerical Coupled Oscillator System**

Adam Woodson
Dr. Michael Goggin, *Faculty Mentor*

Spatially extended dynamical systems with many degrees of freedom can exhibit chaotic behavior both in space and in time. This spatiotemporal chaos is characterized by a sensitive dependence on initial conditions, as well as the spatial relationship among a system's components. Thus, for infinitesimally similar starting conditions, the time evolution of the chaotic system for one set of conditions diverges exponentially from that of the other. An important problem in nonlinear dynamics is that of the onset of spatiotemporal disorder in complex systems. To gain insight into this problem, a computer program was written to simulate a slightly extended system consisting of a damped driven pendulum and a double pendulum coupled magnetically at their axles. Attractors, their respective basins, and ranges of parameter values for which chaotic and periodic motion were observed were characterized for the coupled system. These results were then compared to those of the individual pendulums.

**This project was supported by a 1999 Undergraduate Research Stipend.

Social Science

Effect of Dress Style on Perceived Personality Traits

Ryan Brown and Andy Kuhlmann

Dr. Michele Breault, *Faculty Mentor*

A person's dress style affects how others perceive that person's personality. A field experiment was conducted in campus buildings. The participants, twenty college-age males and females, rated their perceptions of the confederate wearing two types of clothing. The instrument included ratings of various personality traits. A 2x2 design was used, involving the gender of the subject and type of clothing worn by the confederate. There was a significant main effect of dress style on other's perceptions of modesty, conformity, friendliness, and loyalty. There was a significant effect of participant's gender on conformity, friendliness, and loyalty.

Responses of Adults Toward Aging Parents' Remarriage**

Hilary Cook

Dr. Terry Palmer, *Faculty Mentor*

Attitudes of 16 adults toward the remarriage of their aging parents (over the age of 50, remarried after divorce or the death of a spouse) were examined using interviews and questionnaires (the Buss-Durkee Hostility Inventory and an inventory focusing on hostility toward a parent's remarriage). Interviews were scored on scales for several categories to recognize common themes. No significant results were found, probably due to the small sample sizes, but some trends were indicated. There were some connection between

resentment and/or hostility and the lack of a person in the "caretaker" role in a family. Findings also suggested that someone with a higher hostility score was more likely to be hostile toward a stepparent (only for subjects with divorced parents). Although further research with a larger sample is needed, this study gives some hints to the complicated dynamics in families dealing with remarriage late in life.

**This project was supported by a 1999 Undergraduate Research Stipend.

Effects of Large-Scale Livestock Facilities on Social Climate Within a Community

Katie Dallam and Kimberly Ratliff
Dr. Michael Seipel, Faculty Mentor

The changing face of rural America can be attributed to various issues, including concentration within the livestock industry. Large-scale livestock facilities are a source of debate and divisiveness in many rural communities. Residents (N=771) of four northern Missouri counties — two with large-scale swine facilities (Mercer and Putnam) and two without (Knox and Shelby) — responded to various questions concerning the social climate of their communities. Respondents living in Mercer and Putnam counties indicated by a margin of ninety and eighty-five percent, respectively, that there are issues that have divided the community over the past few years, with the most common answer being large-scale swine facilities. Thirty and thirty-eight percent of respondents from Knox and Shelby counties, respectively, reported division within the community. The presented research will show whether the divisive issues affected community member's trust among neighbors, relationships with neighbors, and overall feelings about the community.

Work Experience, Gender, and Importance of Various Job Characteristics

Heather E. Droste,* Grant W. Farmer,* Patrick J. Adams, Jill C. Bradley and Brian M. Bonness
Dr. Teresa M. Heckert, *Faculty Mentor*

The effect of work experience and gender on the importance of various job characteristics was examined. Ratings of eight facets, representing 48 job characteristics, were provided by 102 seniors and 504 alumni from Truman State University. The alumni had graduated one (n=114), two (n=114), five (*n*=122), ten (n=71), and fifteen (n=83) years previously. Work experience was related to the importance given to job qualities, pay and promotion, interpersonal relations, family considerations, benefits, and other orientation. Women rated the pay and promotion facet significantly lower than did the men. However, the women rated travel, interpersonal relations, non-tangible benefits, family considerations, benefits, and other orientation significantly higher than did the men.

Self-Esteem, Sexual Anxiety, and Sexual Orientation**

Grant W. Farmer
Dr. Teresa Heckert, *Faculty Mentor*

In this study, homosexual and heterosexual students were asked to fill out surveys assessing sexual anxiety, self-esteem, religiosity and opinionatedness. Sexual anxiety levels differed by sexual orientation, but self-esteem levels did not. Results indicated that sexual anxiety may be related more to religious belief than sexual norms.

**This project was supported by a 1999 Undergraduate Research Stipend.

The Black Sox Scandal: Its History, Results, and Effects on Baseball

Chris Flieger
Dr. Martha Edwards, *Faculty Mentor*

As philosopher Jacques Barzun stated, "He who would know the heart and mind of America had better learn baseball." The 1919 Black Sox scandal was a turning point in baseball history. This scandal rocked the establishment of baseball as well as all of America. By looking at the Black Sox scandal through primary and secondary sources, and by focusing on Joe Jackson, much can be learned about the game of baseball in the 1910's and into the 1920's. These sources show how the scandal and Jackson have been viewed since 1919. Books such as *Eight Men Out*, *The Natural*, and *Shoeless Joe* each present a distinct view on the scandal and on Joe Jackson. These books and the scandal fit into the larger picture of the history of baseball. To understand the Black Sox scandal and Joe Jackson is to understand a part of America.

Effects of Gender and Observers on Stop Sign Compliance

Nina Graham and Laura Westhoff
Dr. Fred Shaffer, *Faculty Mentor*

A study was conducted among 80 drivers to investigate the effects of visible or hidden observers and observers' sex on stop sign compliance. Observations were taken from westbound drivers at the corner of Normal Street and First Street in Kirksville, Missouri. Data were recorded on drivers' sex, if they had any passengers, and number of seconds stopped. A 2 x 2 factorial design was used to analyze the data. No main effects were found for the variables of visible or hidden observer, observers' gender, gender of driver, or passengers. Also, no significant interaction was found.

Gender Differences In Expectations Regarding Market And Household Activities

Abby Heckman, Tricia Kammerer, and Stephanie Merritt
Dr. Judi Misale, *Faculty Mentor*

This study assessed allocation strategies for future division of household labor as a function of spousal employment and investigated undergraduates' expectations about future wage and work structures. Under three spousal employment schedules, participants estimated the number of hours they preferred doing housework, the number of hours they preferred their spouse to do housework, and the number of hours they expected their spouse to perform housework. To assess related gender issues, participants also estimated their salaries immediately after graduation and ten years later, and they rated the likelihood they or their spouses would be full-time homemakers. Gender differences occurred across all three subareas of investigation. Implications of our findings are discussed.

Effect of Gender Markers on Time, Locality, and Territorial Invasion

Evelyn Henderson and Cyria Canessa
Dr. Teresa Heckert, *Faculty Mentor*

Male and female students and staff of a mid-sized public university were observed for territorial invasion in a cafeteria. A table was selected, and either male or female markers

were placed on the table. The observation periods lasted fifteen minutes. Past research suggested that there would be no difference in invasion due to gender of the marker. The present study showed no statistical significance between the gender of the invader or the gender of the marker, thus supporting past research. A possible explanation for the non-statistically significant results was due to the disproportionate number of males on campus.

"For the Benefit and Enjoyment of the People:" Yellowstone's Caretakers and the Evolution of Yellowstone Management Policy and the National Park Ideal**

Jason P. Hill
Dr. Mark Hanley, *Faculty Mentor*

On March 1, 1872, President Grant set aside a region of northwestern Wyoming known as Yellowstone as the world's first national park. However, with no precedent to follow and no direction from Congress, the Presidency or the Department of Interior, the development of Yellowstone's policy of wilderness and recreation management was left entirely in the hands of the park's own caretakers. Because of this, the development of the wildlife and tourism policy of both Yellowstone and the National Park Service are largely the result of the environmental and recreational experiments of the park's management staff. Acting according to their own understanding of ecology and with the best interests of the park in mind, it has been Yellowstone's caretakers that have determined the Park's wildlife and tourism policy and, in the process, they helped establish important precedents for the management of the nation's network of parks and recreational areas.

**This project was supported by a 1999 Undergraduate Research Stipend.

Writing Rights: Factors Influencing the Strength of Rights Clauses in Post-Communist Countries**

Ryan Kennedy
Dr. John Ishiyama, *Faculty Mentor*

The purpose of this project is to develop a comprehensive evaluation of factors influencing the development and strength of rights clauses in post-communist constitutions. To achieve this goal, I conduct a comprehensive review of literature on institutional choice, constitution-making, and constitutional rights in post-communist Eastern Europe and the countries of the former Soviet Union. Second, measures were developed on all variables identified as having a potential effect on constitution-writing: attitudinal /cultural backgrounds, institutional legacies, and partisan politics. In addition, a coding scheme was developed by conducting a content analysis of the constitutions and an index of strength of rights clauses was developed. This index was regressed against a number of independent variables. Of the independent variables, only the number of effective parties (an indicator of the number of actors involved in the development of the constitution) had a statistically significant relationship with the strength of rights clauses.

**This project was supported by a 1999 Undergraduate Research Stipend.

Factors in Evaluating Teaching Performance: Preliminary Results

Amanda Latier, Brigid Gutting, Jennifer Lydon, and Katie Cunningham
Dr. Teresa M. Heckert, *Faculty Mentor*

The present study seeks to determine factors important in evaluating the performance of college teachers. Students involved in extracurricular activities at Truman State University completed a survey during a regularly scheduled meeting. The survey contained five background information items, three questions about their intelligence and typical exam performance, 28 questions about the class, three questions about the professor's demographics, 15 questions about the professor, and seven overall questions evaluating the course. Half of the respondents rated the professor in their first class of the week and the remaining respondents rated the professor in their final class of the week. Preliminary results will be provided.

How to Select the Best Transformation for Psychophysiological Data

Elizabeth Malone
Dr. Fred Shaffer (Truman State University) and Ron Krebill (St. Louis University)

The present study compared the effectiveness of both natural logarithmic and Box-Cox transformations in normalizing EMG values as assessed by the Kolmogorov-Smirnov statistic. Neither the raw scores, $K\text{-}S$ (48) = .201, p = .0001, nor the natural logarithm of these scores, $K\text{-}S$ (48) = .153, p = .007, were normally distributed. Only a Box-Cox transformation produced a normal distribution, $K\text{-}S$ (48) = .119, p = .086, and the least skew. The authors recommend that researchers select the optimal transformation for a specific data set instead of automatically using a natural logarithmic transformation.

A Revised Survey of Undergraduate Breathing Knowledge

Elizabeth Malone and Janine Hall
Dr. Fred Shaffer and Dr. Jerry L. Mayhew, *Faculty Mentors*

This study examined the breathing knowledge of 227 undergraduates because misconceptions about respiratory mechanics can interfere with diaphragmatic training. These students earned a "failing" score of 4.94 out of 12 on the multiple-choice Breathing Knowledge Exam. They had the greatest difficulty with questions that concerned relaxed breathing (goal, respiratory mechanics, and effort used). Participants were grouped into No-Disorder, No-Information, No Disorder-Information, Disorder-No Information, and Disorder-Information categories. An analysis of variance revealed no significant differences in breathing knowledge among these four groups. We recommend that health care providers review the factual information they impart to patients diagnosed with asthma and panic disorders.

Dysfunctional Breathing Patterns in Undergraduates

Elizabeth Malone and Kris Miller
Dr. Fred Shaffer and Dr. Jerry L. Mayhew, *Faculty Mentors*

This study screened 326 undergraduates (107 men and 219 women) to measure the frequency of functional and dysfunctional breathing behaviors using a 37-item Truman Respiration Questionnaire. Most students breathed through their nose (61%). Chest

expansion (68%) and stomach expansion (56%), and shoulder elevation (52%) were reported during inhalation. Reverse abdominal breathing (28%) and reverse thoracic breathing (10%) were also observed during inhalation. Nine percent of reverse breathers combined both reverse movements. Finally, 25% of students suspended breathing as they stood up quickly. If these findings are replicated at other universities, they would suggest a high prevalence of dysfunctional breathing behaviors.

The Comparative Effects of Book Bags and Carrying Styles on Upper Trapezius and Cervical Paraspinal Surface EMG

Elizabeth Malone, Tina Sippely and Christina Callahan
Dr. Fred Shaffer, *Faculty Mentor*

The present study compared the effects of three book bag conditions (backpack, shoulder bag-same side, and shoulder bag-opposite side) on upper trapezius and cervical paraspinal sEMG. The same side condition produced higher preferred-shoulder sEMG levels and greater left-right sEMG asymmetry than the initial baseline, opposite side, or backpack conditions. We recommend that students avoid wearing a one-strap bag on the same side to carry books since this could risk myofascial pain due to prolonged muscle contraction. Instead, we advise using a two-strap backpack or one-strap bag on the opposite side to minimize muscular strain.

Feminist Social Theory Shows the Power of Patriarchy in Performance Art

Monica Morris
Dr. Keith Doubt, *Faculty Mentor*

United States society today is patriarchal and oppressive to women. Industries promoting fashion, cosmetics, and the ultra-thin "ideal" image of women are based on the idea that beauty has to be cultivated. Our culture rarely sends the message that beauty is something natural that exists before any action or process. In this paper three feminist performance pieces are analyzed using the feminist theories of Simone de Beauvoir, Nancy Heartsock, and Audre Lorde to show that the negative way society views women and their bodies in the late twentieth century is due to the patriarchal foundation of our society. Our oppressive culture causes women to feel alienated in an androcentric world. Women are defined in reference to men and treated as the "Other," rarely as the central half of the population. We must invent new tools to dismantle the house of patriarchy in our society.

Ancient Objects in the Violette Museum: An Exhibit **

Michael G. Murawski
Dr. Martha Edwards, *Faculty Mentor*

After identifying twelve ancient Mesopotamian objects in the E. M. Violette Museum at Truman State University, this project aimed at investigating, recording, and exhibiting these objects. The artifacts displayed included ten clay cuneiform tablets, one stone cylinder seal, and one clay votive cone. Unfortunately, two of the clay tablets were not originally baked and are currently in a state of decay. This project made inquiries into possible conservation techniques which could be used to preserve these objects, although little can be done at this stage. By studying and presenting their historical and archaeological background, more information can be learned about these ancient Mesopotamian artifacts.

**This project was supported by a 1999 Undergraduate Research Stipend.

Muscular Christianity: Redefining Masculinity and the Male Body at the Turn of the Twentieth Century

Michael G. Murawski
Dr. Steve Reschly, *Faculty Mentor*

Between 1880 and 1920, thousands of Protestant men felt threatened by the transforming structure of gender relations and expressed fears about the "feminization" of American society. Under this stressing social and cultural reorientation, a "crisis of masculinity" emerged which led many men to adopt the doctrines of muscular Christianity: fusing a hardy physical manliness with ideals of Christian service. Under the auspices of muscular Christianity, Christian men set out to redefine conceptions of American manhood, attempting to modify popular definitions of masculinity, to reemphasize the male body, and to create a new, masculine image of Jesus. This paper examines the male-directed Christian literature of the period, revealing the textual remasculinization of early twentieth-century American Protestantism. Many of the exaggerated ideals of manhood constructed during this time have continued to affect the lives of men for the remainder of the twentieth century.

Imagining a Dying Panic: A Social Psychology of Panic, Indifference and Transformed Thinking as Responses to the Ecologic Crisis

Christine Sheikh
Dr. Keith Doubt, *Faculty Mentor*

In a consideration of how humans react to morally charged crisis situations, it is intriguing to notice how issues of guilt and shame frame whether there is a sense of agency in response. The deadening effects of panic and indifference correlate to "shame", while the possibility of actualization resonates with "guilt". "Shame" is a morally immature response to perceived wrongdoing, based on self-loathing. "Guilt" is a morally mature response to wrongdoing, based on recognizing one's moral agency and responsibility. A milieu in which this dynamic is evident is in the phenomenon of whether knowledge of the environmental crisis elicits a response that is paralytic or transformative. The purpose of this paper is not to discuss whether or not there is an ecologic crisis; the purpose is to discuss how those who perceive a crisis respond. To conclude, I propose that ecofeminism, as a compelling representation of Carol Gilligan's ethic of care, offers a constructive response to the guilt/shame dichotomy.

Economic Restructuring, Inflation, and Stabilization in Transition Economies: The Case of Bulgaria**

Todor G. Stavrev
Dr. Jane Sung, *Faculty Mentor*

High and variable inflation has been a central feature of all post-communist countries in the period of transition from a centrally planned to

a free market economy. This paper first seeks to shed some light on the determinants of inflation in Bulgaria and then analyzes the aggregate price behavior by applying an econometric regression model and using monthly data for the period from January, 1992 to March, 1999. The research confirms the importance of money supply, wage rate, exchange rate, and output when analyzing inflation in transition economies. Furthermore, this paper draws implications for the design of disinflation programs and makes judgments about whether the Currency Board Arrangements are a cure for the monetary problems in the country.

**This project was supported by a 1999 Undergraduate Research Stipend.

Wage Discrimination and Gender Bias

Todor Stavrev and Janaka Madawela
Dr. Jane Sung, *Faculty Mentor*

The latter half of the 1980's witnessed dramatic changes in gender roles and relationships. Despite many revolutionary changes in the roles women traditionally played, they were more likely to earn less than men in the labor market. The data, originally collected by George Peter and Ronal Ash, analyzed in this paper come from a 1989 survey of business school graduates from the University of Indiana and the University of Kansas. Based on the empirical results of our model it can be concluded that the level of education, the number of years worked since graduation from graduate school, the size of the firm and the average number of hours worked in a week all positively affect wages in differing degrees. The major conclusion that emerged from this study, however, is that sex discrimination was likely to have a substantial effect on women's pay.

Location Memory for Textual Information

Stephanie Thomsen, Kristi Russell, Melissa Reese, and Brigid Gutting
Dr. Robert Tigner, *Faculty Mentor*

This study examined people's ability to recall where on a page they read information. A sample of 159 Truman students read one of two 7-page stories. Recall for both factual information and location of factual information was assessed after one of four delays: 0, 1, 2, 7 days. Results indicate that location memory is demonstrable and predictive of factual recall, but decays rapidly. Location memory persists only for visually distinct elements (e.g., typographical errors). Certain page locations were found to be better remembered than others.

Circadian Rhythms As Related to Personality and Stress

Nathan Thwing, Stephanie Steinman and Janine Hall
Dr. Michele Y. Breault, *Faculty Mentor*

Many college students differ in their peak performance time of day. A study was conducted in order to determine the relationships between circadian rhythms, personality, and stress. 52 participants were asked to fill out a demographic survey, an ideal class schedule and three questionnaires: a survey on sources of stress and modes of stress management, the NEO Personality Scale, and a circadian rhythms composite scale which measures morningness/ eveningness. Statistical analyses were performed, and significant correlations were found between morningness and personality and between personality and stress.

Effects of Marital Status and Initiator Gender on Perceptions of Blame and Responsibility for Extramarital Relationships

Laura Westhoff and Lacey Pritchett
Dr. Michele Breault, *Faculty Mentor*

A study was conducted to investigate the effects of marital status and initiator gender on perceptions of blame and responsibility for extramarital relationships. Eighty subjects were assigned to one of the conditions created by a 2 (marital status) X 2 (initiator gender) factorial design with an additional variable (took ring off, left ring on) nested within marital status. Participants assessed blame and responsibility for the encounter and rated the social acceptability of the encounter. Main effects for marital status revealed higher blame and lower ratings of social acceptability for married targets and lower acceptability for female married targets. Main effects for ring indicated that blame for married condition was higher when the target had removed a wedding ring before the encounter. However, blame was higher for initiator when target kept wedding ring on. Results are consistent with one of the two hypotheses that female initiator scenarios are found to be less acceptable than male initiator scenarios by both genders of subjects. This can be interpreted that females who have extramarital affairs are judged more critically than males who have extramarital affairs.