

**WABASH
COLLEGE**

**Celebration of Student Research,
Scholarship, and Creative Work**

Friday, January 26, 2007 • Detchon Center

WELCOME AND INTRODUCTION FROM GARY A. PHILLIPS, DEAN OF THE COLLEGE

Welcome to the Seventh Annual Celebration of Student Research, Scholarship, and Creative Work at Wabash College. For the past six years, the College has recognized in this public way the creative thinking and work of Wabash students. We celebrate not only the particular achievements of individual students, but also a deeply embedded ethos of the College. The liberal arts are about such student intellectual engagement as this. The impressive breadth and quality of this year's work cause us to look ahead confidently to many annual celebrations.

This program is dedicated to the memory of Paul Caylor McKinney '52, who passed away in 2003 after a long, courageous battle with cancer. Dr. McKinney served the College for more than half a century as chemistry teacher, division and department chair, and Dean of the College. He was an example of a liberally educated person whose interests ranged from quantum mechanics to Plato, and from playing the piano to pondering Nietzsche. He acted in Wabash College Theater productions, and was often found backstage working on difficult equations and problems in his notebook. Among all Wabash men, he would be the most likely to understand everything presented today and most ready to celebrate the successes of Wabash students and faculty members.

Close collaboration between Wabash students and their faculty across the College are hallmarks of our college. It is a special pleasure to introduce some of the results of that collaboration in these presentations. Our thanks go to the students who are prepared to teach the Wabash community about their good work and to faculty members who have devoted considerable time helping students in their research and creative productions.

A conference of this size and scope would not be possible without the dedicated work of the planning committee. The College's thanks go to this year's committee that includes Todd McDorman (co-chair), Jim Brown (co-chair), Jim Amidon, Humberto Barreto, Jeff Beck, Bill Doemel, Amanda Ingram, and Chad Westphal. Christina Gilbert, Scott Feller, and Lon Porter also have contributed in significant ways, as have Jeana Rogers and the Media Center, Computer Services, and Chet Starnes and Campus Services. We express our gratitude to them and to Lilly Endowment Inc. for the grant to our Center of Inquiry in the Liberal Arts that helps support this Celebration.

Gary A. Phillips
Dean of the College

PARTICIPANTS IN THIS YEAR'S CELEBRATION

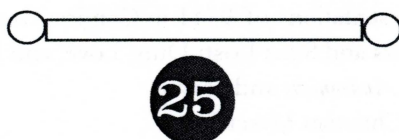
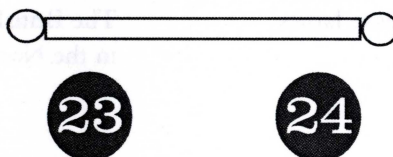
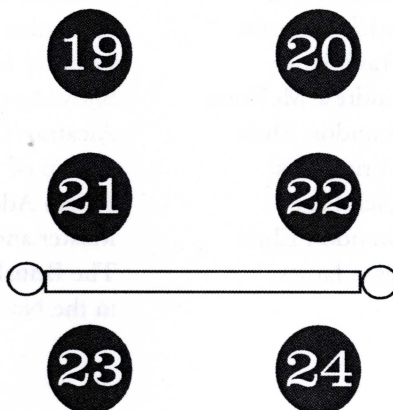
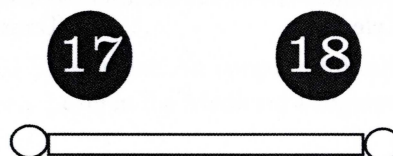
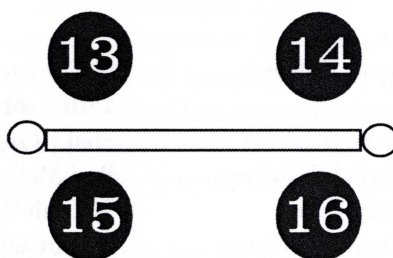
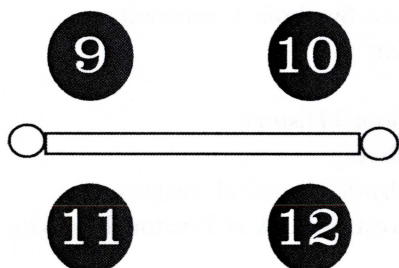
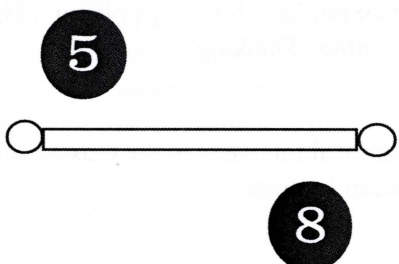
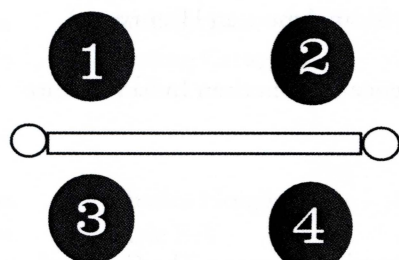
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10	Branko Alavanja	Heavy Metal Removal via X-Type Zeolites
10	Daniel Albrecht	Stability of Functionalized Porous Silicon in a Simulated Gastrointestinal Track
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12	Ty Benefiel	John Maynard Keynes and Modern Day Income Redistribution
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16	Clayton Craig	Ouabache River Ecosystem: Agriculture and its Impact on the Wabash River
17	Duncan Dam	Degradation of Functionalized Porous Silicon in Simulated Gastric Fluid
17	Andrew DeRolf	'Native' Hoosiers: A Look at the Influence of American Indian Culture on the Hoosier Heartland
18	Andrew Dits	Vicarious Image: A Theory of Playwriting
18	Shane Dixon	Biomineralization in Silkworms (<i>Bombyx mori</i>)
19	Christophe Dony	Representations of 9/11 in Comics: Gender relations
19	Shayne Dube	Indiana: Alive with "Little Known" African American History and Historical Markers
20	Aaron Dybel	Klezmer Music
20	Brandon Ehrie	Master and Servant Law: A British Atlantic Historical Analysis
21	Brandon Ehrie	Alcatraz: Contrary to Popular Belief
21	Zach Foughty	The High Costs of Medicaid Enrollment: An Empirical Analysis of the Effect of Income Relative to Poverty Level in the Medicaid Program
22	Adam Fritsch	Nuclear Physics at the National Superconducting Cyclotron Laboratory (NCSCL) with the Modular Neutron Array (MoNA)
22	Adam Fritsch	Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils
23	Kevin Greaves	DNA Detection via Fluorescent Metal/DNA Complexes
23	Chris Greisl	A Cup of Joe: Coffee's Impact on Colonial History
24	Samiul Haque	Expected Return-Risk Premium Relation and Long Run Risk of Stock
24	Charles Hoogland	Stereotypes of Asian Americans: Not 'All Good' After All
25	Jesse James	The British Legacy in the Old Northwest: A Look at Territorial Probate Law in the Northwest Territory
25	Jesse James	Shaky Ground: Mexico City is Sinking and I Want To Know Why!
26	Manbar Khadka	The Effect of Gender on Wages in the United States
26	Frank Knez	Country Music Work Songs: Creation of Symbolic Community
27	Doug Kriech	Heavy Metal Removal via X-Type Zeolites
27	Wassim Labaki	Probing Monolayer Stability via Deterioration of Functionalized Porous Silicon in Alkaline Environments
28	Anthony Lewis	Designed To Tell
28	Kyle Long	Wabash Community Conceptions of 'Critical Thinking'
29	Kyle Long	The Transformation of Liberal Education in Rome

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31	Erick J. Martin	Granados y Albéniz, Mavericks Archetypes of Cultural Revolution
31	James C. McGuffey	Speaking Ourselves out of the State of Nature: Rhetorically Enhancing Social Contract Theory
32	James C. McGuffey	Democracy in Nine Post Communist Countries: Consensus or Majoritarian?
32	Michael McKain	Determination of Parental Progenitors in <i>Eupatorium × truncatum</i>
33	James McKinnon	Approximate Symmetries of the Natural World
33	Andrew McKone	Shostakovich: Quartet No 8 in C minor
34	Patrick Millikan	The Christian Masculine
34	Ryan F. Morris	The Mystery of Iniquity: A Study of France's Black Code during the 18th Century
35	Ryan F. Morris	No Longer Invisible-The Past and Historical Memory: The Castas of 18th Century Mexico
35	Teye M. Morton	Enhanced Teaching in Economics
36	Alex Nolan	Asymmetric Michael Additions Catalyzed by Tetrabutylammonium Prolinate
36	Morgan Nolan	The Problems with Grades
37	Cory Norman	Synthesis, Characterization, and Evaluation of Bifunctional Organocatalytic Salts for Asymmetric Michael Addition
37	Dane Nutty	DNA Detection via Fluorescent Metal/DNA Complexes
38	Patrick O'Rourke	Nuclear Physics at the National Superconducting Cyclotron Laboratory (NCSCL) with the Modular Neutron Array (MoNa)
38	Dick Page	Indian Adoption of European-Style Slavery
39	Joshua Paul	Prejudice Against People with Disabilities: Automatically Activated Stereotypes and Their Effect on Subsequent Judgments and Interaction
39	Braden Pemberton	Directing: Just Create
40	Tom Pizarek	Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils
40	Jackson Price	A Cross-Sectional Study of the Racial Difference in Welfare Dependency: The Battle Between Class and Race for Dominance as the Limiting Factor in African American Opportunities
41	Kyle Prifogle	Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils
41	Steven Rhodes	Putting Metal in the Microwave: Synthesis and Characterization of Molybdenum Carbonyl Complexes
42	Steven Rhodes	Functional Reconstitution and ¹ H NMR Study of Recombinant Peripheral Cannabinoid Receptor, CB2
42	Tim Rickard	Not What You Read in Books
43	Tim Schirack	Classical Rhetoric in Sports Radio Broadcasting
43	Kyle Sell	Advancements in the Study of Autism Spectrum Disorder: A Review of the Literature on Classification, Treatment, and Epidemiology
44	Sabir Shrestha	Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils
44	Jason Siegel	Functionalization of Porous Silicon Using Microwave Radiation
45	Joey Smith	Phenomenology of Acting
45	Aaron Spolarich	Vonnegut: A Hoosier Legacy
46	Ashley Stephen	Beyond the Textbook: Using Non-traditional Literacies in the Classroom
46	Paul Stolarczuk	Exploring Gender Wage Gap in the United States
47	Geoff Walker	<i>Crash</i> : A Burkean and Ethical Analysis
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Detchon International Hall Poster Presentations

Main
Entrance



SCHEDULE OF ORAL PRESENTATIONS

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1:30 p.m.	S. Rhodes & S. Ahmed	Putting Metal in the Microwave: Synthesis and Characterization of Molybdenum Carbonyl Complexes
1:50 p.m.	Omar Mainuddin	BioCrossroads: Science for Life, Growth for Indiana
2:10 p.m.	James McKinnon	Approximate Symmetries of the Natural World
2:40 p.m.	Aaron Spolarich	Vonnegut: A Hoosier Legacy
3:00 p.m.	Kunga Choden	Tourist Caves of Southern Indiana
3:20 p.m.	Clayton Craig	Ouabache River Ecosystem: Agriculture and its Impact on the Wabash River
3:40 p.m.	Shayne Dube	Indiana: Alive with "Little Known" African American History and Historical Markers
4:00 p.m.	Andrew DeRolf	Native Hoosiers: A Look at the Influence of American Indian Culture on the Hoosier Heartland

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3:40 p.m.	Ashley Stephen	Beyond the Textbook: Using Non-traditional Literacies in the Classroom
4:00 p.m.	Kyle Long	The Transformation of Liberal Education in Rome

Detchon 209

1:10 p.m.	Aaron Dybel	Klezmer Music
1:30 p.m.	Erick J. Martin	Granados y Albéniz, Mavericks of Cultural Revolution
1:50 p.m.	Frank Knez	Country Music Work Songs: Creation of Symbolic Community
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SCHEDULE OF POSTER PRESENTATIONS

Session 1

No	Presenters	Title
1	Duncan Dam	Degradation of Functionalized Porous Silicon in Simulated Gastric Fluid
4	Daniel Albrecht	Stability of Functionalized Porous Silicon in a Simulated Gastrointestinal Track
5	Sam Borelli	The Impact of Legal Immigration on Hourly Wages
10	Dane Nutty & Kevin Greaves	DNA Detection via Fluorescent Metal/DNA Complexes
11	J.P. Manalo	Isolating, Identifying, and Cloning Novel RAPs
13	Michael Zielinski	Photovoltaic Cells: Organic vs. Inorganic Dye-Sensitizers
16	Cory Norman	Synthesis, Characterization, and Evaluation of Bifunctional Organocatalytic Salts for Asymmetric Michael Addition
17	Ahson Ali	Analyzing Proteins That Influence Biomineralization
20	Shane Dixon	Biomineralization in Silkworms (<i>Bombyx mori</i>)
21	A. Fritsch & P. O'Rourke	Nuclear Physics at the National Superconducting Cyclotron Laboratory
24	Haris Amin	Simulation of Viscoelastic Fluids
25	Will Clarke	Recent Paintings

Session 2

No	Presenter	Title
2	Jason Siegel	Functionalization of Porous Silicon Using Microwave Radiation
3	Wassim Labaki	Probing Monolayer Stability via Deterioration of Functionalized Porous Silicon in Alkaline Environments
8	James C. McGuffey	Democracy in Nine Post Communist Countries: Consensus or Majoritarianism?
9	Syud Ahmed	Competitive Binding of Albumin and Fibrinogen on Functionalized Amorphous Carbon Surfaces
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15	Alex Nolan	Asymmetric Michael Additions Catalyzed by Tetrabutylammonium Prolinate
18	Michael McKain	Determination of Parental Progenitors in <i>E. x truncatum</i>
19	Tony Caldwell	Investigation of MAPKKK α Gene Interactions with Phosphatase Mutants Using a Yeast Two-Hybrid Approach
22	Prifogle, Fritsch, Pizarek, Shrestha	Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils
23	Feng Mai	Exact Solution of Rational Systems by Efficient Conversion to Integer Systems

Name: Syud Ahmed

Sponsor: Scott Feller (Chemistry)

Title: Competitive Binding of Albumin and Fibrinogen on Functionalized Amorphous Carbon Surfaces

Biography: Syud Ahmed is a chemistry major from Dhaka, Bangladesh. "My interest in materials chemistry and science began since I started doing research in Dr. Porter's lab during my freshman year." This research was conducted with Paul Colavita and Robert J. Hamers, Department of Chemistry, University of Wisconsin, Madison.

Abstract: Adsorption of proteins at surfaces is of great importance in a number of applications, including surface-based bioassays, biosensors, and biomedical devices such as implants. Surfaces such as silicon, diamond and amorphous carbon are commonly used during the development of these devices and are tailored such that they present functional groups which specifically bind to proteins of interest while rejecting all others. We have investigated the use of covalently bound oligo (ethyleneglycol) (EG) and trifluoroacetic acid (TFAAD) monolayers on amorphous carbon surfaces to minimize nonspecific protein adsorption, particularly that of albumin and fibrinogen. The competitive nonspecific binding of these two proteins on functionalized amorphous carbon surfaces was monitored by fluorescence scanning. We find that the amount of albumin and fibrinogen binding to surfaces can be selectively controlled by functionalizing them using EG6 or EG6 and TFAAD monolayers. These results show promise for use of amorphous carbon surfaces in many potential applications, particularly in the development of biomedical implants.

Name: Syud Ahmed (with Steven Rhodes)

Sponsor: Lon Porter (Chemistry)

Title: Putting Metal in the Microwave: Synthesis and Characterization of Molybdenum Carbonyl Complexes

Biography: Syud Ahmed is a chemistry major from Dhaka, Bangladesh. "As part of our CHE441 Advanced Inorganic Chemistry senior lab projects, we were interested in the next generation of chemical synthesis...microwave ovens!"

Abstract: The microwave has been introduced as a tool for organic and solid-state synthesis in numerous fields of chemistry. Microwaves have been implemented as advantageous substitutes for conventional hot plates, enhancing chemical synthesis by offering cleaner reaction products, higher yields, shorter reaction times and minimal energy usage. In this project, microwave-assisted reflux was used to synthesize chiral molybdenum-carbonyl-phosphine complexes. These complexes are studied as an important part of undergraduate chemistry courses for their relevance to structure and bonding, symmetry, and catalytic organic synthesis. Performing transition metal-carbonyl syntheses by conventional reflux methods often requires long reaction times, due to the kinetic stability of the metal-carbonyl bonds. In comparison to conventional reflux methods, the microwave assisted synthesis method developed in this paper reduces reaction times by optimizing the efficiency of energy transfer to the reaction mixture.

Name: Branko Alavanja (with Doug Kriech)

Sponsor: Lon Porter

Title: Heavy Metal Removal via X-Type Zeolites

Biography: Branko Alavanja is a chemistry major from Crown Point, Indiana. "This work concerns waste water remediation using zeolites, interesting solid-state materials we learned about in CHE441 Advanced Inorganic Chemistry as part of our senior lab project."

Abstract: This work focuses on using Zeolites, solid inorganic cage structures, to remove heavy metal contaminants from waste water. This study began with the successful synthesis of X-type zeolite. The white zeolite product was characterized with the use of infrared spectroscopy and its spectrum was compared to that of a reference spectrum. Following the synthesis, an attempt to collect kinetic data on the rate of ion exchange was made by putting ~1g of the X-type zeolite into a 400 ppm Co^{2+} solution and measuring the cobalt concentration at one minute intervals. Upon analysis of the result, no conclusive rate information was obtained, yet it was determined that equilibrium is reached in less than one minute. Lastly, multiple trials were carried out to find the loading capacity X-type zeolite for the ion exchange of Co^{2+} and Cu^{2+} . Mass increments of zeolite were added to a 50 ppm ion solution to achieve this. The trials revealed that the loading capacity of X-type zeolite with respect to Co^{2+} and Cu^{2+} is $418 \pm 26 \text{ g zeolite} \cdot \text{mol Co}^{-1}$ and $330 \pm 26 \text{ g zeolite} \cdot \text{mol Cu}^{-1}$.

Name: Daniel Albrecht

Sponsor: Lon Porter

Title: Stability of Functionalized Porous Silicon in a Simulated Gastrointestinal Track

Biography: Daniel Albrecht is a chemistry major from Clinton, Indiana "I signed up for a summer research internship with the chemistry department last summer and was interested in the research Dr. Porter did since it bridged chemistry and medicine."

Abstract: Due to its easily tailored surface morphology and high surface area, porous silicon (por-Si) has shown great potential toward myriad applications, including microscale sensors and biomedical implants. Unfortunately, its native hydride-termination quickly degrades under ambient and aqueous environments. Literature methods report a variety of methods that allow for the preparation of stable organic monolayers on porous silicon through direct, covalent silicon-carbon linkages. Organic monolayers of varying chain length were prepared by carbocation, thermal, and Lewis acid mediated hydrosilylation. The functionalized por-Si samples, as well as control and oxidized samples, were immersed in simulated gastric fluid and transferred to simulated intestinal fluid to replicate the conditions of potential por-Si biosensors or medicinal delivery systems in the human gastrointestinal track. Degradation of the underlying por-Si surface was monitored using infrared spectroscopy at various time intervals.

Name: Ahson Ali

Sponsor: Scott Feller (Chemistry)

Title: Analyzing Proteins that Influence Biomineralization

Biography: Ahson Ali is a senior chemistry major and French minor from Indianapolis, Indiana. "My interest in this project began when I worked with Dr. Wyman, who taught my Biochemistry course. My research experience last summer with him was an excellent opportunity to develop my laboratory skills and science ability."

Abstract: Raphide crystals of calcium oxalate (CaOx) from *Vitis labrusca* have been extracted and analyzed for proteins that are hypothesized to influence their controlled crystal morphology. These proteins have been characterized by a number of methods, including an innovative technique of crystal blotting to allow for growth of crystals in the presence of proteins that induce growth. The presence of a protein previously identified as associating with CaOx raphides by a mass spectrometry analysis was also investigated by western blotting. Further mass spectrometry analyses of proteins extracted from CaOx crystals by a Laemmli buffer wash and separation by SDS-PAGE have been submitted. We utilized dialysis against an EDTA solution to release organic material trapped within crystals, and using SDS-PAGE, we have isolated several raphide-associated proteins.

Although crystal blots and western blots have been inconclusive to this point, it has been shown that the method produces regions of both increased and decreased crystal growth. Future identification of raphide-associated proteins and their homologs will further knowledge about the process of biomineralization and may someday lead to treatments for ailments in human biomineralization disorders such as kidney stones.

Name: Haris Amin

Sponsor: Chad Westphal (Chemistry)

Title: Simulation of Viscoelastic Fluids

Biography: Haris Amin is a physics major and mathematics minor who was born and raised in Saudi Arabia but is of Pakistani nationality. "I became interested in this project after taking a course with my math professor at the time, Dr. Westphal. We then conducted a nine-week long summer research project on the subject."

Abstract: Viscoelastic fluids have properties of both solids and fluids, and as a consequence, are difficult to simulate on a computer. In this research, we simulate a viscoelastic fluid passing from a large channel to a small channel. The numerical method we use is validated by analyzing the dependence of corner vortex reattachment lengths on the viscoelastic nature of the fluid.

We employ a weighted-norm least-squares finite element method to approximate the solution to the Oldroyd-B equations. The viscoelastic nature of the fluid is characterized by the Weissenberg number, indicating the balance between the fluid and solid character of the fluid. Large Weissenberg number simulations are considered one of the most challenging problems in numerical analysis. Here, we investigate the appropriate weighted norms and approximation spaces to use.

Our numerical tests confirm vortex reattachment lengths comparable to benchmark solutions. We've also found that the use of quadratic basis functions results in the most efficient process to do this. Flow through domains with reentrant corners results in solutions with singularities, indicating unnatural infinities in the solution. Our tests indicate that one possible shortcoming of many methods is the inability to directly treat these corner singularities. Our method has a natural way to deal with these difficulties and our results are in agreement with accepted values.

Name: Ty Benefiel

Sponsor: Humberto Barreto (Economics)

Title: John Maynard Keynes and Modern Day Income Redistribution

Biography: Ty Benefiel is an economics major from Monrovia, Indiana. "Income distribution has been a problem for our country for many years, dating back to the Great Depression. I have always felt that this is a problem with our capitalist market system, and was very intrigued when I found that John Maynard Keynes, one of the world's most influential economists, felt the same way."

Abstract: John Maynard Keynes was one of the most influential economists in the world. It was his ideas of increased government spending in times of economic recessions that helped bring the American economy out of the Great Depression. Though he was an advocate of capitalism, he understood it had its flaws, and he felt that the government should step in and fix those flaws when needed. One such flaw that he recognized was the amount of inequality in the distribution of income in a free market system.

What many people may find surprising is that the inequality in the distribution of income measured during the Great Depression was actually less than it is today. Recent fiscal and monetary policy has increased this inequality. Keynes believed that macroeconomic policies such as a progressive tax and a decreased interest rate would cause a much more level distribution of income. Keynes believed by decreasing the great difference between the rich and the poor, the overall economy would benefit greatly. He also felt a responsibility to look at economics from an ethical standpoint. He would have had a great problem with the extremely wealthy upper class and the poverty-stricken lower class that plagues America today.

Name: Sam Borelli

Sponsor: Humberto Barreto (Economics)

Title: The Impact of Legal Immigration on Hourly Wages

Biography: Sam Borelli is an economics major from Elkhart, Indiana. "The illegal immigration debate continues to be a focus of media attention. Many individuals believe illegal immigrants take jobs and depress the wages of Americans. I wanted to analyze data that would clarify these accusations. Since there is not reliable illegal immigration data, I analyzed data on legal immigration and extrapolated some of the results on those immigrating illegally."

Abstract: In this paper, I examine hourly wages in high immigration and low immigration states while controlling for possible sample biases. The first model compares wages in the southern states Alabama, Arizona, California, Florida, Mississippi, New Mexico, Louisiana, and Texas to the remaining states. Model two compares wages in the highest immigration states, California, Florida, New York, and New Jersey to the remaining states. Model three compares wages in lowest immigration states, Montana, South Dakota, West Virginia, and Wyoming to the other states. Model four compares wages in Florida, the highest illegal immigration state by percentage, to other states. These comparisons are made using ordinary least squares regression techniques in order to determine the impact of legal immigration on hourly wages. Findings suggest that high immigration states have approximately three percent lower hourly wages than other states. The wage gap seen in the lowest immigration states was not statistically significant. Hourly wages in Florida were more depressed than wages in other states. These findings lead me to believe legal immigration depresses wages. In addition, I believe these results can be used to show illegal immigration depresses wages even more than legal immigration.

Name: Tony Caldwell

Sponsor: Ann Taylor (Chemistry)

Title: Investigation of MAPKKK α Gene Interactions with Phosphatase Mutants using a Yeast Two-Hybrid Approach

Biography: Tony Caldwell is a biology major with chemistry and Spanish minors. He is from Washington, Iowa. "I began working on this project this past summer as a research intern at the Boyce Thompson Institute for Plant Studies at Cornell University, and subsequently returned to the work for Independent Study under Dr. Taylor this year." The research was conducted with Kerry F. Pedley of the USDA, Gregory B. Martin of the Boyce Thompson Institute for Plant Research at Cornell, and Professor Ann Taylor.

Abstract: The yeast two-hybrid approach has been utilized extensively to examine interacting proteins through the activation of reporter-to-gene expression. This system was used to study the possible interactions between a site-specific protein (termed "bait") known to interact with the promoter region, and a second protein domain (termed "prey") known to interact with a polymerase and cause downstream transcriptional activation. By introducing the activation domain into a yeast strain that expresses the DNA-binding-domain, it is possible to detect an association between the two proteins.

The goal of the system was to determine if a MAP kinase kinase kinase gene (MAPKKK α) that was previously identified as a regulator of plant cell death interacts with a dual specificity phosphatase (dsp). Four fragments and four point mutants of the dsp were used as the "prey" domain and four variations of the kinase were utilized as the "bait" domain in our yeast screen. One of the four previously identified fragments interacted, but none of the full-length phosphatases interacted with the kinase. Discussion will center on current investigations into the yeast two-hybrid approach as well as further work with the phosphatase mutations.

Name: Eric Carroll

Sponsor: Peter Mikek (Economics)

Title: Mutual Funds vs. Stocks

Biography: Eric Carroll is a junior economics major with Spanish and mathematics minors. He is from Attica, Indiana.

Abstract: This presentation compares the performance of mutual funds to that of the stock market. I did this by looking at the average return, the standard deviation, as well as the risk relative to return. I also compare each investment to a risk-free investment so I can see the difference between those and the risk-free one. I did this for both the short run and long run.

By gathering data from different firms that have mutual funds, I compile an expected return and variance, and then compare it to stocks by looking at the Standard and Poor's index. The risk-free investments I used were U.S. government Treasury Bills. I discuss the potential problems that may affect the data, and explain why the data should be accurate. This study then concludes that mutual funds have much less variation and much less risk relative to return compared to stocks. Stocks do have a higher expected return, but they also have a higher variance, which makes them more unpredictable.

Over the long run, the risk of stocks decreases greatly, making them a fairly safe investment over the long run. However, mutual funds maintain low risk while maintaining fairly high expected returns. From this study one can conclude that mutual funds outperform stocks.

Name: Sterling Carter

Sponsor: Jim Fisher (Theater)

Title: Audience: The Final Collaborator

Biography: Sterling Carter is an English and Theater double major from Flora, Indiana. "Over the course of the Dramatic Theory and Criticism class, every student had to present an essay on the five major elements of theater. The phenomenology of the audience interested me greatly, and this is the end result of that interest."

Abstract: The audience is the final collaborator in the theatrical process. Once all other pieces of the theatrical puzzle have been placed, the audience completes the work and turns play into performance. This reliance upon an outside gaze separates theater as a unique form within the wider connotations of *art*. Whereas sculpture, painting, music, and literature may all provoke appreciation from the creation of the art, theater naturally relies upon the performance, and performance requires, by nature, an audience. Whether this audience includes just one other person or thousands, the basic need to perform theater creates a critically important role for the audience in the nature of the collaborative process. Ultimately, spectators confirm or deny a play's worth. As opposed to art or music, theater relies upon this outside influence to value a piece of art. Unlike other art forms, those who exist inside a production, as artists, may not exclude themselves from the production. They therefore must rely upon the audience's outside value judgments. This act of valuation allows the audience a participatory role in the creation of theater. Thus, the audience is a definite collaborator in the theatrical process, perhaps more so as they give theater a value and an identity as art.

Name: Kunga Choden

Sponsor: David Clapp (Present Indiana)

Title: Tourist Caves of Southern Indiana

Biography: Kunga Choden is a biology major from Kathmandu, Nepal. "I was always interested about caves and enjoyed this opportunity to learn more about them."

Abstract: Over the summer, I followed one of my favorite passions, spelunking. I did this as a Present Indiana Project, funded by Lilly Endowment Inc. My goal in this research was to educate the public about some of Indiana's underground natural wonders. Even though I did not go spelunking in the wild, I was still able to study caves in much detail. In particular, I toured the Bluespring Caverns, Wyandotte Caves, and Marengo Cave. I snapped as many pictures as I could with my camera. I also interviewed two geologists from the Indiana Geological Survey who had helped map many of these tourist caves. The history that lay behind the discovery of these caves was interesting and fun.

Name: Will Clarke

Sponsor: Greg Huebner (Art)

Title: Recent Paintings

Biography: Will Clarke is an art major from Indianapolis, Indiana. "I had finished a group of paintings and Professor Huebner recommended the Celebration to me as a way to display them to the community."

Abstract: In this collection of paintings I use mixed media to show my view on the current U.S. leadership and government. By using the President's image repeatedly, and applying it to the canvas in varied ways, I am trying to emphasize our leader's appearance, an appearance that symbolizes our government and its ways of dealing with problems.

The governance of this great country is supposed to be his focal point; and government under his watch, as measured by him and his staff's performance and execution, has made a lasting impression. This impression is one of incapability, incompetence, and an inability to deal both with problems that they have brought upon themselves and natural occurrences that they would generally be expected to deal with. Most of the time we see bewilderment brooding over the President's face, combined with a false sense of confidence and a cocky tone. I have tried to convey my feelings toward our current government through these mixed media paintings.

Name: David Coddens

Sponsor: Rick Warner (History)

Title: Red Mexico: Socialist Influences and Communism Shaping a Nation's History

Biography: David Coddens is a history and mathematics double major from Grayslake, Illinois. "I first became seriously interested in communism from our curriculum in C&T. After taking History 350 — La Capital — it became apparent to me that communism and leftist ideologies were extremely critical in shaping the politics, society, and culture of Mexico.

Abstract: Historical memory has come to drive the identity and culture of Mexico during the last few decades. I was lucky enough to see firsthand the large degree of historical memory present in Mexico on our immersion trip to Mexico City for History 350. The significance that history has played in defining who Mexicans are was certainly reinforced. This fact is perfectly illustrated by the ways in which socialist thought and communism have significantly influenced the Mexican mindset and identity.

Employing a socialist attitude in the education system along with the nationalization of Mexican industries such as railroads and oil exemplified the climax of communist support in Mexican politics. Fragmentation and disunity again plagued Communists in the post World War II era, and the official party's success would never again reach what it had during the '30s. In the Cold War era, Mexico successfully exploited the Soviet-U.S. rivalry by benefiting economically from both nations. Mexico was the Latin American nation with the most Soviet affiliation economically, and both countries wanted to gain through trade. Although the USSR attempted to pull Mexico away from the U.S., expressing anti-imperialist sentiments, Mexico realized its dependence upon their neighbors to the North. For this reason, Mexico did not benefit fully from either of their relationships with the world's two superpowers during the Cold War. Regardless of where the future of socialist concepts lies within the Mexican agenda, it is clearly evident that communism has had an incredible impact on the Mexican identity and their development of a historical memory through the years.

Name: Joe Cooper

Sponsor: Warren Rosenberg (English)

Title: Fathers and Sons Lost: Duty, Love, and Masculinity in Shakespeare's *Titus Andronicus* and *Hamlet*

Biography: Joe Cooper is an English major from Walkerton, Indiana. "I initially became interested in Shakespeare's *Titus Andronicus* after watching the film adaptation starring Anthony Hopkins. After taking Gender Criticism, I realized how prevalent themes concerning gender, and especially masculinity, were in this play, as well as in much of Shakespearean tragedy."

Abstract: Shakespeare's *Titus Andronicus* and *Hamlet* both illustrate the unique nature of the father-son relationship in tragic Shakespearean drama. There are two ways in which fathers and sons may relate to one another in these plays: their relationships either rely upon political duty or upon the demands of love. The social, patriarchal construction of the father-son relationship, then, legitimates the political fatherhood of men to their sons through such social practices as succession and execution.

At the same time, however, the duties created by these social practices make it impossible for fathers and sons to relate with one another on a personal, rather than political, level. The demands of love which men come to recognize, then, are in direct conflict with such political duties, for these demands require loyalty to family over loyalty to a political system. As such, the tragedy of these plays derives from the struggles of men to overcome this patriarchal social construction and remain loyal to the natural demands of love born out of their father-son relationships. These struggles are tragic because men recognize the demands of love only after the death of the man at whom such love is directed and, due to their conception of masculinity, can attempt to fulfill these demands only through reacting to such death violently. Ultimately, such attempts fail, and the violence born out of love leads to the very result which inspired such love to begin with: death.

Name: Clayton Craig

Sponsor: David Clapp (Present Indiana)

Title: Ouabache River Ecosystem: Agriculture and its Impact on the Wabash River

Biography: Clayton Craig is a biology major from Morristown, Indiana. "I became interested in the Wabash River when I was invited to join the Wabash River Group as part of the Present Indiana Program."

Abstract: During the summer of 2006, I canoed 340 miles of the Wabash River along with two other Wabash men. We battled heavy winds, pounding rain, and blistering heat as we paddled our way from Logansport to the Ohio River. We were the "Wabash River Group."

The WRG was comprised of a history major, a religion major, and a biology major. We each researched the river focusing on our respective majors. As the biologist in the group, the Wabash River ecosystem was a natural direction to take my research. After a week of reading and focusing my topic, I chose agriculture and its impact on the river. More specifically, I focused on various farming practices and how each impacts soil erosion along the banks of the Wabash.

While on the river, I spent much of my time observing the bank conditions as well as taking water measurements. My measurements included dissolved oxygen concentrations, conductivity, and secchi disk depths. Each was an indirect measure of the suspended solid concentration. I did this to gain a better understanding of how much soil and other sediments were being deposited into the river.

In this presentation I will offer my findings as well as share with you my experiences from the Wabash River.

I would like to dedicate my research to Mike Bachner. I was honored to share with him his love for the river. Rest in Peace Mike.

Name: Duncan Dam

Sponsor: Lon Porter (Chemistry)

Title: Degradation of Functionalized Porous Silicon in Simulated Gastric Fluid

Biography: Duncan Dam is a chemistry and mathematics double major from Hanoi, Vietnam. "Porous silicon has been a material of intense technological and fundamental interest due to its high surface area and other properties such as quantum effects, light emission, and nanoscale architecture. The research is the fundamental step for various applications of porous silicon in the biomedical field. The project was a very good opportunity for me to get involved in undergraduate research. It also contributes to the goal of my future career."

Abstract: Owing to its high surface area structure, porous silicon (por-Si) has shown great potential toward a myriad of applications including optoelectronics, biocomposite materials, and biomedical implants. However, the native hydride-termination is only metastable with respect to surface oxidation under ambient conditions. Efforts in our lab to form stable organic monolayers on porous silicon through direct, covalent silicon-carbon linkages have utilized a variety of facile yet efficient functionalization methods. Alkyl monolayers of varying chain length were prepared by carbocation, thermal, and Lewis acid mediated hydrosilylation. The functionalized por-Si samples, as well as control and oxidized samples, were immersed in simulated gastric fluids to replicate the conditions of potential por-Si biosensors or medicinal delivery systems in the human body. Degradation of the underlying por-Si surface was monitored using infrared spectroscopy and scanning electron microscopy at various time intervals.

Name: Andrew DeRolf

Sponsor: Nancy Doemel (Present Indiana)

Title: "Native" Hoosiers: A Look at the Influence of American Indian Culture on the Hoosier Heartland

Biography: Andy DeRolf is a junior history major from Shelbyville, Indiana. "I have been interested in the presentation of Indiana history and wanted to investigate Indiana battle sites, with a focus on sifting through personal accounts in archives to achieve a deeper perspective of the combatants. That brought me to the topic of the original Hoosiers and their battles here. While beginning with the battles of the past, I soon developed an interest in the battles of the future for the Native Americans in Indiana. When I learned that there were archives, battle sites, and tribal leaders I could interview, I decided that this would be a good project to further my work in historical research and my understanding of historical method."

Abstract: Who were the Native Hoosiers? My Present Indiana Project provided opportunities last summer to visit the Eiteljorg Museum of American Indians and Western Art, Mounds State Park, Tippecanoe Battle Ground, Prophetstown State Park, and, giving me historical perspective on the question, the Miami Indian archives at the Miami Nation of Indiana headquarters in Peru, Indiana.

While beginning with an eye toward the great historical battles permeating Hoosier fourth grade history classes, I interviewed Miami tribal leaders who provided insight to more current battles, including a look at stereotypes now discussed in the news. I learned that indigenous Hoosiers influenced our place names, our sports, our government, and our very identity.

This Present Indiana Project, funded by Lilly Endowment Inc., offers a good chance to combat the misinformation and ignorance that has a largely unchallenged foothold in the telling of Hoosier history. The state of Indiana abounds in opportunities to learn outside the classroom about indigenous Hoosiers; my guide to these resources will assist people in taking advantage of these educational opportunities to learn more about the state's first residents.

Name: Andrew Dits

Sponsor: Jim Fisher (Theater)

Title: Vicarious Image: A Theory of Playwriting

Biography: Andrew Dits is a philosophy major with minors in Spanish and English literature. He is from South Bend, Indiana. "I love theater and want to work in some capacity as a writer and actor in that medium after I graduate. For this reason I was attracted to Dr. Fisher's class, where I had the opportunity to fine-tune my ideas on why the theater is important for us. Playwriting is one of the areas we encountered."

Abstract: The job of the playwright is like the job of any other collaborator in the theater: to be open to changes as well as to be an assertive force in channeling the dramatic concept toward production. In this, the playwright is not a god or priest or any sort of divine interlocutor whose authority cannot be questioned. In the theatrical systems of countries and cultures all over the world we have critics, libraries, newspapers, theater companies, etc. that try to maintain the original texts of the playwright, doing them "justice." However, the mere notion of collaboration is a suggestion of the elimination of a Creator for many creators. Thus, the playwright understands he or she has created to some degree a solid life, a story that is printed in literary text format ready for transformation into a performance text.

In my presentation, I will discuss this concept of the playwright as fundamental in the process of moving a dramatic text into performance text, or from the page to the stage. I analyze two contemporary models of excellent playwrights, David Mamet and Tony Kushner, in order to further develop a notion of how the playwright collaborates in the theater. Finally, I discuss some of my own experiences with theater and film, which might help to illustrate how the playwright can collaborate in many ways, enriching the stories he or she tells.

Name: Shane Dixon

Sponsor: Aaron Wyman and Lon Porter (Chemistry)

Title: Biomineralization in Silkworms (*Bombyx mori*)

Biography: Shane Dixon is a chemistry major from Indianapolis, Indiana. "I signed up for a summer research internship with the chemistry department last summer and was interested in the biochem research Dr. Wyman was working on."

Abstract: Silkworms (*Bombyx mori*), long known for their prominent role in the manufacture and production of silk, have become increasingly important as model systems in the process of biomineralization.

One interesting element of study is that one of their organs, Malpighian tubules, contains crystals of calcium oxalate. Silkworms obtain the calcium oxalate from their diet of mulberry leaves and store it in their tubules, which developmentally and functionally resemble mammalian kidneys.

In order to characterize biochemical factors involved in the formation and maintenance of calcium oxalate crystals, the tubules were extracted and crystals isolated. Proteins associating with the crystals were extracted and separated by SDS-PAGE. Isolated proteins were then analyzed by MALDI-MS in order to identify them and also to provide insight into their potential functions. Any proteins that are isolated may aid in characterizing how calcium oxalate formation occurs *in vivo* and could lead to methods for preventing kidney stones, which are also composed of calcium oxalate.

Name: Christophe Dony

Sponsor: Warren Rosenberg (English)

Title: Representations of 9/11 in Comics: Gender Relations

Biography: "I come from Belgium where I studied Germanic languages and literatures (Dutch and English). In coming to Wabash, my goal was to specialize in American cultural studies. My interest for this topic started in Belgium where I attended a seminar on superheroes in comics and movies. As I was doing research, I realized that comics were intrinsically connected with socio-economical, political and cultural realities, and therefore decided to explore how this intriguing medium fascinatingly dealt in multiple ways with the historical events of September 11th 2001."

Abstract: In the wake of September 11th 2001, America strove to stand strong and united to face the atrocities it was challenged with. However, this unity was far from being genuine in terms of gender relations. Indeed, the media and the Bush administration rapidly conceptualized the early aftermath of the events in terms of war rhetoric and conventional gender representations. For example, Diana Taylor observes that the New York Times September 13th's cover presents "an army of men amidst a sea of rubble."

The comic medium has always been dominated by the male individual. Secondly, it often has portrayed women in a voyeuristic, fetishist fashion, appealing to the important young male audience. Considering both the pro-masculine status of the medium and the patriarchal representation of 9/11 in the early aftermath, it is not surprising to observe that most of the comics depict conventional masculinity and femininity. However, it is interesting to notice that those traditional views have been challenged by women artists offering alternative representations of 9/11. This presentation attempts to further explore those conventional and alternative representations of 9/11 in terms of gender relations, while considering multiple responses from various compendiums dedicated to the events—including Marvel, DC, and Alternative Comics. More specifically, it sheds light on different themes such as the male hero motif, the symbolism of the Twin Towers, the conventional representation of women, the body, and last but not least, the challenging representation of 9/11 by women artists.

Name: Shayne Dube

Sponsor: Tim Lake (English)

Title: Indiana: Alive with "Little Known" African American History and Historical Markers

Biography: Shayne Dube is an English major from Indianapolis, Indiana. "I became interested in this project after conversations with Prof. Lake about the summer research program that he was sponsoring."

Abstract: From Lyles Station, an African American settlement in Gibson County, to Bell Hollow, a road named after a locally well-known African American man in Perry County, Indiana is alive with history and historical markers from the African American community. I spent a majority of last summer traveling to counties in Southwest Indiana in search of some of this history. Much of it is well-known locally but has never been documented or published outside of the local library or historical society. Some of it is little known even locally and could only be discovered through "on the ground research," which included literally going from door to door asking people if they were aware of any history in the area. This experience yielded information that I believe should be exposed to everyone coming into contact with Indiana and the state's history.

Name: Aaron Dybel

Sponsor: Lawrence Bennett (Music)

Title: Klezmer Music

Biography: Adam Dybel is a music and psychology double major from Libertyville, Illinois. "I needed to write a paper for my music senior seminar and I enjoyed listening to gypsy music and music similar to that and eventually my paper topic turned into klezmer."

Abstract: My presentation is a broad overview of the development of klezmer music. To begin with, it will discuss the Old World musicians. I will describe their importance during this time in wedding rituals and celebrations and how despite this importance, they were still at the bottom of the social caste. I will then move on to talk about the klezmer musicians' move to the United States and the reasons for the move. Two of the most famous klezmorim during the 1920s and 1930s were Naftule Brandwein and Dave Tarras. They had very different playing styles and radically different performance habits.

Unfortunately, due to several events, including the holocaust, klezmer music became highly out of fashion during the 1950s and 1960s and thus was only played at private clubs and cafes. It was not until the 1970s that revivalists, such as Andy Statman, helped klezmer music to once again become popular. In the 1990s there have been several bands that have stretched what klezmer is. Two such bands are the Klezmatics and Brave Old World. They have given the music a different sound and their lyrics no longer deal with religion, but topics ranging from the fall of the Berlin Wall to marijuana. Later in the nineties, musicians have pushed klezmer even further by creating such novelties as klezmer rock, Hasidic ska, and Hasidic trance. The most famous of the musicians pushing what klezmer is, is John Zorn. Through him, Jewish music has become an accepted genre among the avant-garde.

By the end of this presentation I hope that one will be able to see how pluralistic the genre has become in such a short period of time.

Name: Brandon Ehrie

Sponsor: Rick Warner (History)

Title: Master and Servant Law: A British Atlantic Historical Analysis

Biography: Brandon Ehrie is a history major from Lafayette, Indiana. "This is my senior seminar project. I am very interested in legal history and am in the process of applying to law school. Also, indentured service is sometimes neglected by historians who tend to be more interested in slavery. Hence, it was my intent to make others more aware of this form of colonial bondage."

Abstract: Most historical scholars claim that American law governing labor relations in the Early Republic was steeped in the hierarchies and status titles supplied by the English common law of master and servant. Also, that the legal terminology of master and servant law implied a fundamental inequality between those who hired and those who worked under an indenture.

While these two widely accepted notions are somewhat true, I am going to prove that more voluntary principles also informed the American labor law, which set it apart from the more feudally inspired English law of master and servant.

Finally, the fundamental principle of American labor law in the early republic was a commitment to contractual freedom for the white adult worker. Americans who had recently emerged from their dependent status to England were not eager to incorporate a lot of English legal concepts of subordination into the new domestic system of law. Still, a number of factors contributed to the demise of this labor system. Changes in bankruptcy laws, especially the abolition of imprisonment for debt, and the American Revolution advanced processes that eventually led to the demise of indentured servitude.

Name: Brandon Ehrie

Sponsor: Yvonne Pitts (History)

Title: Alcatraz: Contrary to Popular Belief

Biography: Brandon Ehrie is a history major from Lafayette, Indiana. "This is my work from my History 340 class (Crime and Punishment in U.S. history). I have always been fascinated with the prison on Alcatraz Island, but was not sure of its operating procedures during its time as a Federal prison. Thus, this paper shows just how brutal and inhumane this maximum-security prison was."

Abstract: The mystique of Alcatraz has become a huge part of American culture because of the prison's gruesome reputation. Hence, it is my intent to set all of these widely accepted misconceptions about Alcatraz straight. It is a mistake to believe that all prisoners and prison officials think alike and hold identical opinions about Alcatraz. The fact is that much previous historical work is merely informative and does little to actually analyze the prison's reform tactics. I believe that, while Alcatraz seemed like an appropriate solution to dealing with troublesome inmates, distorted facts presented to the press and public by manipulative officials are another reason why the prison closed in 1963. A system was created at Alcatraz that allowed some officials to have too much power and political influence. It also allowed the privilege of too much secrecy in determining how the men lived, survived, or died. Finally, Alcatraz became a law unto itself and it should be with shame that our federal prison system looks at this prison, rather than holding it in high esteem and considers it a great success.

Name: Zach Foughty

Sponsor: Humberto Barreto (Economics)

Title: The High Costs of Medicaid Enrollment: An Empirical Analysis of the Effect of Income Relative to Poverty Level in the Medicaid Program

Biography: Zach Foughty is an economics major from Ossian, Indiana. "I became interested due to an internship with the State Office of Management and Budget in Government Efficiency and Financial Planning."

Abstract: This study uses data from the March 2005 Supplement of the Current Population Survey (CPS) to examine how strong of an impact income relative to the poverty cut-off has on Medicaid enrollment status for residents in the state of Indiana. To control for variables that may confound results, a multivariable probit model is used to predict the probability of an individual being enrolled in the Medicaid program.

The purpose of the study is two-fold: first, as the cost of Medicaid to the American taxpayer continually rises, it must be evaluated whether there is a substantial number of people who can afford health insurance who are taking advantage of the Medicare system. If cheating of this nature is prevalent, improved auditing could cut down on Medicaid fraud and reduce costs to the taxpayers. Secondly, are those who qualify actually enrolling in the Medicaid program? Social welfare programs are there to be utilized by those who qualify, and this study will explore to what extent the most needy individuals are actually enrolled in the program.

Finally, three main "costs" can severely depress enrollment rates: (i) lack of information (information costs), (ii) intensive application processes (process costs), and (iii) shame which may result from enrollment in a welfare program (outcome costs). By identifying and correcting for these costs, the state can theoretically increase enrollment rates of deserving, lower income Hoosiers. The steps that the current being Daniels' Administration are undertaking to decrease these costs will be discussed to tie the research to current state affairs.

Name: Adam Fritsch (with Patrick O'Rourke)

Sponsor: James Brown (Physics)

Title: Nuclear Physics at the National Superconducting Cyclotron Laboratory (NSCL) with the Modular Neutron Array (MoNA)

Biography: Adam Fritsch is a physics major from New Alsace, Indiana. "I am interested in research physics and wanted to see if nuclear physics would be a passion of mine."

Abstract: The Modular Neutron Array (MoNA) was built by undergraduates, and continues to be used in ways that are designed to involve students in experimental work and data analysis. The MoNA collaboration is a group of faculty and students from nine colleges and universities that work together to study the structure of nuclei close to or slightly beyond the neutron drip-line. The experimental work is carried out at the National Superconducting Cyclotron Laboratory at Michigan State University. The focus of this research is on the structure of the neutron rich oxygen and carbon isotopes. In particular, the excitation energies of the neutron-unbound states in these nuclei are determined by measuring the neutrons and fragments in coincidence. The energies and directions of the emitted neutrons are measured using MoNA. The charged fragments are deflected out of the main beam by a sweeper magnet, and tracked using cathode-readout drift chambers and scintillators. The evolution of shell structure is investigated with MoNA by examining both bound drip-line nuclei and their unbound neighbors. During the experiment, we sent a ^{48}Ca ion beam through a Beryllium target, which produced multiple fragments of particles. These fragments are also often produced in excited nuclear states by this non-selective fragmentation process. To understand and reconstruct these states, the fragments need to be tracked and identified. During different work shifts, members of the collaboration monitored and analyzed the paths of the fragments, and the neutrons once they entered MoNA. We, in particular, aided in the experiment by writing code for software designed to model the paths of particles passing through MoNA and by documenting and tracking necessary code for software used to analyze the actual flights of the neutrons.

Name: Adam Fritsch (with Kyle Prifogle, Tom Pizarrek, and Sabir Shrestha)

Sponsor: Martin Madsen (Physics)

Title: Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils

Biography: Adam Fritsch is a physics major from New Alsace, Indiana. "We started working on this project as a part of Physics 114 Electricity and Magnetism class."

Abstract: Understanding the motion of electrons, and other charged particles, in a magnetic field is a vital part of many modern applications in science, technology, and medicine. Applications that utilize magnetic fields to shape the motion of charged particles include high-energy particle accelerators, mass spectrometers, cathode ray tube monitors, microwave ovens, and x-ray machines.

In our experiment, the magnetic field from a pair of Helmholtz coils was measured both on- and off- axis using a Hall-effect probe. A beam of electrons with initial velocities ranging from 6000 km/s to 11,000 km/s was formed in the center plane of the Helmholtz coils. The electron beam scattered off of a background hydrogen gas in a sealed tube, exciting the hydrogen atoms and resulting in blue fluorescence. The resulting, nearly circular, path of the electron beam was analyzed by taking long exposure digital photographs of the fluorescence and analyzing the images.

The electron motion was compared to two models for the beam path as a result of the magnetic field. The first model assumed a perfectly uniform magnetic field. The second model utilized numerical solutions of the coupled differential equations of motion for the electron beam using the real magnetic field as measured from the Helmholtz coils. The magnetic field measurements, the electron beam measurements, and the comparison to the two models are presented.

Name: Kevin Greaves (with Dane Nutty)

Sponsor: Lon Porter (Chemistry)

Title: DNA Detection via Fluorescent Metal/DNA Complexes

Biography: Kevin Greaves is a chemistry major from Fort Wayne, Indiana. "As part of our Chemistry 441 Advanced Inorganic Chemistry senior lab project, we wanted to study the overlap of inorganic chemistry and biology."

Abstract: This research project studied the photo-physical properties of two ruthenium polypyridyl – $\text{Ru(phen)}_2\text{dppz}^{2+}$ and $\text{Ru(bpy)}_2\text{dppz}^{2+}$ – that display strong fluorescence only in the presence of DNA. These complexes, when alone in solution, show negligible fluorescent activity, which makes them very practical for the detection and investigation of DNA.

The first objective of the research project was the synthesis of these two complexes. The second objective was the characterization of the complexes and the exploration of the two complexes' interactions with DNA, focusing mainly on the fluorescence of the complex in the presence of DNA. Both complexes showed DNA concentration dependent fluorescence, demonstrating a facile method of quantitative DNA detection.

Name: Chris Greisl

Sponsor: Rick Warner (History)

Title: A Cup of Joe: Coffee's Impact on Colonial History

Biography: Chris Greisl is a senior history major from Carmel, Indiana. "My senior seminar class allowed me to conduct extensive research over a topic relating to Atlantic History."

Abstract: It is apparent that an overview of a commodity examined throughout the colonial period carries connections that greatly affect multiple societies across the world. Through the absence of remaining permanently isolated, commodities throughout the colonial period impact various cultures, economies, governments, immigration patterns, and other pertinent aspects of shaping a society. These cross-cultural connections established by commodities are imperative for understanding how ideas transverse from one side of the globe to another.

One commodity that was extremely important for shaping aspects of colonial society was coffee. From Indonesia to Europe to Latin America, coffee significantly traveled the Atlantic in becoming a quintessential export crop. As the demand for coffee began to increase, societies, more specifically wealthy elites, began to see the advantages of turning this commodity into a very profitable form of income.

Through the observation of coffee producing societies in Indonesia, Europe, and Latin America throughout colonial history, it is apparent that the production of coffee created a capitalistic society that was eager to enter the world economy by inducing forms of forced labor, by creating and maintaining private, independent ownership of the coffee industry, and by allowing elites to control and ultimately monopolize the production and trade of the commodity.

Name: Samiul Haque

Sponsor: Peter Mikek (Economics)

Title: Expected Return-Risk Premium Relation and Long Run Risk of Stock

Biography: Samiul Haque is an economics and mathematics double major from Dhaka, Bangladesh. "I got introduced to the long run risks of stocks from my banking class. I read some past research that was contrary to what we were being taught."

Abstract: Theory tells us stock holders should be compensated for risks in the form of a risk premium. Higher risks should be associated with higher expected returns. This paper tries to find evidence from the stock market about the expected return-risk premium nexus and finds a positive relation between the two as supported by theory. The long run risk of common stocks is also investigated in this paper. Theory tells us that the stock market is risky only in the short run, but if one invests for the long run, then it is not very risky. However, the use of different measures of risk shows that the popular notion of "stocks are less risky in the long run" is far from clear. In fact all of the measures of risk used in this paper make us incline towards the finding of Zvi Bodie who concluded that stocks are more risky in the long run than in the short run.

Name: Charles Hoogland

Sponsor: Victor Karandashev and Brenda Bankart (Psychology)

Title: Stereotypes of Asian Americans: Not "All Good" After All

Biography: Charles Hoogland is a psychology major from Indianapolis, Indiana. "I wanted to know more about how Asian Americans are viewed in society because, much like fraternity men, common beliefs about Asian Americans include both positive and negative traits. After some reading about Asian American stereotypes, I realized that there have been few, if any, attempts to synthesize the various lines of empirical research in the nascent field of Asian American stereotyping in the past. Thus, I decided to write my psychology senior seminar literature review about stereotypes of Asian Americans and how they have had profound impacts on Asian Americans."

Abstract: Asian Americans are viewed by many as resistant to full integration into American society, making them "perpetual foreigners," a component of the Yellow Peril stereotype (Abreu, 2003). Asian Americans are often viewed as being "all the same" (Agbayani-Siewart, 2003). Asian Americans are ambivalently stereotyped as being highly competent but rather cold (Fiske, Xu, & Cuddy, 1999). As Asian Americans are often expected to be excellent students but not athletic, they are often evaluated positively when playing the role of college pupils but negatively when depicted as basketball players (Kawai, 1999; Barden, Maddux, Petty, & Brewer, 2004). The activation of stereotypes of Asian Americans as being good at mathematics has been found to either help or hurt performance on math tests, depending on the experimental design (Shih, Pittinsky, & Ambady; Cheryan & Bodenhausen, 2000).

Members of different racial groups and cohorts hold diverse views of Asian Americans, though the evidence about what they are sometimes conflicts, especially with regard to African Americans (Cummings & Lambert, 1997 and Gilbert Carr-Ruffino, Ivancevich, & Lownes Jackson, 2003). Stereotyping has had an impact on Asian Americans, as teachers likely treat Asian American students differently from African American students and European American students (Chang & Sue, 2003), and Asian American males suffer from stigmatization as being "unmanly" from a traditional American standpoint (Mok, 1998). Media images have also impacted Asian Americans' standards of beauty (Mok, 1998). Finally, and perhaps most importantly, societal and parental expectations (which have likely been influenced by popular stereotypes) have led to Asian American youth limiting their future vocational goals (Kao, 2000).

Name: Jesse James

Sponsor: Yvonne Pitts (History)

Title: The British Legacy in the Old Northwest: A Look at Territorial Probate Law in the Northwest Territory

Biography: Jesse James is a history major from Sullivan, Indiana. "I cannot pinpoint why the inheritance concept interests me. Talking with Dr. Pitts and seeing the concept's importance to human history was very inspiring. I owe much of my passion to her."

Abstract: Two hundred acres, 25 head of cattle, 34 white ceramic dishes, one wagon, three metal-frame beds, 36 pounds of linen, and \$300 debt are typical components of the territorial man or woman's estate inventory. Three months in jail, \$50 in fines, and a hanging post are typical components of the murderer's last actions in the Old Northwest.

Between 1785 and 1820 in the Northwest Territory more attention was given to that estate list and less to that murderer's trial.

This project traces the roots of inheritance on Americans' first entity, the Territories. By looking at the history of probate on the territorial frontier we can see that the British dynastic legacy is larger than life. Literally. After one's death, the legacy takes over. The Northwest Ordinance dictates and guarantees family's to testate and intestate property. What we are left with is a battle between the American tradition of open markets and individual freedoms and the subliminal British legacy that creates miniature "monarchs" and "dynasties" on America's frontier. Wills and testamentary documents from the period give us a glimpse into this jurisprudential fight by the Motherland. Were our frontier ancestors, through the similarities of the American probate system to British common law, granted the right to a family dynasty?

Name: Jesse James

Sponsor: Rick Warner (History)

Title: Shaky Ground: Mexico City is Sinking and I Want To Know Why!

Biography: Jesse James is a history major from Sullivan, Indiana. "I am an environmental historian. I love to explore the relationship between humans and nature. After seeing a picture of tilted churches in the City I wanted to learn why!"

Abstract: The Metropolitan Cathedral, one of the world's most renowned structures, is sinking? The Tower of Pisa leans and we all call it the "Leaning Tower." Why does Mexico City not get such notoriety? They do actually; just not in a literally famous name.

Mexico City's ancestor, Tenochtitlan, was an island city amongst the lagos azul of the Valley of Mexico. We've all heard the story behind its divine upbringing. We've seen the flag. But has this very legacy brought the modern world's Mexico City to its knees begging for relief?

History tells us the whole "city on a lake" thing is not the primary culprit. In fact, the relationship between the Aztecs and their environment was rather healthy. They constructed floating gardens, irrigation systems, canoe causeways, fortified pyramids, and rising temples, all at the mercy of and support from the lakes themselves. This all changed, however, when the new Spanish proprietors decided to fill in the city to accommodate their European lifestyle. What began as a project to widen the island-to-shore pedestrian walkways in order to accommodate the equestrian's wagon resulted in a project catered to urbanization that eventually claimed all the waters surrounding Tenochtitlan.

Indeed, Mexico City has a lively and fascinating hydrogeological history. We find relationships between society and nature that affect everything from societal growth and urban planning to political platforms and environmental reformation. Did the Aztecs do something the Spaniards did not? Did the Spaniards attempt projects better suited for European soil? We will look at these very things.

Name: Manbar Khadka

Sponsor: Joyce Burnette (Economics)

Title: The Effect of Gender on Wages in the United States

Biography: Manbar Khadka is a senior economics major from Lalitpur, Nepal. "In Labor Economics, we learned theories of discrimination that explain how minorities and women are discriminated against in the labor market. I was interested to learn more about it and so I did my research paper on "Wage Differential between Sexes."

Abstract: This paper uses the CPS Basic Monthly Survey for February 2006 in order to track the effect of gender on wages in the US. A variety of models are constructed in an attempt to include variables that might be correlated with an individual's weekly earnings. Regression analysis run on these models confirms that gender does have an effect on wages and basic human capital variables do not explain the wage differential.

Moreover, Oaxaca's decomposition method applied to estimate gender differentials report a wage differential of log 0.38 points between the sexes. Out of log 0.38 points, a difference of log 0.01 points is attributed to male and female mean characteristics, while the remaining portion of log 0.37 points is attributed to unexplained factors, including discrimination.

Though this paper establishes a relationship between gender and wages, the results obtained could have been further improved by adding more explanatory variables in the regression models. Variables that are used to explain variation in weekly earnings are age, sex, race, education, experience, and region. A regression analysis is conducted to estimate the wage differential between sexes.

Name: Frank Knez

Sponsor: David Timmerman (Rhetoric)

Title: Country Music Work Songs: Creation of Symbolic Community

Biography: Frank Knez is a senior rhetoric major from Portage, Indiana. "I wanted to investigate why I turned to country music when I came to Wabash, and why I continue to love to listen to it today."

Abstract: Pride, family, and religion. These three characteristics symbolize the working class of America. Qualities such as these have been at the heart of the life of the farmer, steelworker, coalminer, and factory worker for generations.

Pride, family, and religion also reside in the heart of country music, more specifically the "work songs" of country music. Country music icons such as Merle Haggard, Johnny Cash, and Alabama, as well as contemporary country star Jason Aldean, have all contributed to this genre.

Through the lens of narrative criticism, the notion of Kenneth Burke's identification, and conceptions of musical critique developed by Sellnow and Sellnow, this paper analyzes country music work songs to determine if a rational story in combination with congruency affects the understanding or message of the song. The "Illusion of Life" rhetorical perspective allows for a rhetorical analysis on how the entire song functions rhetorically. From my study, I conclude that it is evident that the understanding of a song is affected by both the lyrical and musical content.

Name: Doug Kriech (with Branko Alavanja)

Sponsor: Lon Porter (Chemistry)

Title: Heavy Metal Removal via X-Type Zeolites

Biography: Doug Kriech is a chemistry major from Indianapolis, Indiana. "This work concerns waste water remediation using zeolites, interesting solid-state materials we learned about in CHE441 Advanced Inorganic Chemistry as part of our senior lab project."

Abstract: This work focuses on using Zeolites, solid inorganic cage structures, to remove heavy metal contaminants from waste water. This study began with the successful synthesis of X-type zeolite. The white zeolite product was characterized with the use of infrared spectroscopy and its spectrum was compared to that of a reference spectrum. Following the synthesis, an attempt to collect kinetic data on the rate of ion exchange was made by putting $\sim 1\text{g}$ of the X-type zeolite into a 400 ppm Co^{2+} solution and measuring the cobalt concentration at one minute intervals.

Upon analysis of the result, no conclusive rate information was obtained, yet it was determined that equilibrium is reached in less than one minute. Lastly, multiple trials were carried out to find the loading capacity X-type zeolite for the ion exchange of Co^{2+} and Cu^{2+} . Mass increments of zeolite were added to a 50 ppm ion solution to achieve this. The trials revealed that the loading capacity of X-type zeolite with respect to Co^{2+} and Cu^{2+} is $418 \pm 26\text{ g zeolite} \cdot \text{mol Co}^{-1}$ and $330 \pm 26\text{ g zeolite} \cdot \text{mol Cu}^{-1}$.

Name: Wassim Labaki

Sponsor: Lon Porter (Chemistry)

Title: Probing Monolayer Stability via Deterioration of Functionalized Porous Silicon in Alkaline Environments

Biography: Wassim Labaki is a biology major from Hacienda Heights, California. "The applications of porous silicon are very promising, seem limitless and are revolutionizing many fields including healthcare and electronics. The opportunity to work on the fundamental chemistry behind porous silicon is mainly what led me to become interested in this project."

Abstract: Porous silicon (por-Si), a unique nanocrystalline form of silicon has demonstrated great potential for a variety of applications. However, hydride-terminated por-Si is easily oxidized to silicon dioxide and dissolved under alkaline conditions.

Using thermal assisted, Lewis-acid catalyzed, and carbocation mediated hydrosilylation methods, we have functionalized por-Si surfaces with alkyl monolayers. Transmission FTIR spectroscopy indicates that the functionalization of the por-Si surface provides greatly-improved stability for an extended period of time in alkaline environments (aqueous, pH 12-14).

In each of the three reactions presented, the stability of the alkyl-functionalized por-Si surface was greatly improved when compared to the unfunctionalized control sample. The functionalized samples oxidized and dissolved at a greatly reduced rate when compared to the deterioration rate of the silicon-hydride control sample. Based on these initial results, the thermal reaction appears to give the greatest enhancement of stability.

Name: Anthony Lewis

Sponsor: Jim Fisher (Theater)

Title: Designed to Tell

Biography: Anthony Lewis is a theater and English double major from Rio Grande City, Texas. "I originally wrote this paper for my theater criticism class."

Abstract: My paper focuses on how designers tell their story. As with all other aspects of theater, design is a collaborative effort. Without the input of the other dramatists (director, actors, and fellow designers), it would be impossible for the individual designer to do his/her job. My paper examines how they walk the line between what the playwrights seems to want, what the director wants, and what they want. How well they are able to convey their view of the story, while working collaboratively with the other dramatists, determines how successful they are as a dramatist. My presentation will discuss what I feel makes a designer successful or unsuccessful at conveying their own ideals in their chosen media.

Designers (scenic, lights, sound, and costume), like everyone else who creates theater, are artists. However, unlike everyone else who is involved with theater, they are more concerned with the visual aspects of theater than with its physical or verbal aspects. Working together, they discover how to design a visual concept that assists the actor in telling the story that the director has decided the playwright is trying to tell, while at the same time putting their own stamp on the production.

Plays are meant to be seen. While they may have begun life as words on a page, and may enjoy a limited readership, plays today rely on being seen by an audience. When the audience comes to see the play, they are not solely interested in the words or actions of the actors on stage; they are also interested in the design elements utilized to articulate those words and actions. Theater without designers is dead. Designers give the written word life. In many ways, they design to tell.

Name: Kyle Long

Sponsor: Charles Blaich (Center of Inquiry)

Title: Wabash Community Conceptions of 'Critical Thinking'

Biography: Kyle Long is a senior classical civilizations major and English literature minor from Crown Point, Indiana. "My influences on this project were the University of St Andrews, Dr. Mark Brouwer, and Dr. Charles Blaich."

Abstract: My research investigates how members of the Wabash College Community conceptualize the term 'critical thinking.' Some in higher education champion the phrase as a skill every educated person should strive for, while others dismiss it as vague and confusing language. Regardless, 'critical thinking' is here to stay, it seems. Especially at Wabash, where 'critical thinking' appears in the first line of our mission statement, on the back of faculty business cards, the front page of the *Bachelor*, etc., ad nauseam. Still begging the question, what does 'critical thinking' mean? In attempting to answer this question, I intend for far greater implications than producing a mere definition, but rather in creating a better campus-wide understanding of critical thinking, thus benefiting both pedagogy and student achievement, while helping Wabash College to more confidently fulfill its mission statement.

During my presentation you'll learn about both the history of 'critical thinking' in higher education and contemporary scholarship on the term and its application. But most importantly you'll hear how Wabash College students, faculty, administrators, and alumni conceptualize critical thinking, and how our collective conceptions affect teaching and learning.

Name: Kyle Long

Sponsor: Jeremy Hartnett (Classics)

Title: The Transformation of Liberal Education in Rome

Biography: Kyle Long is a senior classical civilizations major and English literature minor from Crown Point, Indiana. "My influences on this project were the Center of Inquiry and the Classics Department faculty. I would also like to thank Trent and Nick for all their help."

Abstract: For the longest time, researchers have looked to Greece when searching for the origins of the modern concept of a liberal arts education. They have done so for good reason as the Greeks were certainly active in creating an education suitable for a free man. In focusing attention on the fifth century Greeks, however, scholars have largely rejected the contribution of the Romans of the first century BC. My paper is an attempt to redirect scholarly interest to this period in Rome in the search for the foundations of a liberal arts education. By closely examining two texts—Cicero's *De Oratore* and Vitruvius's *De Architectura*—I suggest that Romans had transformed the Greek idea of liberal education from the loosely understood collection of disciplines that comprised the education of a free citizen into a tighter curriculum of liberal arts studied by an aspiring professional for the purpose of utility.

During my presentation the audience will learn about the obstacles researchers must overcome when searching for the origins of liberal educational theory, the contributions of both the Greeks and the Romans, the influence of Cicero and Vitruvius, and what we can learn about contemporary liberal education from the ancients.

Name: Feng Mai

Sponsor: William Turner (Mathematics)

Title: Exact Solutions of Rational Systems by Efficient Conversion to Integer Systems

Biography: Feng Mai is a mathematics major from Xiangtan Hunan, China. "This is the research project our group (including Matthew Reyna, Case Western; Zachary Roth, Hastings; and Amanda Watkins, Evansville) did for Wabash Summer Institute in Algebra."

Abstract: Wiedemann (1986), Dixon (1982), et al. provide nontraditional methods for finding the exact solutions of linear systems of equations. Some of these methods are especially efficient for sparse systems, whose solutions may be untenable with traditional techniques. Dixon's method works exclusively over the integers modulo a prime p , and Wiedemann's method works most efficiently over the integers modulo p . Therefore, given a (possibly sparse) system with rational coefficients, there is an interest in converting it to a system with integer coefficients for efficient solution by one of the aforementioned methods.

The current prevalent method for conversion involves multiplying the entire system by the least common multiple (LCM) of all of the denominators in the system. We improve upon this method by presenting two methods of conversion that preserve the solution set of the system.

One method, which involves multiplying each row by the LCM of its denominators, has time complexity $O(\eta^2 n)$ and space complexity $O(\eta n)$, while the other method, which involves multiplying each row by the product of its denominators, has time complexity $O(\eta n \log(\eta)^2)$ and space complexity $O(\eta n)$ for linear systems of n equations with n nonzero coefficients. Each method has advantages in varying circumstances.

Name: Omar Mainuddin

Sponsor: David Polley (Biology)

Title: BioCrossroads: Science for Life, Growth for Indiana

Biography: Omar Mainuddin is a biology major from Dhaka, Bangladesh.

Abstract: I will be presenting about BioCrossroads because it helped to bring together the Indiana life science assets, academic institutions, and corporate assets to form a life sciences initiative that is opening windows to more jobs and innovations in the life sciences industry, thereby improving the state's economy. To me this seemed to be a unique scenario that the state of Indiana represented and finding out more about it would be interesting and useful to science and business students alike, as well as researchers at the graduate level or higher.

Name: J.P. Manalo

Sponsor: Scott Feller (Chemistry)

Title: Exact Solutions of Rational Systems by Efficient Conversion to Integer Systems

Biography: J.P. Manalo is a biology major from Fort Wayne, Indiana. "I became interested with the project after Dr. Aaron Wyman described to me the possible medicinal value of the research."

Abstract: Calcium oxalate (CaOx) crystals are synthesized by many eukaryotic species including grape (*Vitis labrusca*). It is hypothesized that these crystals serve a number of functional roles including protection against predation and detoxification of heavy metals. In addition, it has been hypothesized that formation of CaOx crystals, which often occurs in specialized cells termed idioblasts, is a mechanism to remove excess calcium from the cytosol. Excess calcium is toxic to many eukaryotic systems. CaOx from plants exhibit numerous morphologies; within grape idioblasts, they form needle-like bundles called raphides which contain both inter- and intramolecular proteins.

The purpose of this research is to isolate and identify any raphide associated proteins (RAPs), and characterize their functions in the development of calcium oxalate crystals. Raphides were isolated from grape idioblasts and RAPs solubilized from the crystals. These RAPs were separated by SDS-PAGE and analyzed by MALDI-MS in an attempt to identify these proteins (Hall et. al, 2003). BLAST searches were conducted to identify other eukaryotic homologues of the isolated RAPs. Genes encoding for a number of these homologues were selected for cloning. Primer sequences were created for these target genes and utilized in polymerase chain reactions.

We are particularly interested in how RAPs may control the growth and morphology of CaOx crystals. Previous research has suggested that proteins associated with CaOx crystals from numerous organisms are involved in controlling their morphology. In addition, calcium oxalate is a chief component of kidney stones in humans. By isolating plant RAPs, we anticipate identifying human protein homologues which may be involved in controlling the size and growth of kidney stones. The ultimate goal of this research is to find new methods of treating the debilitating condition of kidney stone formation in humans using biological molecules. This project has the potential to be an invaluable medicinal tool.

Name: Erick J. Martin

Sponsor: Lawrence Bennett (Music)

Title: Granados y Albéniz, Mavericks, and Archetypes of a Social Revolution

Biography: Erick J. Martin is a music and economics double major from Chicago, Illinois. "I became interested in Spanish music on my immersion trip to Ecuador. It was there that I learned about these great composers whom I had never known to exist before. I was amazed at how the music was put together; how it was such a blending of Western Style and Spanish folk tradition."

Abstract: Enrique Granados and Isaac Albéniz were two of the most important composers in Spanish history. After Spain's immense loss of global power, Spain seemed to also lose its national cultural identity. During the seventeenth through the early nineteenth centuries, most if not all thriving musicians and artisans were of Italian and French descent, as was the monarchy in power. Although they were not the first Spanish composers to do so, they were the driving force of the Nationalist movement which brought with it a strong sense of identity and cultural promotion. Granados and Albéniz were close friends, major contemporaries, and they lived somewhat parallel lives.

Drawing upon the folk music of the distinct provinces of Spain, each composer highlights their natural and learned abilities, while creating a sound that is as unique in its conception as it is in its formation. Albéniz, the piano virtuoso, had a much stronger sense of form than Granados, and his music had a definite impressionist style. Granados, by comparison, was much better at improvisation; his music tended to grow from a single point like a tree, and branch out in many different directions. Granados liked his music to evolve, to take on a life of its own. This presentation will explain the subtle nuances which make each composer great, and also will show their relative impact on the Western world at large.

Name: James C. McGuffey

Sponsor: David Timmerman (Rhetoric)

Title: Speaking Ourselves out of the State of Nature: Rhetorically Enhancing Social Contract Theory

Biography: James C. McGuffey is a rhetoric and political science double major from Arcadia, Indiana. "The nature of my double major guided me to this project, as I was looking for a way to combine them. Social contract theory sparked further interest because, for me, it captures the goals of contemporary rhetorical theory."

Abstract: Plato's *Crito* put forth an important question for society, asking why we should follow the rules and laws of the societies we live in. Searching for a means to answer this question, Enlightenment period philosophers, most notably Hobbes, Locke, and Rousseau, began to construct social contract theory. The social contract theory provides that man consents to live within civil society and is therefore bound by its laws. This theory seeks to answer how society formed and, further, why civil societies have legitimate authority to act. However, a number of criticisms of social contract theory focus on the lack of a process by which the contract arises and is maintained.

This paper finds that rhetorical theory provides a way to describe the process of social contract, reviving social contract theory, while also describing rhetoric's role in the creation and maintenance of civil society. The rhetorical theories of Kenneth Burke, Edwin Black, Michael McGee, and Maurice Charland shine new light on Rousseau's "general will" and "pact of association," describing how individuals are able to consent to society. A rhetorical consideration of Rousseau's concepts finds that the creation of civil society is itself a rhetorical act. In turn, the rhetorical act constituting a civil society allows further exploration of how and why civil societies function, as well as how and why they should function.

Name: James C. McGuffey

Sponsor: Melissa Butler (Political Science)

Title: Democracy in Nine Post Communist Countries: Consensus or Majoritarian?

Biography: James C. McGuffey is a rhetoric and political science double major from Arcadia, Indiana. "I became interested in this project after reading *Patterns of Democracy* by Arend Lijphart. I felt that seven years after publishing the book there were a number of countries that could be added to his study."

Abstract: Until the publishing of Arend Lijphart's *Patterns of Democracy*, it had been assumed that majoritarian democracies perform faster and better than consensus democracies. However, Lijphart's research found that consensus democracies tend to manage their economies as well as majoritarian democracies, while outperforming them on indicators of democratic performance. Since *Patterns of Democracy* was published in 1999, a number of new democracies have emerged as part of the third wave of democracy. Specifically nine countries in post communist Europe, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia, lend themselves to Lijphart's study. These countries fall into the category of free, based on Freedom House scores.

Utilizing Lijphart's two dimensions consisting of five variables each, I seek to reproduce the study for these nine countries, while also seeking out new, more effective ways to measure the ten total variables. Once the two dimensions are mapped out, I measure the levels of majoritarian-consensus democracy against indicators of economic and democratic performance. The goal of this study is to answer the question, "Does the analysis of these nine countries produce the same conclusions about majoritarian and consensus democracies found in Lijphart's study?" Further, what new information can this study provide about the nature of majoritarian and consensus democracies? The final conclusions lead to a discussion about the ways to improve Lijphart's study by analyzing ways to measure consensus and majoritarian democracy against indicators of economic and democratic performance.

Name: Michael McKain

Sponsor: Amanda Ingram (Biology)

Title: Determination of Parental Progenitors in *Eupatorium* \times *truncatum*

Biography: Michael McKain is a biology major from Seymour, Indiana. "When I took Dr. Ingram's vascular plants course, I did a research project on the Saxifragaceae. During that project, I read a paper concerning speciation through hybridization after which I wanted to pursue a project in which I analyzed a putative relationship of the same type."

Abstract: Speciation is a process that occurs through many different mechanisms. Until recently, one of the least understood has been hybridization. Hybridization has traditionally been considered an evolutionary dead end due to the sterility of many of the offspring, but molecular techniques have allowed biologists to determine that hybrid speciation is much more common than previously thought. Molecular data have shown that this process has been important in a wide array of taxa, including birds, butterflies, crickets, and many different genera of plants. Plant hybridization is particularly interesting because many extant species, including important crop species, are thought to be of hybrid origin.

An excellent model for studying plant hybrid speciation is the genus *Eupatorium*, a genus of the Asteraceae (the sunflower family) consisting of 36-60 species native to temperate North America. Multiple cases of speciation through hybridization are known in *Eupatorium*. Two species that are thought to hybridize are *E. serotinum* (late boneset) and *E. perfoliatum* (boneset). Their putative hybrid, *E. \times truncatum*, was first documented near Hanover, Indiana in 1938 and designated *E. serotinum* var. *polynuron* (F. J. Herm.). The species was first thought to be a variety based on its morphological characteristics that are very similar to those of *E. serotinum*. It was not until 1989, when Arthur Tucker investigated *E. serotinum* var. *polynuron* that it was given hybrid species status as *E. \times truncatum*, due to its morphological similarities to both *E. serotinum* and *E. perfoliatum*. In this study, DNA sequence data from *E. perfoliatum*, *E. serotinum*, and *E. \times truncatum* were compared to determine if this putative hybrid is indeed the offspring of its proposed parents and to determine which species was the maternal parent.

Name: James McKinnon

Sponsor: Robert Foote (Mathematics)

Title: Approximate Symmetries of the Natural World

Biography: James McKinnon is a mathematics and philosophy double major from Waterloo, Indiana. "I became interested in this subject while I was working as an intern with Professor Foote the summer of my sophomore year. Our main project was to design a computer program that would measure the symmetry of leaves. We decided that it would be interesting to try to apply some of our ideas in a more theoretical context."

Abstract: My research actually found its inspiration in a project the biology department undertook some years ago. The goal of the project was to determine whether or not a correlation existed between the health of a plant and the symmetry of its leaves. One of the major challenges facing the researchers was the fact that it is extremely hard to measure the symmetry of real world objects. This problem soon piqued the interest of the math department.

Symmetry is the central focus of a great deal of mathematical thought. Fields such as geometry and group theory spend significant amounts of time studying symmetrical figures and developing theories regarding their characteristics. Unfortunately, it is difficult to find real world applications for these theories because of the fact that true symmetry does not exist in the natural world. Objects in the real world may initially appear to be symmetric, but upon closer inspection some imperfection ruins the symmetry. However, it is certainly the case that some objects appear to be more symmetric than others. Thus it seems that one way to bridge the gap between the theoretical realm of mathematics and the physical world is to develop a rigorous measure that would determine the degree to which a given object is symmetric. Describing such a measure became the focus of my internship in the summer of 2005, and I will be discussing the approach I took to developing such a system.

Name: Andrew McKone

Sponsor: Lawrence Bennett (Music)

Title: Shostakovich: Quartet No 8 in C minor

Biography: Andrew McKone is a music major and English minor from Glastonbury Connecticut. "While living in Vienna, Austria this past year, I saw a performance of Shostakovich's 5th Symphony and was blown away by the emotion and energy of his compositions. When my senior seminar presented the opportunity to pursue an in-depth study of any piece we would like, I decided to examine Shostakovich's most famous chamber work, Quartet No. 8."

Abstract: There has always been something that has captivated me about string quartets. From Haydn to Schnittke, the string quartet has been a dominant facet in music. Many regard it as the most challenging form of musical composition. The quartet's seemingly barebones construction of four independent musical voices must be woven into an intricate web of musical dialogue. Arnold Steinhardt, first violinist of the acclaimed Guarneri String Quartet, declared, "to play in a quartet is to engage in a meditation with three like-minded companions- 'a discourse among four reasonable people,' as Goethe said." It is this musical interaction on the most personal level that attracts me to the string quartet.

It was not until rather recently that I was exposed to Dmitri Shostakovich's 15 string quartets; I was instantly awestricken. The beauty of some passages gave me chills, while others made my pulse race. I had never before experienced such a kaleidoscopic of emotions from a piece of music. Upon a further examination of Shostakovich's quartets it became apparent that he used this traditional four-voice medium to express the numerous emotions that had captivated me. Unlike Shostakovich's symphonies, which were subjected to public performance and criticism from Stalin's regime, the quartet provided Shostakovich with a means of composing much more personal, unexposed, emotional and truthful pieces of music. In the article "Shostakovich's String Quartets" Niall O'Loughlin explains, "The string quartet medium gave Shostakovich an opportunity to develop his skills in a much more refined and undemonstrative way, in a complete contrast to the 'public' display of the symphonies" (744). In this presentation I will explore one of Shostakovich's most highly regarded string quartets: Quartet No. 8 in C minor op. 110. This work shall be examined from a historical, theoretical and analytical perspective.

Name: Patrick Millikan

Sponsor: Stephen Webb (Religion)

Title: The Christian Masculine

Biography: Patrick Millikan is a religion major from Newburgh, Indiana. "I became interested in the subject through the almost constant discussion of masculinity on our campus, and how that applied within the realm of Christianity, specifically to the image of the Christian man."

Abstract: In "The Christian Masculine," the image of the Christian man in popular society is examined. It is proposed that what most consider to be a Christian man is quiet, considerate, and almost feminine in nature. This image results from changes in the Christian church, and a dwindling of men within the congregation as a result of these changes.

In this paper, I reveal the true image of a Christian man through verses in the Bible. Then, I attempt to uncover the changes that lead to masculinity being drained from the church, resulting in the change in the image of the Christian man. I then focus on how men responded, and what may be done to call men back to the church community, and restore balance to Christianity.

Name: Ryan F. Morris

Sponsor: Veronique Zara (French)

Title: The Mystery of Iniquity: A Study of France's Black Code during the 18th Century

Biography: Ryan F. Morris is a French major and biology minor from Los Angeles, California. "I became interested in this project because I have always been interested in race as a social construct, and how different societies have responded to the idea of 'race.'"

Abstract: During the 17th and 18th century, every aspect of the lives of individuals of African descent living in French colonies, both free and enslaved, were closely scrutinized by the French government and monarch. Directly stemming from Louis XIV's desire to augment French supremacy in its colonies, the Black Code (*Code Noir*) was created in the 17th century to further systematize the conduct and slavery of Blacks.

However, with the increase in miscegenation and the gradual dissolution of racial lines, the idea of "race" and how *de facto* and *de jure* racism would be exercised, became problematic.

This presentation will explore several court cases, involving the discrepancy between Paris' ideas of race and slavery, and those held by slave owners and inhabitants of France's holdings in the Americas. The trials also embark upon the difficult task of defining "blackness" and lay emphasis upon race being a social construct.

Name: Ryan F. Morris

Sponsor: Rick Warner (History)

Title: No Longer Invisible—The Past and Historical Memory: The Castas of 18th Century Mexico

Biography: Ryan F. Morris is a French major and biology minor from Los Angeles, California. “I became interested in this project because I was unaware of the presence of Africans in Mexico’s past. I was also interested in the idea of historical memory, and how these Africans and their contributions were remembered by Mexico’s current population.”

Abstract: This presentation will explore how the ideas of *limpieza de sangre* (purity of blood) and *linaje* (lineage) were formulated in Medieval Iberia in response to the influx of Moors and Jews, and how this idea was carried to the Americas by the Spanish conquistadores. While arguing that the Spanish conquest of the Americas was one of territorial and ethnic subjugation, I will show the ideas of race, miscegenation, and “marrying up” changed in Mexico, and how Mexican society of the 16th, 17th, and 18th century was ordered to maintain Spanish domination. Furthermore, I will explore the idea of historical memory by analyzing the remnants of African culture and people in present-day Mexico.

Name: Teye M. Morton

Sponsor: Peter Mikek (Economics)

Title: Enhanced Teaching in Economics

Biography: Teye M. Morton is an economics major from Ghana, Africa. “I started working on this project with Dr. Mikek last year, collecting films that contained economic principals and collating them into teaching material.”

Abstract: In my Macroeconomics class, we were presented with an idea: learning economics through media illustrations. The abstract nature of most of the course material, and the fact that we seldom see concepts in action at our current level of education, makes the textbook a difficult way to learn.

In some of our economics classes, and numerous other social science classes, we are left having to imagine how the concept we are learning translates into actuality. It is difficult for some professors to find a good example or make sure everyone understands the material from the textbook. It is useful to have students read other material like the *Wall Street Journal* and the *Economist*, but at times these are still just too technical for students at the beginner’s level. It has been found though, that there are other methods of teaching that are simple to grasp and which students find interesting and worthwhile—movies.

Using film and other entertainment media in a class is nothing new though. Numerous films are available that illustrate economic concepts. The idea of this project is to setup a database where someone could find condensed media clips that adequately summarized a movie and the economic aspect. This way, instead of having students watching one or two full length movies outside class a year, over the semester, you would use several smaller five-minute clips in class. I have worked over the last year finding and condensing numerous movies and documentaries and would like to show the school the idea that the professors have in mind on how short media clips could theoretically be applied to the class room setting.

Name: Alex Nolan

Sponsor: Paul LePlae (Chemistry)

Title: Asymmetric Michael Additions Catalyzed by Tetrabutylammonium Prolinate

Biography: Alex Nolan is a junior chemistry major from Bedford, Indiana. "I became interested in the project because of previous research I had done with Dr. LePlae. Also I researched the field of organocatalysts and became interested because of the possibilities that the field can produce."

Abstract: The need for chiral compounds that have a particular handedness has increased substantially in recent memory. Because of the power of asymmetric transformations such as the Michael addition, enantiomerically pure compounds can be produced easier than before. The Michael addition is a powerful carbon-carbon bond forming reaction that can result in molecules with certain chirality, or handedness. These reactions have implications into the next generation of drugs because of the lack of products that generate side effects and the maximum desired drug manufactured in each reaction.

The Michael addition had previously relied on the use of Lewis acids, compounds that contain hazardous metals. Recently organocatalysts, non-metal containing catalysts used for Michael additions, have been reported to produce enantiomerically pure compounds, compounds of a single handedness, in high yields. Different organic molecules have been investigated for their catalytic properties, and chiral pyrrolidine rings have been shown to generate the best yields when added in substoichiometric amounts. The results of the Michael addition of propionaldehyde to methyl vinyl ketone in the presence of the tetrabutylammonium salt of L-Proline, an organocatalyst, are presented.

Name: Morgan Nolan

Sponsor: Michele Pittard (Teacher Education)

Title: The Problems with Grades

Biography: Morgan Nolan is a political science major from Bedford, Indiana. "I became interested in this topic after reading Afie Kohn's book *Punished by Rewards*."

Abstract: The question I proposed to study in a one-week unit was, "Do pedagogical strategies based in pre-reading, during reading, and post reading, create the needed intrinsic motivation, dampen the effects of extrinsic motivation (grades), and lead students to become more involved in the reading process?"

Using a one-week World Civilization class to explore the details of my question, I set up the following methods to create questions and answers to this proposal. The first of these areas was student journals. The second data collection method was self-evaluation forms. Students were given two evaluation forms. One evaluation was given days before the unit began, and a second evaluation was given the last day of class. The third way in which I collected data was based on the discussion of the readings and the material.

I found several primary conclusions for this study. The first was that it was difficult to conduct this experiment when I was outside the culture of the classroom and students knew they would start to receive grades the day after I left. The second was that pre-reading, during-reading, and post-reading, activities really helped move the students along in their reading and learning quest. The final finding was that in one week nearly all of the students felt they had changed their reading habits, strategies, or feelings.

Name: Cory Norman

Sponsor: Paul LePlae (Chemistry)

Title: Synthesis, Characterization, and Evaluation of Bifunctional Organocatalytic Salts for Asymmetric Michael Addition

Biography: Cory Norman is a chemistry major from Flora, Indiana. "I am a chemistry major interested in gaining experience in chemical research. My intention is to become a medical doctor and research related to the preparation of pharmaceuticals drew my attention. I conducted this research with Dr. Paul LePlae."

Abstract: Organocatalysis is an exciting area of organic chemistry with many new breakthroughs in recent years. During the past six months, my research focused on synthesis of a bifunctional organocatalytic salt. This salt is designed to activate both molecules of an asymmetric Michael addition simultaneously. The cationic portion of the salt activates the ketone through hydrogen bonding and the anionic amine activates the aldehyde via enamine formation.

I began my research focused on synthesis of anionic piperidine and pyrrolidine sulfates. However, after a pyrrolidine sulfate zwitterion vital to the synthetic scheme was found to be unstable, I shifted my research to the synthesis of a cationic hydrogen bond donor. I then spent the remainder of my internship synthesizing two different cations and successfully isolated a 3,4-dihydroxyammonium salt and a 2,3-di-acetoxyammonium iodide salt.

Name: Dane Nutty (with Kevin Greaves)

Sponsor: Lon Porter (Chemistry)

Title: DNA Detection via Fluorescent Metal/DNA Complexes

Biography: Dane Nutty is a chemistry major from Indianapolis, Indiana. "As part of our CHE441 Advanced Inorganic Chemistry senior lab project, we wanted to study the overlap of inorganic chemistry and biology."

Abstract: This research project studied the photophysical properties of two ruthenium polypyridyl – $\text{Ru}(\text{phen})_2\text{dppz}^{2+}$ and $\text{Ru}(\text{bpy})_2\text{dppz}^{2+}$ – that display strong fluorescence only in the presence of DNA.

These complexes, when alone in solution, show negligible fluorescent activity, which makes them very practical for the detection investigation of DNA. The first objective of the research project was the synthesis of these two complexes. The second objective was the characterization of the complexes and the exploration and of the two complexes' interactions with DNA, focusing mainly on the fluorescence of the complex in the presence of DNA. Both complexes showed DNA concentration dependent fluorescence, demonstrating a facile method of quantitative DNA detection.

Name: Patrick O'Rourke (with Adam Fritsch)

Sponsor: James Brown (Physics)

Title: Nuclear Physics at the National Superconducting Cyclotron Laboratory (NSCL) with the Modular Neutron Array (MoNA)

Biography: Patrick O'Rourke is a physics and philosophy double major from Kearsarge, New Hampshire. I aspire to be a particle physicist, and nuclear physics seems to be a good starting point."

Abstract: The Modular Neutron Array (MoNA) was built by undergraduates, and continues to be used in ways that are designed to involve students in experimental work and data analysis. The MoNA collaboration is a group of faculty and students from nine colleges and universities that work together to study the structure of nuclei close to or slightly beyond the neutron drip-line. The experimental work is carried out at the National Superconducting Cyclotron Laboratory at Michigan State University. The focus of this research is on the structure of the neutron rich oxygen and carbon isotopes. In particular, the excitation energies of the neutron-unbound states in these nuclei are determined by measuring the neutrons and fragments in coincidence. The energies and directions of the emitted neutrons are measured using MoNA. The charged fragments are deflected out of the main beam by a sweeper magnet, and tracked using cathode-readout drift chambers and scintillators. The evolution of shell structure is investigated with MoNA by examining both bound drip-line nuclei and their unbound neighbors. During the experiment, we sent a ^{48}Ca ion beam through a Beryllium target, which produced multiple fragments of particles. These fragments are also often produced in excited nuclear states by this non-selective fragmentation process. To understand and reconstruct these states, the fragments need to be tracked and identified. During different work shifts, members of the collaboration monitored and analyzed the paths of the fragments, and the neutrons once they entered MoNA. We, in particular, aided in the experiment by writing code for software designed to model the paths of particles passing through MoNA and by documenting and tracking necessary code for software used to analyze the actual flights of the neutrons.

Name: Dick Page

Sponsor: Yvonne Pitts (History)

Title: Indian Adoption of European-Style Slavery

Biography: Dick Page is a history major from Cary, North Carolina. "I have always been fascinated with how alien cultures interact. This project first offered an opportunity to look at a place where three cultures intersected, then at a time when people of one culture decided to embrace another, and finally at a topic where a new theoretical approach could be applied."

Abstract: Perhaps one of the most neglected aspects of Native American history is its adoption of European-style racial slavery. Within that section of cultural analysis, one part that remains unclear is the reasons behind the shift from pre-contact slave systems (or lack thereof), which were kinship-based, into European-style economically-driven racialized slavery, which would seem anathema to Native culture. In my research I argue that the nature of the shift to European-style racialized slavery was threefold. First, some Indians adopted racial slavery for economic advantages over both their fellow Indians and their European neighbors, much as Europeans used slaves to improve their social standing. This does not completely explain the transition, however, since it is inconsistent with pre-contact native beliefs in kinship and shared property and relies upon a Eurocentric conception of the advantages of slavery. So, secondly, the adoption of racial slavery was a function of social interaction and reaction to European incursion. A power struggle occurred between the "civilizing" forces of the Europeans and the resistance and subversion by Indians of European institutions. Racialized slavery was both a locus and sign of these struggles over acculturation. This theory, however, may place too much responsibility in the hands of the Europeans. The final facet is internal cultural change, predicated on European interaction, but representing a redefinition by Native Americans of what it means to be a Native American. This is the most original section of my research, and my hope is to show that mere power struggles cannot fully explain the changes found in Indian culture following European contact – instead, cultural change must be personally mapped onto a preexisting cultural structure.

Name: Joshua Paul

Sponsor: Robert Horton (Psychology)

Title: Prejudice Against People with Disabilities: Automatically Activated Stereotypes and Their Effect on Subsequent Judgments and Interaction

Biography: Joshua Paul is a senior psychology major from Bloomington, Indiana. "My interest is prejudice and how it manifests itself against outgroups; specifically how it manifests itself against people with disabilities."

Abstract: My research focuses on how prejudice against people with disabilities is created and manifests itself and includes a review of literature and a description of my empirical work devoted to the topic. I have conducted an extensive literature review on research pertaining to stereotyping and prejudice, focusing on automatically activated stereotypes.

In this line of research, stereotypes are cognitive structures that are socialized from a young age. This research suggests that all people possess equal amounts of stereotypes (these cognitive structures) for outgroups (groups to which one does not belong), but it is the person or situation which determines to what extent these stereotypes are utilized.

Additionally, research assesses whether it is possible to manipulate these stereotypes once they are created, but few of these studies address stereotypes of people with disabilities.

Finally, my own empirical contribution assesses one's willingness to derogate an outgroup in the face of collective and individual threat and is intrinsically tied to this line of investigation.

Name: Braden Pemberton

Sponsor: Jim Fisher (Theater)

Title: Directing: Just Create

Biography: Braden Pemberton is a theater major from Westfield, Indiana. "This project was developed in Theater 317: Dramatic Criticism."

Abstract: The first hurdle that faces the director is the interpretation of the script. The quandary facing the director is pitting his understanding of a script against what the playwright was intending when the script was written. Friction takes place when audiences, including critics, are displeased with the interpretation, responding that the director should perpetuate what the playwright meant to say. This idea is false and perpetuates theater that is destructive to the overall experience. The director must balance reproduction and personal interpretation. Thus, the director should seek to create in a vacuum, relying on his own ideas to bring the script to life, independent of the desires of the audiences.

Creating solely in a vacuum is an inherently flawed idea, however. Humans are naturally social beings and cannot truly isolate themselves from every aspect that has shaped and molded their personal experience as a human being; the director must seek to replicate the human political condition, the motivations of humans that live in a social world. If a director is to succeed in staging a production, they must tap into the world around them, reflect the world in which they live, and put the world on the stage. He must create alone and then apply his creation to society.

With this strange game of balance, how can a director create? The answer is simply to forge ahead and create. Only through experience, successes and failures, can a director achieve their truest creations. To fall victim to the fears of creation is a devastating blow to the creation of art, drama in particular. Through creation is the only way to self-fulfillment in oneself and society as a whole; deciding what works for the director himself, rather than what books, theories, audiences, anyone or anything tell him.

Name: Tom Pizarek (with Adam Fritsch, Kyle Priggle, and Sabir Shrestha)

Sponsor: Martin Madsen (Physics)

Title: Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils

Biography: Tom Pizarek is a physics and mathematics major from Austin, TX. "We started working on this project as a part of Physics 114 Electricity and Magnetism class."

Abstract: Understanding the motion of electrons, and other charged particles, in a magnetic field is a vital part of many modern applications in science, technology, and medicine. Applications that utilize magnetic fields to shape the motion of charged particles include high-energy particle accelerators, mass spectrometers, cathode ray tube monitors, microwave ovens, and x-ray machines.

In our experiment, the magnetic field from a pair of Helmholtz coils was measured both on- and off- axis using a Hall-effect probe. A beam of electrons with initial velocities ranging from 6000 km/s to 11,000 km/s was formed in the center plane of the Helmholtz coils. The electron beam scattered off of a background hydrogen gas in a sealed tube, exciting the hydrogen atoms and resulting in blue fluorescence. The resulting, nearly circular, path of the electron beam was analyzed by taking long exposure digital photographs of the fluorescence and analyzing the images.

The electron motion was compared to two models for the beam path as a result of the magnetic field. The first model assumed a perfectly uniform magnetic field. The second model utilized numerical solutions of the coupled differential equations of motion for the electron beam using the real magnetic field as measured from the Helmholtz coils. The magnetic field measurements, the electron beam measurements, and the comparison to the two models are presented.

Name: Jackson Price

Sponsor: Humberto Barreto (Economics)

Title: A Cross-Sectional Study of the Racial Difference in Welfare Dependency: The Battle Between Class and Race for Dominance as the Limiting Factor in African American Opportunities

Biography: Jackson Price is an economics and biology major from Louisville, Kentucky.

Abstract: This study finds that class, not race, is the dominant limiting factor in African American opportunities. When controlling for educational attainment, marital status, number of children, previous employment, age, gender, and household income, the gap between black and white usage of welfare disappears completely. Furthermore, this study found that in the traditional South, educational attainment does not influence the probability that an individual will require welfare. This finding suggests that the educational system in the South is flawed and needs to be reformed in order to give educational attainment a positive influence on an individual's likelihood for self-sufficiency.

Name: Kyle Prifogle (with Adam Fritsch, Tom Pizarrek, and Sabir Shrestha)

Sponsor: Martin Madsen (Physics)

Title: Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils

Biography: Kyle Prifogle is a physics and mathematics major from Ridgefield, Indiana. "We started working on this project as a part of Physics 114 Electricity and Magnetism class."

Abstract: Understanding the motion of electrons, and other charged particles, in a magnetic field is a vital part of many modern applications in science, technology, and medicine. Applications that utilize magnetic fields to shape the motion of charged particles include high-energy particle accelerators, mass spectrometers, cathode ray tube monitors, microwave ovens, and x-ray machines.

In our experiment, the magnetic field from a pair of Helmholtz coils was measured both on- and off- axis using a Hall-effect probe. A beam of electrons with initial velocities ranging from 6000 km/s to 11,000 km/s was formed in the center plane of the Helmholtz coils. The electron beam scattered off of a background hydrogen gas in a sealed tube, exciting the hydrogen atoms and resulting in blue fluorescence. The resulting, nearly circular, path of the electron beam was analyzed by taking long exposure digital photographs of the fluorescence and analyzing the images.

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Name: Steven Rhodes (with Syud Ahmed)

Sponsor: Lon Porter (Chemistry)

Title: Putting Metal in the Microwave: Synthesis and Characterization of Molybdenum Carbonyl Complexes

Biography: Steven Rhodes is a chemistry major from West Lafayette, Indiana. "As part of our CHE441 Advanced Inorganic Chemistry senior lab projects, we were interested in the next generation of chemical synthesis...microwave ovens!"

Abstract: The microwave has been introduced as a tool for organic and solid-state synthesis in numerous fields of chemistry. Microwaves have been implemented as advantageous substitutes for conventional hot plates, enhancing chemical synthesis by offering cleaner reaction products, higher yields, shorter reaction times and minimal energy usage.

In this project, microwave-assisted reflux was used to synthesize chiral molybdenum-carbonyl-phosphine complexes. These complexes are studied as an important part of undergraduate chemistry courses for their relevance to structure and bonding, symmetry, and catalytic organic synthesis.

Performing transition metal-carbonyl syntheses by conventional reflux methods often requires long reaction times, due to the kinetic stability of the metal-carbonyl bonds. In comparison to conventional reflux methods, the microwave assisted synthesis method developed in this paper reduces reaction times by optimizing the efficiency of energy transfer to the reaction mixture.

Name: Steven Rhodes

Sponsor: Scott Feller (Chemistry)

Title: Functional Reconstitution and ^1H NMR Study of Recombinant Peripheral Cannabinoid Receptor, CB2

Biography: Steven Rhodes is a chemistry major from West Lafayette, Indiana. "I became interested in this project after learning that CB2 and other G-Protein Coupled Receptors (GPCRs) control a wide range of signal transduction pathways and are the target of nearly 50% of modern pharmaceuticals. Ultimately, this project could provide unique insight as to how CB2 and other GPCRs bind with drugs and other molecules in cellular membranes."

Abstract: This research was completed by Steven Rhodes, Tomohiro Kimura, Alexei Yeliseev, and Klaus Gawrisch at the Laboratory of Membrane Biochemistry and Biophysics, National Institute on Alcohol Abuse and Alcoholism in Bethesda, MD.

The recombinant peripheral-type cannabinoid receptor, CB2, is thought to play an important role in regulating a number of physiological responses including pain relief, appetite stimulation, and inflammation. The CB2 receptor is also important as a representative member of the class of proteins referred to as G-Protein Coupled Receptors (GPCRs). GPCRs control a wide range of signal transduction pathways and are the target of nearly 50% of modern pharmaceuticals. Here we describe efforts to functionally reconstitute CB2 into a 1-palmitoyl-2-oleoyl-*sn*-glycero-3-phosphocholine (POPC) lipid bilayer membrane and study the protein's interaction with the cannabinoid receptor ligand 2-arachidonoylglycerol (2-AG) by ^1H NMR saturation transfer difference (STD) spectroscopy with magic angle spinning (MAS). The STD experiment involves the selective pre-irradiation of the protein, causing the nuclear magnetization of its protons to become saturated. Ligand-protein interaction is monitored via nuclear magnetization transfer to 2-AG protons, resulting in their saturation and a reduction in their peak integral intensity. Our results demonstrate the promise of this technique for providing unique insight as to how CB2 and other GPCRs bind with ligands in cellular membranes.

Name: Tim Rickard

Sponsor: Gregory Redding

Title: Not What You Read in Books (German)

Biography: Tim Rickard is a German major from Valparaiso, Indiana. "This project was originally a Freshmen Tutorial project that was too large to be researched in a couple of weeks. When the option of researching it over the summer was offered, I took it. This research was conducted collaboratively with Professor Redding."

Abstract: Immigrants have predictable ways of keeping their heritage while in another country. An example of the stereotypical German family that kept their heritage intact was the Stark family. The most famous member of this family was named Otto Stark, who was a world renowned impressionist painter at the turn of the 20th century and a first generation American from a German immigrant family. His father Gustav was a carpenter in Indianapolis. While Otto was pursuing his career on the east coast, Gustav and Otto wrote letters to each other, some of which can be found in the Ruth Lilly Special Archives at IUPUI. These letters reveal an interesting relationship that does not conform to the father-son dynamic that was portrayed in German literature of the era. Herman Hesse and Thomas Mann were writing about the duality of life and the rejection of the older generation's ways. More specifically, they dealt with the struggle between artistic children and their unartistic parents, usually manifested by the father. The absence of this struggle stands out in the relationship of Gustav and Otto Stark, who in most respects reveal a "typically German" identity.

There are four ways in which the Starks demonstrate their "Germanness"— occupation, religion, language, location. Evidence for these categories was found in the letters, our main source, and then backed up by investigations into each of their lives. There are several reasons why this research is important. First, parallels can be drawn to today's immigrant debate, as the Germans were persecuted during World War I, during the span of Otto's career. Second, the research shows us how the "melting pot" of America works. Immigrants do not adopt a new culture wholesale; they integrate aspects of their adopted culture into the culture of their homeland.

Name: Tim Schirack

Sponsor: David Timmerman (Rhetoric)

Title: Classical Rhetoric in Sports Radio Broadcasting

Biography: Tim Schirack is a rhetoric major and economics minor from West Lafayette, Indiana. "I became interested in this project due to broadcasting Wabash basketball for the past three years, as well as reading about the role of the broadcaster in communicating with their audience. I wanted to answer the question of how a broadcaster could be persuasive."

Abstract: Fans don't need to sit in the stands in order to experience the highs and lows of a sporting competition. Radio and sports broadcasting allows all people to bring the game into their own homes and lives.

It is important to understand the modes of radio and how radio broadcasts allow the audience to believe the actions on the court or field as described. Classical rhetoric and the concepts of the classical period allow us to see how persuasion is obtained through broadcasting. We will discover this ability by dissecting the concepts of classical rhetoric and then applying them to examples of sports radio broadcasting. The research will attempt to show that the concepts of classical rhetoric allows the listener to better understand sports broadcasts. Four specific concepts were chosen to represent classical rhetoric.

The first is the concept of *kairos*. This concept talks about the timing of presentation. The essay gives an example of *kairos* from the classical period and then shows how it exists in sports broadcasting. Second, is the classical concept of metaphor. I illustrate the workings of metaphor by providing a few examples and then showing how those examples are apparent in sports radio broadcasting. Subsequently, this same organizational format is used to present the classical concepts of the enthymeme and ethos.

Very few broadcasters and listeners are able to recognize that they are being affected by radio broadcasting, and these concepts from classical rhetoric help us understand better how this occurs. Even though the individuals are not aware of the concepts surrounding them they are still impacted by them. The ability to view and understand these concepts allows for better understanding and better use of them in persuasion.

Name: Kyle Sell

Sponsor: Brenda Bankart (Psychology)

Title: Advancements in the Study of Autism Spectrum Disorder: A Review of the Literature on Classification, Treatment, and Epidemiology

Biography: Kyle Sell is a psychology major from Woodburn, Indiana. "I did an internship with the Autism Community Together (ACT) group over the summer. This experience sparked my interest in the growing problem of Autism Spectrum Disorders."

Abstract: Autism Spectrum Disorder (ASD) is the title given to five distinct disorders that have strikingly similar characteristics. Social isolation, language impairments, and insistence on sameness are typical characteristics of children with ASD.

Since its discovery in 1943 by Dr. Leo Kanner, the study of ASD has become a point of interest among developmental psychologists and medical doctors. The advancements made by these researchers over the past several decades will be the focus of this literature review.

The first section of the review will identify advancements in defining, diagnosing, and treating ASDs.

The final section of this review will discuss the epidemiology of ASD by focusing on possible causes and implications of recent rises in the diagnosis of ASD among children.

Name: Sabir Shrestha (with Adam Fritsch, Tom Piz-zarek, Kyle Prifogle)

Sponsor: Martin Madsen (Physics)

Title: Analysis of the Circular Motion of an Electron Beam in Real Helmholtz Coils

Biography: Sabir Shrestha is a physics and mathematics major from Kathmandu, Nepal. "We started working on this project as a part of Physics 114 Electricity and Magnetism class."

Abstract: Understanding the motion of electrons, and other charged particles, in a magnetic field is a vital part of many modern applications in science, technology, and medicine. Applications that utilize magnetic fields to shape the motion of charged particles include high-energy particle accelerators, mass spectrometers, cathode ray tube monitors, microwave ovens, and x-ray machines.

In our experiment, the magnetic field from a pair of Helmholtz coils was measured both on- and off- axis using a Hall-effect probe. A beam of electrons with initial velocities ranging from 6000 km/s to 11,000 km/s was formed in the center plane of the Helmholtz coils. The electron beam scattered off of a background hydrogen gas in a sealed tube, exciting the hydrogen atoms and resulting in blue fluorescence. The resulting, nearly circular, path of the electron beam was analyzed by taking long exposure digital photographs of the fluorescence and analyzing the images.

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Name: Jason Siegel

Sponsor: Lon Porter (Chemistry)

Title: Functionalization of Porous Silicon Using Microwave Radiation

Biography: Jason Siegel is a biology major from Fort Wayne, Indiana. "This is work that I learned about at last year's Celebration. Doctor Porter received a new grant and I began work on this project in the fall semester and hope to continue on it this spring."

Abstract: High surface area porous silicon is prepared from flat silicon wafers by etching nanometer sized pores with hydrofluoric acid. This nanomaterial is a prime candidate for chemical sensors and medical diagnostic tools. The various applications of porous silicon have been the subject of intense research. One of the chief enabling technologies leading to many potential applications is the ability to graft hydrocarbon monolayers onto the porous silicon. Surface functionalization, via monolayers allow control over the chemical properties of porous silicon. This project focused on developing a new reaction to bind organic monolayers onto porous silicon using microwaves. Microwaves allow reactions to proceed much more quickly and efficiently than previous means. The multitude of variables made this work challenging, but ultimately we developed a new protocol for the binding of organic molecules onto porous silicon.

Name: Joey Smith

Sponsor: Jim Fisher (Theater)

Title: Phenomenology of Acting

Biography: Joey Smith a philosophy major from Mooresville, Indiana. "This project represents a melding of my major and minor--the philosophy of acting. I do my best to keep it philosophical."

Abstract: The first and most important single part of acting is, of course, the action. An audience has no way of knowing anything if the characters take no action! A play is put on stage and its meaning revealed through the action of the actors. Action may be the most important part, but it's not the only one.

After action there is language. For example, what is a play without action? A script. And though a script is a major part of the play, it is action that makes it a play. In what way does action take shape, carry out their motions? The actor. The actor is an entity, more specifically an entity with a body, in which conveys what the play means, says and does. This must be true since the only thing the audience sees and gets meaning from is inevitably action from an actor's body. Even an emotion or thought that is supposed to be conveyed on stage by the actor is done through his body and the actions it takes. This is the first distinction that we should take in to consideration when we say the word "actor."

After we make these distinctions we should consider the individuals' parts that make up an actor. Ego, character and body are three parts that limit and liberate an actor. I use these ideas and describe acting in a very precise and detailed manner that gets at the heart of what exactly is going on when a person is acting.

Name: Aaron Spolarich

Sponsor: Tom Campbell (English) and David Clapp (Present Indiana)

Title: Vonnegut: A Hoosier Legacy

Biography: Aaron Spolarich is an English and psychology double major from Schererville, Indiana. "This presentation was created as part of the Present Indiana Project during the summer. New faculty members, international students, and two high schools have been audiences for the presentation thus far. I will also be a keynote speaker for the Indiana German Heritage Society."

Abstract: Kurt Vonnegut Jr. is revered by readers worldwide for his mastery of biting sarcasm and dark humor. Masterpieces of Vonnegut include bestsellers such as: *Cat's Cradle*, *Breakfast of Champions*, and *Slaughterhouse Five*.

Kurt Vonnegut Jr. is famous for his writing, but his family left an impact on Indiana far prior to the birth of this American icon. On his arrival to America from Germany, Clemens Vonnegut established Vonnegut Hardware Company, a mainstay of downtown Indianapolis for over a century.

Bernard Vonnegut, Kurt's paternal grandfather, was one of the most influential architects in Indianapolis. The architecture firm of Vonnegut and Bohn designed buildings such as the Athenaeum and Shortridge High School.

Albert Lieber, Kurt's maternal grandfather, operated the P. Lieber Brewery Company. Kurt's father, Kurt Vonnegut Sr., carried on the Vonnegut name in architecture, being responsible for Indianapolis landmarks such as the original L.S. Ayres building and the Kahn building.

Growing up in Indiana had a lasting impact on Kurt Vonnegut Jr., and this relationship is evident in the numerous references to Indiana throughout his writings. The Vonnegut family will forever be connected to the Hoosier spirit.

Name: Ashley Stephen

Sponsor: Michele Pittard (Teacher Education)

Title: Beyond the Textbook: Using Non-traditional Literacies in the Classroom

Biography: Ashley Stephen is a history major with a teacher education area of concentration. He is from Centerville, Indiana. "The idea for this classroom-based research project, a requirement for EDU-400: Adolescent Literacy, was sparked by my desire to find the best ways to teach high school students."

Abstract: High school students do not usually read textbooks. Instead, they watch television, listen to music, surf the Internet, and read magazines.

Why should the classroom/learning environment be any different from their normal environment?

Since most of the students I surveyed claimed they felt most comfortable with the texts (i.e., the sources from which they draw information) in their normal environment, I wanted to know what the impact of using those non-traditional literacies might be on student learning. Non-traditional literacies are means of communication other than the written word, which include television and videos, video games, print media, and images.

During a week of team-teaching, I attempted to engage the non-traditional literacies of the students by developing lessons in which I showed them a video, asked them to examine pictures, and asked them to read journal articles. After each lesson, I asked the students to inform me about their learning in regards to the non-traditional text used.

Because this was a one-week pilot project for a larger research project I will complete during student teaching, the results of my classroom-based research project were inconclusive on whether students learn more when non-traditional literacies are employed. However, my data show that students are more engaged when non-traditional texts are used, and student engagement is central to success in the learning process.

Name: Paul Stolarczuk

Sponsor: Humberto Barreto (Economics)

Title: Exploring Gender Wage Gap in the United States

Biography: Paul Stolarczuk is an economics major from Indianapolis, Indiana. "I became interested in this project after reading a number of news articles that conclude men still earn more than women."

Abstract: In my research project I set out to determine if women in the United States really earn less on average than men do, as is often reported in the media. If it is true that female workers' wages are a fifth lower than those of their male counterparts, this would indicate that wage discrimination against female employees exists in the workplace. We cannot look at only the "raw" average wage for all men and women because there might be significant differences between female and male workers in general that explain the disparity in earnings. We have to take into account differences in the educational level, work experience, skills and many others. Only when we consider these factors and control for them can we begin to compare average wages between genders.

In my research project I attempted to compare the average wage between genders by controlling for such variables like education, work experience, job occupation, and type of industry. I collected data about earnings from the January 2006 Current Population Survey on more than 4,500 workers between the ages of 21 and 65. Results indicate that even after we account for such things like age, amount of hours worked, education, marital status, race, and even nationality, the gender wage gap exists and on average women earn 14% less than men. I also looked at the average pay differences between genders in different industries and occupation groups. Results are not conclusive and to some extent ambiguous. For some job categories and industry types, differences in average wages are very small, but in general it appears that the gender wage gap is real and exists even at the industry level and within occupation groups.

Name: Geoff Walker

Sponsor: David Timmerman (Rhetoric)

Title: *Crash*: A Burkean and Ethical Analysis

Biography: Geoff Walker is a rhetoric major from Schererville, Indiana. "The first time that I saw the movie *Crash*, I had the inclination that the movie was created to affect more than just the entertainment industry. Instead, I saw that it was a challenge to the way people lived, the way people interacted and treated each other, and the way prejudices and stereotypes mold perceptions and personalities. The movie inspired me because it was revolutionary; it tackled issues that other motion pictures were either afraid to address, or too conservative to fully understand."

Abstract: This examination consisted of a rhetorical analysis of Paul Haggis' motion picture, *Crash*. The post 9/11 film takes a rather direct path at illustrating the struggles between human connection, prejudice, and racial profiling.

The current study seeks to uncover the underlying themes and to demystify the motivations presented in the film. It also seeks to illustrate how ethics and ethical perspectives play a role in how we view the significance of the film for American society.

The study begins with a synopsis of the major concepts and theories of Kenneth Burke's Dramatism method, and then moves to an explanation of certain ethical perspectives that deal with rhetoric and society.

It then provides background information on the film itself and director/writer Paul Haggis. Subsequently, it analyzes and interprets how the film functions rhetorically and ethically.

Finally, this project will discuss the implications of the analysis and attempt to reveal how those implications affect the world and society we, as humans and Americans, live in today.

Name: Kevin Witt

Sponsor: Brian Tucker (German)

Title: Freudian Analysis Applied to Literature

Biography: Kevin Witt is a sophomore biology major from Huntington, Indiana. "My interest in this project developed in Dr. Tucker's Humanities 277 class on Freudian interpretation. The final project was to apply what we learned about Freudian analysis to a piece of literature. I found this idea very interesting because many of Freud's ideas on psychology have been disregarded by the field of modern psychology. However, his ideas on psychoanalysis were able to find a new home in literary analysis."

Abstract: Sigmund Freud revolutionized the field of psychology during the early 20th century; however, as the field progressed, Freud's concepts on psychoanalysis and the components of the mind began to lose their foothold in psychology. However, psychoanalysis and the unconscious conflict of the id and super-ego have found a new home: literary analysis.

Much like a dream, literature allows for interpretation of both what is written, and what is not written. Freudian analysis often focused around Oedipal conflicts, displays of nudity, neurotic behavior, and father-son relationships. In dream analysis, Freud would find relationships between the related dream and the unconscious wish or content behind what is remembered.

Much like a dream, the words on the page of a story are the manifest content, and it takes analysis to find the true latent content of that story. By utilizing Freudian methods of analysis, I focused on one particular work by German author Franz Kafka. Many of Kafka's stories showed many Freudian aspects. My paper applies Freudian methods of analysis to Franz Kafka's "A Report to an Academy," in which an ape named Rotpeter describes how he became a walking, talking, civilized person. Though Kafka intended the story to represent a conflict between the natural and civilized world, Freudian analysis exposes a more psychological dynamic behind the story's manifest content.

Name: Michael Zielinski

Sponsor: Lon Porter (Chemistry)

Title: Photovoltaic Cells: Organic vs. Inorganic Dye-Sensitizers

Biography: Michael Zielinski is a chemistry major from Pittsboro, Indiana. "This work concerns solar cell fabrication using metal complexes learned about in Chemistry 441 Advanced Inorganic Chemistry as part of my senior lab project."

Abstract: This was a preliminary study of pigments which can be used in dye-sensitized solar cells. Naturally occurring anthocyanin dyes found in raspberry juice were compared with a synthesized sensitizing dye, bis(bipyridine)(2,2'-bipyridyl-4,4'-octadecylester) ruthenium. Both were used in small photovoltaic cells, but the results gotten from these trials do not hold much value because a lack of time which prevented a number of variables from being optimized and held constant in the comparison trials.

Primarily, it was not possible to determine the concentration of dye absorbed by the TiO_2 semiconducting layer of the solar cell. This means, if the two efficiencies were compared, they would not hold true in comparing an individual molecule of raspberry dye to an individual molecule of synthesized dye. What was compared was the viability of dye-sensitized cells of any sort to silicon semiconductor solar cells.

This research found that the dye-sensitized solar cells did not perform near as well as literature reported efficiencies of silicon semiconductor solar cells. The greatest value of this research was to help specify the correct conditions so further research in the area could be more quantitatively valuable.

Notes from the Celebration