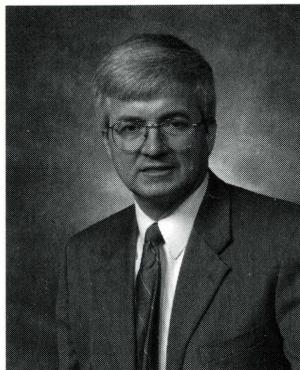




**FOURTH ANNUAL
CELEBRATION OF STUDENT RESEARCH,
SCHOLARSHIP, AND CREATIVE WORK**

**FRIDAY, JANUARY 30, 2004
DETON CENTER**

WELCOME AND INTRODUCTION FROM MAURI DITZLER, DEAN OF THE COLLEGE



Welcome to Wabash's Fourth Annual Celebration of Student Research, Scholarship, and Creative Work. For the last three years, the Celebration has proven to demonstrate the many ways in which Wabash men pursue research and creativity: alone, as part of a class, or in collaboration with faculty. This year the breadth and range of the work is most impressive.

We dedicate this year's Celebration to Paul Caylor McKinney '52, who passed away in December after a long 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 the truest possible example of a liberally educated man whose interests ranged from quantum mechanics to Plato, and from playing the piano to Nietzsche. He acted in Wabash College Theater productions, and was often found backstage working on difficult equations and problems in his notebook. That snapshot accurately suggests his love of life and love of learning, and serves as a model for the liberally educated Wabash man. That desire to learn more about the universe lasted until his death, and I'm pleased that his colleagues in the Chemistry Department helped him complete one final paper, which will soon be published in the *International Journal of Quantum Chemistry*.

I think Paul McKinney would be proud of the students whose work is on display and will be presented this afternoon. Virtually every academic department is represented and many students will make presentations in more than one discipline. This work is a reflection of the liberal arts ideal we strive for at Wabash, and which Paul McKinney embodied during his long tenure at the College.

I would like to thank the presenters who have worked so hard on their projects and have agreed to spend an afternoon teaching the Wabash community about their interests. I also wish to thank the faculty sponsors who have devoted considerable time helping these students on their presentations.

A conference of this size would not be possible without the dedication of the planning committee which comprises chair Shivi Selvaratnam, Jeff Beck, Charlie Blaich, Scott Feller, Todd McDorman, and Ann Taylor. Special thanks, too, to the Center for Academic Enrichment, the Computer Center, Media Center, and the Public Affairs Office for their help in making this conference so successful.

Mauri Ditzler '75
Dean of the College

TABLE OF CONTENTS

2	Welcome and Introduction from Dean of the College Mauri Ditzler
3-4	Table of Contents
5	Schedule and Location of Oral Presentations and Poster Presentations
6	Location Map for Poster Presentations in Detchon's International Hall
8-34	Abstracts of Student Presentations and Posters (<i>Alphabetical Listing By Last Name of Presenters</i>)
8	S. Amer Ahmed, Akira Kurosawa— <i>The Artist and the Auteur</i>
8	Steven Andrews and Dunmomi Owolabi, <i>How Students Perceive the Impacts of Spring Break Immersion Trips</i>
9	Alexander Barefoot, <i>The European Far Right: Anti-Democratic or the Voice of the People?</i>
9	Sean Baylor and Josh Richey, <i>Effects of the Familiarity of a Distracting Task on Memory Recall</i>
10	Jonathan Button, <i>Semiconductors in Particle Physics</i>
10	Samuel Clark, <i>Electronic Music</i>
11	Galen Collins, Gaurav Lamichhane, Francis Raycroft, and Paul Taraska, <i>Identification of Differential Regulated Genes Important in Early Embryonic Development of Xenopus laevis</i>
11	Galen Collins, <i>Asymmetric Leaves: Regulating Stem Cell Identity in Arabidopsis thaliana</i>
12	David Dahl, <i>Psychoneuroimmunology, Religion, and Your Health</i>
12	Stephen Dewart, <i>Enhancing User Experience: Wabash College and the Web</i>
13	Andrew Dits, <i>"Bale Jump" and Other Readings</i>
13	Paul Drambarean and John Serak, <i>Antibiotic Resistance of Bacteria in Little Sugar Creek</i>
14	Christopher Eash, <i>The Quantum Quincunx and Its Implications for Quantum Computing</i>
14	Philip Eubanks, <i>Community Building: Student and Staff Interaction in Today's Colleges</i>
15	Nathan Flory, <i>Physics Renovation: New Lab Technology Put to Use</i>
15	Tom Gaff, <i>"Fight Club" and Understanding Contemporary Manliness</i>
16	Greg Golic and Sabastian Peers, <i>Plasma Glucose in Infant and Adult Rats Given Chronic Insulin</i>
16	Aqualus Gordon, <i>Emotional Intimacy in Male Same-Sex Friendships: The Role of College Environment</i>
17	Eric Griffin, <i>Death in Athenian Families: An Investigation of Affection Through Public Representation and Social Obligation</i>
17	Justin Grimmer and Chris Jackson, <i>The Impact of Changing and Dropping Data</i>
18	Justin Grimmer, <i>An Empirical Analysis of Individual and PAC Contributions to Congressional Incumbents</i>
18	Justin Hatfield and Ibrahim Khan, <i>Using Scanning Electron Microscope to View Algae and Fungi</i>
19	Timothy Hunt and Michael Lawlor, <i>The Effects of Ladders and Chutes in "Chutes and Ladders"</i>
19	Tanner Kinhead, <i>St. Francis and the Franciscans</i>
20	Jean Kongpinda, <i>A Linkage of the Cox Proportional Hazard Model and Partial Least Squares to Analyze Gene Expression Data with Patient Survival Time</i>
20	Erik Kroger, <i>Investigation into Potassium Regulation in Chlamydomonas Through Changes in Gene Regulation Observed via Differential Display</i>
21	Sandeep Lakhan, <i>Quantifying the Expression of Phosphatase Genes GMKP1 and GMKP2 in Soy Plants</i>
21	James Litton and Nathan Lundquist, <i>For a "Higher" Adult Learning: The Importance of Continuing Intellectual Challenges</i>
22	Keir Marshall, Marc Magnussen, and Peter Muraige, <i>Community Analysis of Little Sugar Creek</i>
22	Brock Medsker, <i>Genetic Variation of Calytonia virginica in Fuller Arboretum</i>
23	Kevin Meyer and Sebastian Peers, <i>Synthesis (and Photochemistry) of 1,2,4-Triphenyl-1,3butadiene</i>
23	Matt Miller and David J. Pierce, <i>Trimedial Quasigroups and a Systematic Approach to Translating Otter Proofs</i>

TABLE OF CONTENTS

Abstracts of Student Presentations and Posters continued

- 24 Akil Kasumba Muhangi, *A Computational Study of the Structures of Gallium Sulfide*
- 24 Kariuki Murage, *Idiophones of Africa: Timbila (Log Xylophone) of the Chopi as a Case Study*
- 25 Alpha Newberry, *Electronic Music: An Art Science*
- 25 Shaylan Owen, *Out of Phocus: Photography in Layers*
- 26 Jacob Pactor, *Oil's Deterrence to Democratization*
- 26 Jacob Pactor, *Integrating Research and Civic Engagement into the High School Social Studies Classroom*
- 27 Alan Patton, *Matrix Switches*
- 27 Sam Reheinhardt, *AtPTP Activity*
- 28 Steven Rhodes, *Potatoes Were More Secure: Russia's Nuclear Material...a Look at the Risks and Implications of Theft and What Can Be Done to Prevent It*
- 28 Jeremy Robinson, *Callimachus: a Work in Progress*
- 29 Caleb Selby, *Deer Hunting and Degradation: Multiple Images and Their Impact on Interpretation*
- 29 Bob Shaver, *Quantum Theory and Free Will: an Argument for Scientific and Theological Dialogue*
- 30 Mark Shreve, *A Life Worth Living: The Life, Career, and Influence of Victor M. Powell*
- 30 Tyler Simpson, *The Effect of C4 Grass Density on Richness and Species Composition in Small Remnants*
- 31 Jacob Straub and Daniel Sung, *The Cincinnati Folk Festival: A Brief Examination of its Cultural Significance*
- 31 Paul Taraska, *Beta-Oxidation for Lipid Bodies in Rape and Maize Seeds*
- 32 Ivan Vassilev, *Probabilities Connected with Elimination Tournaments*
- 32 Jesse Ward, *The Effects of Trans-Unsaturated Fatty Acids on Lipid Membranes*
- 33 Joe Warfel, *Zero-Divisor Graphs for Direct Products of Commutative Rings*
- 33 Anthony Warren, *Integrated Schools: A Solution to the Northern Ireland Problem*
- 34 Jeremiah Wilcox and Joshua Coons, *Early American Blues: An Examination of the Performances and Contextual Meanings*

SCHEDULE OF POSTERS AND PRESENTATIONS

Poster Session I (1:00-2:30 p.m.)

Shaylan Owen
 Sean Baylor & Josh Richey
 Galen Collins
 Paul Drambarean & John Serak
 Justin Grimmer
 Erik Kroger
 Keir Marshall, Marc Magnussen, Peter Murage
 Akil Muhangi
 Sebastian Peers & Kevin Meyer
 Jeremy Robinson
 Paul Taraska

Poster Session II (2:30-4:00 p.m.)

Caleb Selby
 Jonathan Button
 Galen Collins, Gaurav Lamichhan, Francis
 Raycroft, & Paul Taraska
 Mark Shreve
 Greg Golec & Sebastian Peers
 Jason Hatfield & Ibrahim Khan
 Sandeep Lakhan
 Brock Medsker
 Dunmomi Owolabi & Steven Andrews
 Sam Rheinhardt
 Tyler Simpson
 Jesse Ward

Schedule and Location of Oral Presentations

Detchon 111

1:10 Jacob Straub & Daniel Sung
 1:30 Christopher Eash
 2:10 Syud Amer Ahmed
 2:40 Anthony Warren
 3:00 Tom Gaff
 3:20 Jean Kongpinda

Detchon 112

1:10 Joe Warfel
 1:30 Aqualus Gordon
 1:50 Ivan Vassilev
 2:10 Jeremiah Wilcox & Joshua Coons
 2:40 David Pierce & Matt Miller
 3:00 David Dahl
 3:20 Nathan Lundquist & James Litton

Detchon 209

1:10 Nathan Flory
 1:30 Samuel Clark and Alpha Newberry
 1:50 Stephen Dewart
 2:10 Justin Grimmer & Chris Jackson
 2:40 Jacob Pactor
 3:00 Alexander Barefoot
 3:20 Alan Patton

Detchon 212

1:10 Steven Rhodes
 1:30 Andrew Dits
 1:50 Peter Murage
 2:10 Jacob Pactor
 2:40 Bob Shaver
 3:00 Timothy Hunt, & Michael Lawlor
 3:20 Tanner Kinkead

LOCATION MAP FOR POSTER PRESENTATIONS IN INTERNATIONAL HALL

International Flags at the Front of the Room

Jeremy Robinson (1:00 -2:30 p.m.)
Tyler Simpson (2:30-4:00 p.m.)

Paul Taraska (1:00 -2:30 p.m.)
Jesse Ward (2:30-4:00 p.m.)

**Marhsall, Magnussen,
and Murage**
(1:00-2:30 p.m.)
Brock Medsker
(2:30-4:00 p.m.)
Akil Muhangi
(1:00-2:30 p.m.)

S. Andrews & D. Owolabi
(2:30-4:00 p.m.)
K. Meyer & S. Peers
(1:00-2:30 p.m.)
Sam Rheinhardt
(2:30-4:00 p.m.)

G. Golec & S. Peers
(2:30-4:00 p.m.)
Justin Grimmer
(1:00-2:30 p.m.)

J. Hatfield & I. Khan
(2:30-4:00 p.m.)
Erik Kroger
(1:00-2:30 p.m.)
Sandeep Lakkan
(2:30-4:00 p.m.)

S. Baylor & J. Richey
(1:00-2:30 p.m.)
Jonathan Button
(2:30-4:00 p.m.)
Galen Collins
(1:00-2:30 p.m.)

**Collins, Lamichhane,
Raycroft, and Taraska**
(2:30-4:00 p.m.)
P. Drambarean & J. Serak
(1:00-2:30 p.m.)
Mark Shreve
(2:30-4:00 p.m.)

Shaylan Owen (1:00-2:30 p.m.)

Caleb Selby (1:00-2:30 p.m.)

Jonathan Button***Semiconductors in Particle Physics***

Dennis Krause, Sponsor

Jonathan Button is a junior physics major from Cleveland, Ohio who is minoring in mathematics and history. He had numerous research opportunities through his NSF-sponsored REU at Purdue University last summer, and chose this topic because High Energy Physics is appealing to him, "most particularly because it deals with searching for the fundamental particles and origins of the universe."

I will talk about the use of circuit simulation in testing and designing the detectors used nearest to the beamline of the most powerful particle accelerators in physics. I will also talk about the operation and design of the detectors themselves and will also discuss the future of High Energy Physics and the importance of the development of large accelerators such as those at FermiLab and CERN.

Samuel David Clark***Electronic Music***

Judd Danby, Sponsor

Samuel Clark is a sophomore English major from Indianapolis, Indiana, who is minoring in music. He became interested in the research he conducted through the music class he took last semester (Introduction to Electronic Music).

The final project for the Introduction to Electronic Music class was to create a three to four minute-long piece that utilized digital recording medium and techniques. The type of music this piece demonstrates is electronic music. This type of music is not the standard music that is heard daily in the lives of people; it does not contain rhythm, melody, or harmony in the classical sense. The piece I made consists entirely of three sounds: a harmonica, a mandolin, and my voice.

I manipulated these sounds on computer software that allowed me to manipulate these sounds with effects, pitch shifting, and time manipulation. By doing so, I was able to create new sounds from the initial sounds I recorded onto the hard drive of the computer. I then took the original and new sounds on the computer and arranged them into a piece of music with various electronic "gestures." For my presentaion I will play this piece and describe exactly what electronic music is. Furthermore, I will demonstrate the differences and advantages between analog recording (reel-to-reel and cassette tape) and digital recording (ADAT, CD, and hard drive).

Galen Collins, Gaurav Lamichhane, Francis Raycroft, and Paul Taraska
Identification of Differential Regulated Genes Important in Early Embryonic Development of Xenopus laevis

Richard Nelson, Sponsor

Galen Collins is a senior biology major from Cranberry, New Jersey, who says, "The interconnection between genes and development through the regulation of gene expression is an idea that I find very fascinating and which I am able to explore in this project."

Gaurav Lamichhane is a sophomore from Nepal, who says, "The fact that complex organisms such as frogs and humans develop from a single cell has always made me wonder about the underlying principles behind it."

Francis Raycroft is a sophomore biology major from Whiting, Indiana, who says, "I hope to advance the interests of our lab by furthering my understanding in developmental biology with an emphasis on gene regulation. Furthermore, the techniques employed in our lab offer a great opportunity to explore the possibilities of molecular biology and improve upon our laboratory practices."

Paul Taraska is a junior chemistry major from Evansville, Indiana, who says, "I wanted to see what biology research is like because I am interested in a field that is a combination of biology and chemistry."

Differential gene expression is crucially important in embryonic patterning during early vertebrate development. In our lab, we have utilized RFDD-PCR (restriction fragment polymerase chain reaction) as a method of detecting and isolating genes whose expression level changes between the onset of zygotic transcription and early neurulation during early embryonic development of frogs (*Xenopus laevis*). DNA sequencing of several of these isolated gene fragments revealed a high degree of homology to previously characterized genes: aldehyde dehydrogenase, isocitrate dehydrogenase, CDC6, calreticulin, CDC42 effector protein, piwi and atrophin. Our goal is now is to more fully characterize the expression patterns of these genes and to explore their function during embryogenesis.

Galen Collins

Asymmetric Leaves: Regulating Stem Cell Identity in Arabidopsis thaliana

Richard Nelson (Biology) and Marja Timmermans (Cold Spring Harbor Laboratories), Sponsors

Galen Collins is a senior biology major from Cranberry, New Jersey, who last summer worked at Cold Spring Harbor Laboratories on Long Island, New York. He says, "We were interested in understanding the genetic and molecular biological process governing proper development in leaves, namely how does a cell in the leaf know its supposed to be a leaf? After graduation I hope to go to graduate school to pursue a career in research biology."

The diversity of leaf forms observed in nature is due in large part to the control of gene expression during the early developmental stages. However such mechanism of control are not fully know. This summer we studied Asymmetric Leaves1(As1), which regulates other genes responsible for leaf development. We were able to show how As1 interacted with other proteins and DNA to bring about this regulation.

David N. Dahl

Psychoneuroimmunology, Religion, and Your Health

Robert Royalty, Sponsor

David Dahl is a senior religion major and chemistry major from Washington, Indiana. "This subject combines both my major and my future plans of attending medical school. I saw it as a perfect synthesis of two seemingly different subjects."

Thanks to the generosity of a Dill Internship provided by alumnus G. Michael Dill, I was able to attend a conference and meet with some of the leading researchers into the effects of religious beliefs on health.

This presentation will serve two purposes. First, I hope to present to the audience some useful and thought-provoking information on the ways in which science has been exploring the link between religious faith and its effects on health. Second, in doing so, I hope to plant the seed of inquiry into the minds of the audience so that they will then continue to ponder how their own religious faith effects their health. I do not believe that a person can use religion, *per se*, to improve their health. However, an honest appraisal, by both religious and non-religious people, of how their worldview relates to their health can prove useful.

Stephen M. Dewart

Enhancing User Experience: Wabash College and the Web

Justin Lyon, Sponsor

Stephen Dewart is a sophomore religion major from Lake Bluff, Illinois who has been interested in Web design/development since about age 12, and has held a position in a Web company since age 13. He has worked with the Wabash Public Affairs Office since his freshman year.

The Web has emerged over the past decade as the latest and greatest advancement in the instant dispersal of information and communication. The Web has broken all boundaries, transcended all limitations posed by previous media, in giving both individuals and organizations the ability to reach the widest audience possible: anyone, anytime, anywhere.

The exponential growth of the Web throughout the past decade has, however, presented quite a challenge to all types of organizations. Struggling to keep up their existing visibility in a new landscape, they are finding it isn't only the tallest trees in the forest that are seen, but often also the brightest and most unique as well. More than just text and images, the effective Web site should evolve as a living, breathing, interactive powerhouse of information and features, specially tailored to a particular group or set of groups.

In today's age, success requires a well-engineered Web site. But just as an effective Web site can strengthen and refine, a poorly organized site can prove counterproductive. A weak Web site can convey the wrong message and yield inadequate results.

Throughout the past year, Wabash has reevaluated its Web presence in a process dubbed Enhanced User Experience. Under the direction and management of Justin Lyon, I studied and helped redefine the objectives and purposes of *Wabash.edu* and its deriving sections. The project has yielded numerous improvements to the entire Wabash Web system, principally the way information is organized and dispersed to multiple audiences.

This presentation will consider several relevant cases, e.g., the overhaul of the sports, admissions, alumni, and Wabash Magazine sites, as well as the content management system and its impact on departmental sites.

Andrew Dits

“Bale Jump” and Other Readings

Marc Hudson, Sponsor

Andrew Dits is an English/German major from South Bend, Indiana. He says, “I became interested in creative writing when I was unable to play basketball and through my stay at the Abbey of Gethsemani monastery in Kentucky. The monastery has been a source of poetry for me since then.”

THE SMELL OF NON-LIVING

The upstairs of this deep house is opened today,
like pores in a steam room,
by familiar warm fronts of coffee aroma.

Once, only antiquity and basement dust
rose up slowly filling the rooms.

Last week I slept here alone,
settled between the towers of sealed banana boxes.
There were a dozen dozen ladybugs
weightless dead on stale blue rugs; nothing flying
nowhere
not scents, not noises,
not furniture, not frames,
not family.

There is a smell of non-living in the loose carpet,
moving in the completely empty rooms,
and lying casually in the vents.

A smell of the house lagging between two families;
an anticipation and a remembrance.

There are houses without a street or name.

I'd like never to move in,
but linger
in this eerie smell of non-living
that has no memory and no demands

Paul Drambarean and John Serak

Antibiotic Resistance of Bacteria in Little Sugar Creek

Shivi Selvaratnam, Sponsor

Paul Drambarean is a junior biology major from Attica, Indiana. John Serak is a junior biology major from Avon, Indiana.

We became interested in continuing this research because of the ecological impact of run-off on bacterial community structure in aquatic environments like Little Sugar Creek. This research also has implications in terms of health impact on humans as an increasing number of antibiotics normally used to treat bacterial infections are becoming obsolete.

The goal of this one-year study was to assess the prevalence of antibiotic resistant bacteria in a creek adjacent to an operational hog farm. Antibiotics are added to animal feed for prophylaxis and growth promotion. The problem, however, is that a large percent of the drugs are not completely metabolized by the animals. Furthermore, this indiscriminate drug use can select for antimicrobial resistant bacteria within the animal. The unmetabolized antibiotics and resistant bacteria excreted through animal wastes can find their way into nearby aquatic environments by way of run-off.

The study was conducted by collecting water samples on a monthly from three sites along Little Sugar Creek in Crawfordsville, Indiana. The sites included one upstream (site A), one adjacent (site B), and one downstream (site C) from a swine farm. Results indicate at least a 2-fold higher prevalence of ampicillin resistant (amp^R) bacteria at site B in comparison to sites A and C. Amp^R isolates from the three sites were at least one other class of antimicrobial agents as demonstrated by the Kirby-Bauer assay. Identification of the amp^R isolates by amplification of the 16s rRNA gene revealed both similarities and differences in the types of bacteria present at the three sites.

Christopher Eash

The Quantum Quincunx and Its Implications for Quantum Computing

Michael Stohler, Sponsor

Christopher Eash is a junior physics major from Fort Wayne, Indiana. He says, "I became interested in the research after talking with Dr. Stohler about his current research projects. I was interested in any sort of physics research, and this happened to be the particular project he was working on."

Quantum computing is currently at the forefront of physics research across the globe. Quantum computers have been shown to be at least polynomially faster (for particular problems) than their classical counterparts. However, the field of quantum computing is still in its infant stage. This past summer I had the opportunity to work on a project that could have some serious future implications in this field. The quantum quincunx (quantum random walk) is similar to a classical random walk in that it splits inputs into orthogonal directions at every intersection, and then records the results of each path. The quantum quincunx uses laser beams, beam splitters, and rotating polarizers instead of pegs and balls to accomplish the random walk. In this way, laser paths can be split, and then recombined later to achieve constructive and destructive interference.

It is the pattern of interference that makes the quantum quincunx interesting. If each original (unaltered) laser beam is thought of as a computation, then each interfered laser beam can be considered a solution to the computation. The fact that all of the computations can be done simultaneously at the speed of light makes the quantum computer a highly significant pursuit.

Philip W. Eubanks

Community Building: Student and Staff Interaction in Today's Colleges

Richard Lynch, Sponsor

Philip Eubanks is a sophomore religion major and psychology minor from Jackson, Tennessee. He is a research intern for the Center of Inquiry in the Liberal Arts, and for the past year, he has been researching "C&T for Staff," the Center's pilot project, as well as student and staff interaction in the National Survey of Student Engagement's (NSSE) DEEP Project.

What role do support staff play in students' intellectual life in college? Students' relationships with staff are an important, if unacknowledged, part of their experiences on campus—a "ghost in the machine," as it were. But these relationships, which have the potential to contribute much to students' experiences and campus communities, often have little to do with students' academic and intellectual programs. A number of campuses, however, are recognizing the importance of the wider campus community and are developing ways to actively bring staff into the intellectual life of the college.

I will discuss a few examples from campuses in the National Survey of Student Engagement's (NSSE) Documenting Effective Education Practices (DEEP) project, and focus in more detail on Wabash College. The college recently began to offer "Cultures and Traditions," a core course for sophomores, to College staff in a special evening section. Participants note that they have become more intellectually active and self confident, increased their sense of belonging in the College community, and found new possibilities for interaction with students. These programs illustrate that including staff in the intellectual life of the College holds the potential for many benefits—or students, staff, and the College as a whole.

Nathan Flory

Physics Renovation: New Lab Technology Put to Use

Dennis Krause, Sponsor

Nathan Florey is a senior physics major, math and computer science minor from Delphi, Indiana. he says, "Last year I decided to look for an internship over the summer to provide me with some research experience that I could talk about when I applied to graduate school. When I learned that Dr. Krause could use some help over the summer to find ways to enhance many of the labs to include newer technology, I accepted."

The purpose of this presentation is to provide information on three modified labs and one new lab, with the exception of the "Ball Toss" lab which is entirely new this year. A "before and after" analysis will be given on the changes made to the experiment setup. For the "Ball Toss" lab, an introduction to the computer software and several possibilities for the use of camera technology in physics will be presented.

Tom Gaff

Fight Club and Understanding Contemporary Manliness

Warren Rosenberg, Sponsor

Tom Gaff is a senior English major, psychology minor from Kendallville, Indiana. He says, "I became interested in examining Fight Club after attending a faculty-student discussion on the film. The young men strongly supported Fight Club's value, but many women and faculty did not understand their attraction to what appeared to be just another 'blood and guts' movie. I wanted to examine why young men feel such an association with Fight Club.

The first rule of Fight Club is that you do not talk about Fight Club. The second rule of Fight Club is that you do not talk about Fight Club. Regrettably, we must break these rules in order to distinguish why the film *Fight Club* maintains such immense popularity within the college male cohort. Why would anyone want to watch men beat each other senseless while causing mass destruction? What is the attraction to watching a psychopath hurt himself?

The viewer must understand that *Fight Club* is not just about blood, guts, and gore. The violence seen on the screen only scratches the surface of the underlying issues approached by *Fight Club*. It is about a confusion felt by most educated young men. It is about how a man must discover himself in contemporary society. It is about what it really means to become a man today.

The feminist movement has changed the country's perception of masculinity and femininity. Many of women's gender stereotypes have been destroyed or changed. Unfortunately, most old stereotypes for men are still ingrained in society. Both men and women perpetuate these values, narrowing men's acceptable roles in a social climate that should support men's growth away from stereotypes.

This presentation explains that many young men grow up in this strange new environment, confused as to what is acceptable. Should they continue the gender roles that feminism fought? Can they be still men if they do not? *Fight Club* addresses a few of these areas of confusion.

Greg Golec and Sebasitan Peers
Plasma Glucose in Infant and Adult Rats Given Chronic Insulin

Carl Thompson, Sponsor

Greg Golec is a junior psychology major and economics minor from Schererville, Indiana. Sebastian Peers is senior chemistry major and psychology minor from Goshen, Indiana. They write, "We became interested in this project while taking Physiological Psychology and wanted to add practical experience to our knowledge."

Previous studies have found that rat pups given 6 U/kg insulin daily for 10 days by osmotic minipump (MP) are hypoglycemic on Day 2 and regain normoglycemia by Day 5. The same MP dose fails to produce hypoglycemia in adults.

We hypothesized that increasing the insulin dose would cause an initial hypoglycemia in both pups and adults, and that the pups might regain normoglycemia faster. Thirty pups (10 days old) and 30 adults (40 days old) were implanted with MPs configured to deliver either 0 (saline control), 12 or 18 U/kg insulin daily for 10 days. Plasma glucose levels were measured on treatment Days 2, 5, 8 and 10, and triglycerides were measured on Day 10.

Results showed that pups with insulin MPs were hypoglycemic relative to controls on Day 2, but not on Days 5, 8 or 10. Adults with insulin MPs never were hypoglycemic, even though much lower insulin doses induce hypoglycemia in adults given insulin by injection. Unlike adults, rats younger than 25 days of age do not feed in response to hyperglycemia, and it is possible that the adults averted hypoglycemia by eating more; however, adults given insulin did not gain more weight than controls. Pups had higher glucose and triglyceride levels than adults, probably reflecting the pup's higher metabolic rates.

We conclude that chronic insulin infusions reduce plasma glucose more in pups than in adults, although the pup's hypoglycemia disappears within five days.

Aqualus Gordon
Emotional Intimacy in Male Same-Sex Friendships: The Role of College Environment

Bobby Horton, Sponsor

Aqualus Gordon is a senior psychology major from Mobile, Alabama.

Previous research on friendship has indicated that American women have more intimate and expressive friendships than do American men. More specifically, friendships between two men (homo-social) tend to be less intimate and expressive than friendships between a man and woman or between two women. The current study investigated whether college environment influenced men's psychological gender and, thus, the intimacy and expressiveness of men's same-sex friendships.

Men and women from DePauw University and men from Wabash College completed assessments of the emotional closeness (i.e., expressiveness and intimacy) of their best same-sex friendships. Participants also completed assessments of psychological gender (masculinity and femininity). DePauw women expressed more emotional closeness with their same-sex friends than did either group of men. Interestingly, Wabash men were more comfortable with emotional closeness than were DePauw men; however, the two groups did not differ in the emotional closeness they reported in their same-sex friendships. Results also indicated that psychological gender was a good predictor of intimacy between men.

Eric Griffin

Death in Athenian Families: An Investigation of Affection Through Public Representation and Social Obligation

Joseph Day, Sponsor

Eric Griffin is a senior classics major minoring in philosophy from Whiting, Indiana. He writes, "I became interested with this project through my classics' senior seminar on Love and Friendship in the Ancient World. We studied a variety of relationships between members of Greek society. I wanted to see if funerary monuments represented a sense of intimacy from the perspective of the private sphere."

In today's society it is quite common for someone to die that is either a friend or close relative. We then must choose if the dead will be cremated or buried and how to go about doing such procedures. Our culture dictates the format of many aspects of the funeral procedure, but many of us never think of why we do such things to honor the dead. This was also the case in the Classical World. Cultural norms and laws made it a family obligation to erect monuments to honor the deceased. There is a question about why grave monuments were made mandatory instead of a simple sign of love, devotion, and mourning as they are in Western Modern society. I do not believe that because grave markers were an obligation means there was a general lack of love or affection in the Greek World. I feel that by making grave monuments a mandatory part of the Greek funeral, the culture was reinforcing the connection between family members and therefore increasing the amount of affection contained within the average Greek family.

By analyzing funerary data (inscriptions, grave markers, tomb gifts, etc.) we can see that it was a common occurrence to exceed the bare minimum of what was expected by the laws concerning funerals and monuments and move into a more emotional realm filled with affection and mourning. This concept that emotion too was added to the realm of the grave monument is reflected by historical evidence that suggests that love was a factor within the Greek household. I feel that by looking at the legal and social-historical areas concerning death and the family of Greek society we can see that affection did truly exist between members of the family and is represented by art and representations of the family on grave monuments.

Justin Grimmer and Chris Jackson

The Impact of Changing and Dropping Data

Peter Thompson, Sponsor

Justin Grimmer is a mathematics and political science double major with an economics minor. Chris Jackson is a mathematics major and an English minor with a business area of concentration. Both students reside in Griffith, Indiana. They write, "The issue of data manipulation in research, whether it be a justification of a removal of an outlier or a much more nefarious attempt by a researcher to adjust her data interested us both. Further, programming issues in mathematica, such as simulations and strategies for solving equations that were too big for mathematica to handle further fascinated us both."

During research, scientists (both natural and social) often find reasons to delete or change data values. In this project, we investigate the impact that altering these data values has on statistics regarding differences in group means. There will be two primary questions explored during our presentation. First, what causes a more dramatic shift in the observed probability that the difference between two means is statistically significant, dropping a data value or replacing with a data value causing the P-Value to drop to an optimally low level (given the data)? Second, when the number of observations increases, what is the effect on our ability to manipulate the P-Value for the groups?

In order to analyze this question, we employ symbolic manipulation in mathematica, followed by simulations to extract the new P-value. We will show that replacing data with an "optimal value" causes a greater shift in P-value and that increasing observations leads to a decreased ability to alter the P-value.

Justin Grimmer

An Empirical Analysis of Individual and PAC Contributions to Congressional Incumbents

David Hadley, Sponsor

Justin Grimmer is junior a political science and mathematics double major, residing in Griffith, Indiana. He writes, "I first became interested in "Political" Action Committee (PAC) contributions during the course Parties, Elections, and Pressure Groups last semester. This semester, while reading about rational decision-making in an independent study, I began to wonder how the contribution decision of PACs and individuals varied. The fascinating methodological issues involved in this analysis further piqued my interests."

Campaign contributions from both individuals and PACs have been shown to increase as incumbents face strong electoral competition. The extent to which the contributions of individuals, Business PACs, and Labor PACs in the 2000 general election differed based on the electoral security of the candidate is analyzed in this paper. In order to allow for comparison, I first compute an OLS and TOBIT model of campaign contributions, and then use the OLS model to compute an electoral security elasticity of contributions from individuals, Business PACs, and Labor PACs to incumbents. I conclude that individuals are the most responsive to the electoral security of the incumbents.

Jason Hatfield and Ibrahim Khan

Using Scanning Electron Microscope to View Algae and Fungi

Austin Brooks, Sponsor

Jason Hatfield is a senior biology major from Cincinnati, Ohio. Ibrahim Khan is a senior biology major from Indianapolis, Indiana. They write, "We became interested in this work through class and lab work in the Non-Vascular Plants course taught by Dr. Brooks in the fall of 2003."

Algal and fungal specimens were cultured in the laboratory on defined media. For scanning electron microscopy (SEM) the organisms were fixed in 4% buffered glutaraldehyde for 30-60 minutes and post-fixed in 1% osmium tetroxide for 20-30 minutes at room temperature.

We dehydrated the specimens in a graded ethanol series (20-100%) before they were transferred to the transitional fluid, liquid carbon dioxide. At this point we used a critical point drying apparatus to prepare the organisms for sputter coating with gold.

All samples were examined in the Hitachi Model H-300 electron microscope equipped with a model 3010 scanning electron image accessory. Electron micrographs were made on Polaroid type 55 film. Light photomicrographs were taken with a Nikon Coolpix 4500 digital camera mounted on a Nikon Eclipse, E200 compound microscope.

Timothy Hunt and Michael Lawlor

The Effects of Ladders and Chutes in "Chutes and Ladders"

Peter Thompson, Sponsor

Timothy Hunt is a sophomore math major, economics minor from Munster, Indiana. Michael Lawlor is a sophomore math major, Spanish minor from Crown Point, Indiana. They write, "We became interested in this project last year when it was assigned as part of a statistics course, but eventually grew to enjoy the underlying mathematical distributions and qualities of the game, thus we decided to pursue it more."

One interesting aspect of American culture are the various ways we use recreational time. Whether one participates in a sport, card game, or board game, there is almost an endless variety to choose from. Nowadays, society deems board games as old-fashioned, or just for kids. However, board games can be fun for all ages. One such example is the classic game "Chutes and Ladders," a game designed for players to move around a board that contains 100 squares. It is a game that tries to enforce good behavior by rewarding good behavior with ladders to move you further ahead, and by punishing bad behavior with chutes that move you backwards on the board. There are many intriguing probabilistic aspects of this game because of the aforementioned chutes and ladders. What we wanted to study were the following:

What are the median number of turns it takes to go from start to finish for 1, 2, 3, and 4 player games?

What square would you have to start on in order for the median number of turns for 1, 2, 3, and 4 player games to be half the expected value from position zero?

How effective are the ladders in creating an advantage?

How detrimental to your probability of winning are the chutes?

What would happen if the chutes, ladders, or both were removed from the game?

Which squares around the ladders give you a better probability of landing on the ladder?

How likely is it that someone who is behind on the board can catch up and win?

Tanner Kinkead

St. Francis and the Franciscans

Steve Webb, Sponsor

Tanner Kinkead is a sophomore religion and Greek double major from Indianapolis, Indiana. He writes, "I first became interested in St. Francis after Professor Webb spoke about him in class, and then I did some further study and reading on my own."

This is a paper about St. Francis and the Franciscan Order. But it is meant less as a biographical or historical picture of the St. Francis and his order—a work best reserved for a real biographer or a real historian—than as a commentary on the nature of Francis' life and his work. No words will be offered on his views of nature, views that have generated much attention since he was declared the patron saint of ecology in the late 20th century, and few words will be spent on stories of his miracles. The end of this paper is to unravel the central mystery of St. Francis himself, and to understand how this influenced his burning passion.

Jean M. Kongpinda***A Linkage of the Cox Proportional Hazard Model and Partial Least Squares to Analyze Gene Expression Data with Patient Survival Time***

Peter Thompson, Sponsor

Jean Kongpinda is a sophomore math/physics double major from Dallas, Texas. He writes, "I wanted to do a summer research program. Therefore, I applied and I got accepted to the Statistics summer program at Rice University. From there, I found the lectures on Bioinformatics and Biostatistics very interesting. That was how I decided to have a project dealing with Biostatistics.

Microarray experiments are being increasingly used in biomedical research as a way of finding the relationship between the genotype and phenotype of an individual. Doctors would like to predict the physical characteristics of a patient (phenotype) after analyzing the expression of his genes (genotype). This has many applications in medicine and has been used on many cancer patients. This method would help to determine whether a patient has cancer or not and the cancer's stage. Most investigations so far, deal with dichotomous phenotypes, but less has been done in the case where the phenotype of the patients in study is their survival time. A simple regression model (such as a logistic regression model) can be applied on the former one, but will not be appropriate with the latter one: this is mainly due to the problem of censoring. In this paper we consider the case where the phenotype is the survival time. We examine the problem of survival analysis when the number of variables is much larger than the sample size, a typical case in DNA microarray data.

We show that a combination of the method of Partial Least Squares and the Cox Proportional Hazard model can be used to fix at the same time the problem of censoring and the much larger set of variables compared to the sample size. Partial Least Squares is used to reduce the high dimensional matrix of variables while still keeping a good percent of information provided by the variables. The Cox Proportional Hazard model can then be applied with the new reduced matrix of variables as the covariates. A Kaplan-Meier estimator is used in the Cox model to circumvent the problem of censoring. We demonstrated the methodology on a data set of gene expression containing survival data on lung cancer patients. The data set is comprised of 86 lung cancer patients, 67 of whom have stage I cancer and 19 have stage III cancer. The method will be extended to provide information on which gene express themselves differently across the survival time of the patients and their stage of cancer.

Erik Kroger***Investigation into Potassium Regulation in Chlamydomonas Through Changes in Gene Regulation Observed via Differential Display***

L. David Polley, Sponsor

Erik Kroger is a senior biology major, chemistry minor from Fishers, Indiana. He writes, "I became interested in the process through which genetic code is transformed into proteins and the regulation of that process while taking Dr. Polley's advanced genetics class during the spring semester of my junior year."

The research that I conducted in the first semester is a continuation of research performed with Mike Einterz during the summer with considerable assistance and direction provided by Dr. Polley. This research focused on *Chlamydomonas* responses to potassium stress, specifically means of potassium regulation. We attempted to utilize differential display to identify upregulated expression of genes following exposure to potassium stress. Eventually this study hopes to find, isolate, and identify sequences that are upregulated during potassium starvation. It is our expectation that this information will yield useful information about the nature of potassium regulation within *Chlamydomonas*.

This research began with the extraction of RNA from wild type cells in logarithmic growth in the presence of high levels of potassium ions and in solutions completely lacking potassium. The RNA was then converted to cDNA stocks. Stocks were made from three different cultures of both potassium starved and normal cells. The cDNA bands of cultures grown in similar conditions are of similar intensity. It is this portion of the experiment on which I worked last semester. Changes in gene expression can be observed in comparing the band intensity of the two different sorts of cultures. These differences can be examined when the cDNA libraries are cut with Taq and then amplified by PCR using specific primers that possess three unique bases at the 3' end of the primer. This is done so that only cDNA products that have bases complementary to the unique primer bases will be displayed when amplified. This allows segments to be identified and isolated from acryl amide gels.

After a sequence thought to be upregulated during potassium starvation is isolated, it can be inserted into a plasmid loop through either chemical transformation or electroportation. These plasmids could then be reproduced in bacterial cells and sequenced. The sequences are compared to other characterized sequences through the use of very large internet databases.

Sandeep Lakhan

Quantifying the Expression of Phosphatase Genes GMKP1 and GMKP2 in Soy Plants

Ann Taylor, Sponsor

Sandeep Lakhan is a junior chemistry major, biology minor from Brownsburg, Indiana.

Many studies have been conducted in the past to see how the plants turn on the mechanisms (with Kinases) that enable them to cope with changes in their environment. But the concept of switching these mechanisms back off (with phosphatases) has been neglected. The purpose of this research was to quantify the expression of soybean map kinase phosphatases called GMKP1 and GMKP2, which supposedly turn soybean defense mechanisms off by removing phosphates off Mitogen-activated protein Kinases (MAP kinases) and tyrosine.

These intracellular enzymes (MAP kinases) then lead to the signaling cascades which lead to the activation of transcription factors in a cell. Having the choice of either plant tissue or cell media, the cell media was chosen and treated with water (Osmotic Stress) and hydrogen peroxide. Using a reagent called TRIzol® LS, total RNA was isolated from cells that were taken out of the stressed/treated environment at six different time intervals. The mRNA was then converted to cDNA using Invitrogen® First strand synthesis RT-PCR kit. cDNA was amplified using PCR (Polymerase Chain Reaction) /thermal cycler. Finally the samples from PCR were analyzed for GMKP1 and GMKP2 expression by gel electrophoresis knowing that that the base pair lengths of GMKP1 and GMKP 2 were 556 bp and 620 bp respectively.

Since the research called for quantification of these genes, it was absolutely necessary to either use the same amount and concentration of cDNA for each sample during PCR amplification or use a control gene that is present in plants at all times. A semi-quantitative method was used as the Actin gene (520 bp) was used as a medium for comparison and measurement of the amount of GMKP1 and GMKP2.

James Litton and Nathan Lundquist

For a "Higher" Adult Learning: The Importance of Continuing Intellectual Challenges

Richard Lynch, Sponsor

James Litton is a senior from Waltham, Massachusetts. Nathan Lundquist is a senior from Wabash, Indiana.

Adult-learning programs are primarily focused on remedial education or job skills. However, this emphasis on technical skills neglects another important aspect of adult learning—life-long intellectual challenge and stimulation.

Using a pilot project offered by Wabash College that provided the Cultures & Traditions course to adult members of the community (n = 19), we concluded that such intellectual stimulation was important for continual growth in personal belief and that this course filled a much needed void in the lives of these adult students. These finding demonstrate the importance of extending liberal arts education to a much larger demographic.

Keir Marshall, Marc Magnussen, and Peter Murage
Community Analysis of Little Sugar Creek
 Shivi Selvaratnam and Austin Brooks, Sponsors

Keir Marshall is a senior biology major, chemistry minor from Carmel, Indiana. "I wanted to become part of a long-term research project that emphasized a combination of outdoor field work and microbiological laboratory techniques."

Marc Magnussen is a senior biology major, religion minor from Greenfield, Indiana. "This project offered an ideal balance of laboratory research and field work, and also provided me with the opportunity to study the effects of a catastrophic environmental event."

Peter Murage is a sophomore biology major, chemistry minor from Nairobi, Kenya. "I have had an interest in micro and molecular Biology. Hence, a research project that encompassed molecular and microbiology techniques seemed appropriate."

Our research project involves the long-term analysis of the bacterial and algal communities at three sites along Little Sugar Creek (S.R. 32, between Crawfordsville and Shannondale). Shortly before the beginning of our experiment, this area had been polluted by waste from a nearby hog farm. Using microbiological techniques such as DNA extraction, PCR, agarose gels and DGGE (Denaturing Gradient Gel Electrophoresis), we attempted to analyze the long-term effects of this pollution on the bacterial and algal community structures. Samples were collected from rocks on the creek bed. Artificial substrate boxes were also placed at each site to determine if similar communities colonized on these surfaces. Comparisons were made over time in single sites, as well as between the three sites.

Brock Medsker
Genetic Variation of Claytonia virginica in Fuller Arboretum

Austin Brooks, Sponsor

Brock Medsker is a junior biology major from Sullivan, Indiana. He writes, "I found that this study incorporated many different aspects of molecular and ecological biology. The internship also allowed me the opportunity to learn and improve upon lab skills."

In the months between March and May you can find *Claytonia virginica*, a small perennial flower growing in different parts of the Parish Fuller Arboretum. Within the arboretum, patches of *Claytonia virginica* are separated by sidewalks and roadways. My research was aimed at determining if samples taken from different areas of the arboretum were genetically different.

After the samples were collected, DNA was extracted from the leaves. Next, I used PCR to make millions of copies of the ITS and 18s regions of the genome. These areas were of particular interest because they are highly conserved throughout different species and have been previously proven useful in phylogenetic research. In order to determine if the populations were genetically different I utilized restriction enzyme digests, RAPD primer analysis and total sequencing of the highly conserved ITS and 18s regions.

Research is ongoing but initial findings suggest that some of the populations are genetically different.

Kevin Meyer and Sebastian Peers
Synthesis (and Photochemistry) of 1,2,4-Triphenyl-1,3-butadiene

Robert Olsen, Sponsor

Kevin Meyer is a sophomore chemistry major, psychology major from Columbus, Indiana. Sebastian Peers is a senior chemistry major, psychology minor from Goshen, Indiana. They write, "We became interested in this project because it gave us a chance to build on the knowledge and skills we acquired in the classroom."

The goal of this research was to synthesize the four stereoisomers of 1,2,4-triphenyl-1,3-butadiene (figure 1) and to study their photochemistry.

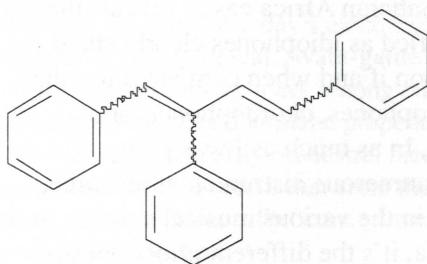


figure 1

The photochemistry of this molecule can occur under non-oxidative conditions resulting in photoisomerization or oxidative conditions resulting in photocyclization. The photoisomerization will result in the four stereoisomers around the two double bonds (EE, EZ, ZE, and ZZ). The photocyclization could result in as many as four polycyclic products: 1,3-diphenyl-naphthalene, 9-(2-phenylethenyl)-phenanthrene, benzo[g]chrysene, 1,2-diphenyl-naphthalene.

Matt Miller and David J. Pierce
Trimedial Quasigroups and a Systematic Approach to Translating Otter Proofs

J.D. Phillips, Sponsor

Matt Miller is a senior mathematics major, philosophy minor who hails from Indianapolis, Indiana by way of Dallas, Texas. He writes, "In our world which places so much importance on 'pure rationality' and 'objective truth,' mathematics is that which gives validity to the 'pure sciences' and the so-called 'social sciences.' Although I am a person who believes in the necessity of irrationality, I think that mathematics is that which exercises our highest faculties as humans (next, of course to dialectic). I did this research so that I may continue to feel superior to everyone else."

David J. Pierce is a senior mathematics major from Greenwood, Indiana. He says, "I became interested in quasigroup theory after studying loop and group theory in Abstract Algebra. Also, the idea of working within an algebra that does not have an identity element and is not associative attracted me to quasigroups."

We give new and interesting equations that axiomatize the variety of trimedial quasigroups. We also provide new criteria for a G2 quasigroup to be G7 and G1. The variety of quasigroups focused on is what the authors call G-quasigroups and semi-medial quasigroups. Also, we discovered a new systematic way to translate Otter (an automated reasoning tool) proofs.

Akil Kasumba Muhangi***A Computational Study of the Structures of Gallium Sulfide***

Dennis Krause, Sponsor

Akil Muhangi is a senior physics major, math minor, from Baltimore Maryland. He writes, "My interest in the project grew as I worked on it. The work was done at Dartmouth College. I have been remotely interested in chemistry, so this was a way to get my feet wet a little, without making a full-fledged commitment to the discipline."

The initial step was a comparison of both theoretical work and experimental work. The theoretical part of the project was through the use of a molecular modeling program called "Chem3D." I used my creativity to come up with as many molecular combinations of two gallium atoms and three sulfur atoms (for the monomer level), and four gallium atoms and six sulfur atoms (for the dimer level). The focus of the project was to take the most probable combinations, which were determined by optimizing their equilibrium geometry with another program called "gaussian98," and performing more extensive tests to see if they will, in fact, maintain their geometry or if the atoms will eventually dissociate and break apart.

On the experimental side, a solid sample of gallium sulfide was placed in the path of an Nd:Yag laser. The sample broke down into the constituent atoms, which were then accelerated toward a detector, and based on their relative speeds, an oscilloscope connected to the detector produced a mass spectra printout with the peaks signifying the different molecules that were detected. There were large peaks for gallium and sulfur ions, as well as a peak for Ga₂S₃ (monomer) and (Ga₂S₃)₂ (dimer). There was also an incidental peak for Ga₂S₄, which was not expected by my research team. I spent some time modeling those structures as well, and they are also included in the results.

The work I did last summer may prove to have important implications in the future. I have laid some groundwork toward understanding the relative stability of gallium sulfide molecules, which may lead to an understanding of its properties and some possible uses for the molecule. My work may also lead chemists to a better understanding of the constituent atoms as well.

Kariuki P. Murage***Idiophones of Africa: Timbila (log xylophone) of the Chopi as a Case Study***

James Makubuya, Sponsor

Kariuki Murage is a sophomore from Nairobi, Kenya, whose major is undecided. About this project he writes, "When I took the World Music course, Music102, and the class was exposed to and discussed the different folk musical instruments found in Africa, the log xylophones interested me the most. It was then that I decided to do a research project on the timbila (log xylophone) of Mozambique. I am glad to share parts of my research findings at this Celebration for Student Research event."

A quick bird's eye view and survey of instrumental resources of sub-Saharan Africa easily reveals that the instruments classified as idiophones clearly stand out as the most common if and when compared to others categorized of aerophones, chordophones, and membranophones. In as much as I was pretty fascinated by the numerous instrumental resources identified as used in the various musical cultures and traditions of Africa, it's the different idiophones of Sub-Saharan Africa classified in sub-categories of the melodic and non-melodic instruments that interested me the most.

In this presentation I will focus on the *timbila*, one of the melodic idiophones and a log xylophone of the Chopi (people), as a case study. Specifically this paper discusses the classification of this idiophone as tuned to a pentatonic scale. The presentation further analyzes the construction materials including gourds, beeswax, and mahogany, which are used, and why they are used.

I will also address the playing techniques/styles, the different levels of playing the *timbila* some of which include *ngalanga* and *mgodo* etc. In addition to discussing the playing techniques that include hitting and striking with wooden mallets, I will examine the stylistic elements and the context in which the *timbila* is played.

Alpha Omega Newberry IV***Electronic Music: An Art Science***

Judd Danby, Sponsor

Alpha Newberry is a junior from Memphis, Tennessee. He is a philosophy/Spanish double major with a minor in music. "This presentation is the culmination of my work in the Electronic Music class taught by Professor Danby in the fall semester of 2003."

What we know today as electronic music is the outgrowth of the effort of many 20th century composers and technicians. The original intent of these men and women was to take music beyond the bounds of traditional instruments, traditional rhythms, traditional styles, and the limitations of concert musicians. They wanted to broaden the vocabulary of music to contain all sounds possible.

However, the roots of today's electronic music are not necessarily technological. Avant-garde composers in the early twentieth century used, among other things, boxes, sirens, machinery, and airplane propellers to make music in what were still primarily orchestral pieces. Electronic music has since moved further from the realm of orchestral music. It is not technically "concert music," as it no longer needs live musicians.

Early mediums for recording electronic music included wax cylinders and magnetic tape. Although magnetic tape remains a good way to record sound, composers have, for the most part, moved on to the digital medium.

The digital medium is both less time consuming to work with than tape and also more flexible. Composers today can manipulate sound in ways that are impossible in a real world setting. They can create sounds without an original recorded soundbite, give one sound the characteristics of another, shorten sounds, lengthen them, change their pitch, etc.

Electronic music today doesn't sound like the traditional conception of "music." It can be devoid of pitch, definite rhythm, or easily recognizable form. What electronic music does have in common with traditional music is that it is made to elicit an emotional response. Electronic composers, like other composers, have scores. Their music is not random as may be perceived at first by the listener.

This presentation will focus mainly on an electronic composition of mine, entitled "Mjollnir." I will play the composition, provide information about its dramatic shape, what kind of response I intended it to make, the sounds I used to create the music, how I manipulated it, and what kind of equipment I used.

Shaylan Owen***Out of Phocus: Photography in Layers***

Doug Calisch, Sponsor

Shaylan Owen is a junior from Delphi, Indiana, who writes, "My photographic work last semester, in most cases, revolved around the use of layers: both layers in a three-dimensional sense and in a symbolic sense as well."

I began the semester with a particular interest in composite photography—the combination of multiple images to create a larger unified image. However, during the process, my direction shifted to allow space and depth to play a significant role in my work. With this idea in mind, I began creating composite photographic images with both sculptural and planar qualities. This resulted in several pieces of photography interacting with one another as well as the shape of the space around them.

Another of my focuses this semester was the combination of text and photographic images. I found this most powerful when combined with my personal ideas in an autobiographical triptych. Neither the words nor the images overpower one another, but both are necessary to express the intended self-realization.

Jacob Pactor

Oil's Deterrence to Democratization

Phil Mikesell, Sponsor

Jacob Pactor is a senior political science major from Indianapolis, Indiana. "I became interested in this topic while studying comparative non-democratic politics as the Bush Administration began to push for war in Iraq. Could an oil-rich country become democratic?"

"When freedom takes hold, men and women turn to the peaceful pursuit of a better life," said George Bush, United States President, in May 2003.

"What Iraq needs most of all is a stable stream of revenues with which to fund its reconstruction. Since oil is presently the country's only significant source of revenue, it needs good oil prices," said Dr. Alvaro Silva-Calderon, OPEC Secretary General, in July 2003.

While oil plays a different role in the histories of Saudi Arabia, Nigeria, Venezuela, and Bahrain, oil has played an integral part, and that's what is important. It doesn't matter how oil impacts the country, it matters that it does so definitively. If oil were never to exist in Saudi Arabia, Nigeria, or Venezuela, just as today it no longer exists in Bahrain, those three countries would have had a drastically different outcome. If the governments of those countries had to tap their human resources instead of just their oil wells, they would have become democracies, or at least approached democratization earlier. So as long as the demand for oil does not decrease, oil will continue to deter democratization because it allows governments to ignore the people.

This presentation will explain how mono-export countries, specifically those with elevated petroleum export values as a percentage of total export values, cannot democratize because the ruling person/faction/party only capitalizes on economic, and not human, capital. As such, without utilizing both the natural and human capital, the country cannot democratize or develop.

Jacob Pactor

Integrating Research & Civic Engagement into the High School Social Studies Classroom

Michele Pittard, Sponsor

Jacob Pactor is a senior political science and teacher education student from Indianapolis. "This research combines the two topics of civic engagement and in-class literacy. It stems from an Education 400 classroom inquiry project, which asked us to integrate classroom-based research into a creative unit we would teach. The question I posed is: How do online literacy tools introduced in a social studies classroom affect student's civic engagement outside of the classroom?"

The research will study how the incorporation of online literacy tools (such as web blogs, online journals, chat rooms, instant message conversations, online magazine and newspaper editions, e-mail, and other online communication methods) affect students' civic engagement/political participation (social capital) outside of the classroom. Using qualitative methodology, this research will be incorporated into lessons taught during student teaching.

In general, classroom-based research is important because it allows teachers the opportunity to gauge their students' learning in particular ways related to specific units of instruction and to systematically assess how well they, as teachers, are doing. I will share how the research will be integrated into several teaching units over the course of student teaching.

Why should civic engagement be an integral part of the high school social studies curriculum? According to the Indiana Academic Standards for high school social studies, "Students will explain the idea of citizenship in the United States, describe the roles of US citizens, and identify and explain the rights and responsibilities of US citizens...and describe and demonstrate how citizens can participate responsibly and effectively in the civic and political life of the United States."

The standard clearly spells out what students should know about citizenship, but I believe it's important for these students not only to describe and demonstrate how citizens can participate, but to actively participate as well. Civic engagement represents a great and important avenue for taking students to the next level—the level of active civic participation. It allows students the real opportunity to use their knowledge, while providing incentives to own the knowledge.

Alan Patton**Matrix Switches**

William J. Turner, Sponsor

Alan Patton is a senior mathematics major, religion minor from Covington, Indiana. He says, "I became interested in the topic of symbolic computation after talking with Dr. Turner about possible research internship. I thought that the material was interesting and would be beneficial for my major."

Over the summer, I studied how a black box matrix could be preconditioned to use in different, previously established algorithms. In order to precondition the matrix, I studied how a potential generalized switch could move any element of the matrix from one row to another while maintaining linear independence. Another key to finding a switch was its "cost" or the number of multiplications or additions involved between elements and symbols.

The work in trying to find an efficient switch started by examining other switches that already existed in the 2×2 matrix form. From this point it made sense to look for some kind of pattern that could be generalized into an $n \times n$ dimensional matrix. Of course, a pattern was difficult to see, so the next step was to look at a 3×3 switching matrix. There were various forms of this switch that were successful, but some were rather "expensive" due to the fact that they had lots of additions and multiplications. On the flip side, there were also some switches that seemed to be efficient and accomplished the same job.

Since a 3×3 matrix was able to be found in switching the elements to any rows, once again a pattern was sought but to no avail. The reason that a pattern could not be established was because it seems that there exists no general switch that will work with all matrix dimensions.

Sam Rheinhardt**AtPTP Activity**

Ann Taylor, Sponsor

Sam Rheinhardt is a senior chemistry major, English literature minor from Ilion, New York. He says, "I wanted to get a feel for what actual research in chemistry is like and how the concepts are put into practice. I find biochemistry to be particularly interesting among the different areas of chemistry and, thus, signed up to do research with Dr. Taylor."

AtPTP is a phosphatase protein found in plants that plays an important role in signal transduction by hydrolyzing phosphotyrosine. It has been demonstrated that this protein is sensitive to changes in the redox state of plant cells. Under oxidizing conditions, AtPTP loses its activity but will regain it upon the addition of reducing agents. This research attempts to gain further insight into the mechanism of this inactivation/reactivation, as well as the effects of superoxide on AtPTP activity.

Steven Rhodes

Potatoes Were More Secure: Russia's Nuclear Material...a Look at the Risks and Implications of Theft and What Can Be Done to Prevent It

Frank Howland, Sponsor

Steven Rhodes is a freshman chemistry major from West Lafayette, Indiana. He writes, "I first became interested in this topic while debating the 2000-2001 National Forensic League resolution: 'The United States federal government should establish a foreign policy significantly limiting the use of weapons of mass destruction.' I conducted further research on this topic in Professor Howland's freshman tutorial, Interpreting Modern Technology."

Upon the collapse of the Soviet Union, Russia inherited a nuclear complex of an almost incomprehensible scale. In search of a quick fix to this dilemma, the Russian government, instead of taking steps to gradually downsize this complex, simply cut the budget out from underneath it. As a result, the security of its nuclear materials has deteriorated drastically. Six hundred metric tons of highly enriched, weapons usable nuclear material, is now dangerously vulnerable to theft. The risk that these materials will be stolen is much more than a hypothetical concern. The International Atomic Energy Agency has documented 18 confirmed cases in which weapons grade nuclear material was stolen from Russia in the past 12 years.

If these materials were to fall into the hands of a terrorist organization, the results could be disastrous. Upon acquiring these materials, terrorists could easily construct a crude nuclear device known as a dirty bomb, capable of spreading radioactive contaminants over a wide area, killing thousands and rendering the area uninhabitable for decades.

In an oral presentation utilizing Microsoft PowerPoint, I plan to answer the following questions: Why should we be concerned about the security of Russia's nuclear material? How high is the risk of theft of Russia's nuclear materials? What are the ramifications of such theft? How can this looming threat to our national security best be addressed?

Jeremy Robinson

Callimachus: a Work in Progress

Bill Placher and Dwight Watson, Sponsors

Jeremy Robinson, a senior English and Spanish double major from Indianapolis, Indiana, became involved with Callimachus after one of his own works was published in the journal during the fall of his sophomore year. His involvement and interest in the publication's overall role on campus grew quickly, and the following semester he became the Editor in Chief. After spending a year abroad in Salamanca, Spain, he has once again taken an active role in the journal and looks forward to strengthening its quality and reputation on campus.

Each semester the *Callimachus* strives to showcase and to promote creative and inspiring talent in the Humanities among students of Wabash College. The articles presented in each issue demonstrate clarity of thought and dedication to scholarly research—essential aspects of the liberal arts motto we hold dear. Much like the poetry and scholastic work of the Hellenistic Greek poet after whom the journal is named, submissions are chosen based on their originality, readability and insight.

The presentation "*Callimachus: a Work in Progress*" represents the challenges that have faced this undergraduate scholarly journal as it has attempted to redefine itself and increase its exposure on campus. Focusing on the overall process of soliciting, selecting and eventually publishing undergraduate essays and artwork, Robinson and fellow staff members will show how the journal is never a completely finished product, but a continually evolving collaboration.

Caleb Selby

Deer Hunting and Degradation: Multiple Images and Their Impact on Interpretation

Doug Calisch, Sponsor

Caleb Selby is a senior speech major from Crawfordsville, Indiana, who is minoring in religion.

The images I will be presenting address two of the themes that I worked with over the course of the fall semester. These very different themes are degradation and deer hunting.

In addressing these themes, I use multiple images to convey my interpretation of each topic. This first set—which fell under the “cultural landscape” assignment—deal with the degradation of a nearby wire factory and the photographs address this decay in multiple ways. In doing this assignment, I utilized the concept of composite photography thus creating one image out of numerous connected images. Then, I took isolated images out of this larger work. These isolated photographs function similarly to the composite in their content yet differently in their presentation.

The other set of photographs that I will be presenting—my “personal landscape” assignment—deal with deer hunting. Deer hunting is a specific facet of my life and I have been actively engaged in this pastime since I was young. These photographs address the graphic and sometimes gruesome nature of deer hunting. In this effort, I explain how these images are understood differently by hunters themselves as images of success. In explaining this difference of interpretation, I have paired images of deer in the slaughterhouse with images of hunters in pursuit of their prey. Much like the former set of images commenting on the degradation of the wire factory, these images draw their explanation as a set, not simply as isolated images.

Thus, the two sets of photographs I will be presenting display the power that multiple images can have in constructing an interconnected message.

Bob Shaver

Quantum Theory and Free Will: An Argument for Scientific and Theological Dialogue

William Placher, Sponsor

Bob Shaver is a senior religion major from Indianapolis, Indiana. “I became interested in studying the relationship between modern physics and religion because I finished a physics minor and wanted to incorporate my scientific work somehow into my major course of study. The study turned out to be much more fruitful than I had anticipated.”

By tracing the history and development of quantum theory, I attempt to demonstrate the inherent subjectivity in doing science. Then, by using a number of free will arguments from theologians and scientists, I propose that interdisciplinary dialogue is possible and recommended. It turns out that scientists and theologians have pertinent things to say to one another and that scientific claims to unique rationality cannot be substantiated.

Mark Shreve*A Life Worth Living: The Life, Career, and Influence of Victor M. Powell*

Peter Frederick, Sponsor

Mark Shreve is a senior history major from Cincinnati, Ohio. His biography on Vic Powell is a product of his history senior seminar course. Last summer, he began research on the history of Wabash in the 1990s and the presidency of Andrew Ford as a Public Affairs intern.

Two years ago, I was able to attend a Wabash alumni event in Indianapolis. The keynote speaker was Victor Powell—a man I could recognize from campus, but whom I knew little about. It was shocking to me that so many of the alumni gathered in Indianapolis—nearly all of them—were waiting to speak with Dr. Powell. Some of them took just one course with him, but they were anxious to share memories. It was clear to me then that Dr. Powell had been an influence in the lives of many young Wabash students.

This fall I had the pleasure to sit with Dr. Powell on several occasions to learn more about his life and career. We sat in his basement one day, sharing a plate of sugar cookies and drinking Coca-Cola, and spoke of the fondest and the most challenging moments of his teaching career. It was a moment that only Wabash—and Dr. Powell—could provide. He made reference to the portraits of his friends Dan Evans and Butch Shearer. I asked him to visualize the portrait that would someday honor him and what elements would characterize him. He had no immediate response. After much thought, he said, “I couldn’t imagine what would be so obviously characteristic of me.” His response symbolizes his sense of humility.

In another sense, however, how could an artist portray the life and career of Powell within the confines of a portrait? His involvement at Wabash—from professor, debate coach, dean of the college, department chair, acting president—to his family and community lives, proves he has worn many hats. This biography aimed to portray to future generations all the energy and impact Vic Powell had on previous Wabash men.

This biography on emeritus faculty members has been a unique assignment. It was required of us to practice the skills necessary for historians—conducting interviews, searching through the archives for primary sources, and crafting a paper with themes of the person’s life. But it was also a challenge to produce what would become an historical record for this College.

Tyler Simpson*The Effect of C4 Grass Density on Richness and Species Composition in Small Remnants*

David Krohne, Sponsor

Tyler Simpson is a senior biology major, chemistry/psychology double minor from Flora, Indiana. “My interest in prairie land ecology began after taking Ecology with Dr. Krohne. He approached me with the available internship position knowing my interest and enthusiasm for field ecology.”

The majority of remnant prairie maintenance is conducted with periodic burning. Data from large Kansas prairies suggest that burning alone will result in the loss of species richness due to the increase in C4 grass dominance in the absence of bison grazing. For preservation of species richness, some argue that the key element of bison grazing should be incorporated into the conservation and restoration strategies for remnant prairies (Steuter, 1997). The question that arises is, what the effect of C4 grass density on richness and species composition is in small remnants? Our data reject the hypothesis that C4 grass density accounts for the variation in richness among remnant prairies.

Jacob Straub and Daniel Sung

The Cincinnati Celtic Folk Festival:

A Brief Examination of its Cultural Significance

James Makubuya, Sponsor

Jacob Straub is a sophomore history major from Rolling Meadows, Illinois. Daniel Sung is a sophomore math major from Fishers, Indiana. They write, "After taking a World Music (MUS 102) class fieldtrip to one of the cultural festivals that was held in Cincinnati, Ohio at the beginning of the fall semester of 2003, we decided to do a research project in which to examine the cultural significance of folk festivals."

In the United States, different states and cities within them have in the last 30 to 40 years witnessed an ever-increasing surge in the phenomena of cultural folk festivals. Attendances of these festivals have inevitably and deeply immersed the cultural festival goers in vibrant activities of traditional folk music and dance, humorous and entertaining acts of comedians, and extravagant works of painters and sculptors. Perhaps one of the main objectives of these festivals is to remind immigrant peoples of their ethnic affinities. These festivals have been and still are forums for annual, intimate, and club-like atmospheres where groups with similar ethnic affinities and interests assemble to either recreate, showcase, or even celebrate what were at one time the cultural values of their ancestors.

In our presentation we will examine the Cincinnati Celtic Music Festival as a case study, primarily with a focus on the music and dance that took place then and takes place on a regular annual basis. The emphasis will be placed on the appreciation and understanding of the music and dances of the festival from both the perspective of structure and the cultural context in which the said music and dance performances were created. In an attempt to connect with our primarily American audiences, our presentation also examines the extent to which this Celtic music has influenced American country music. Last, through this presentation, we will attempt to show how vibrant the Celtic musical culture is and the possible reasons for its continued success.

Paul Taraska

Beta-Oxidation for Lipid Bodies in Rape and Maize Seeds

Julie Olsen, Sponsor

Paul Taraska is a junior chemistry major, biology minor from Evansville, Indiana. He writes, "I am very interested in research that combines both chemistry and biology because they are my major and minor."

Beta-Oxidation during germination of Rape and Maize seeds occur in two organelles, the glyoxysomes and the lipid bodies. We have been analyzing this process at two points:

- 1) the acyl CoA oxidation step, where oxygen is converted to hydrogen peroxide and we can measure the oxygen consumption, and
- 2) the acyl CoA dehydroxidase step, where NADH is produced and we can measure its production spectrophotometrically.

This summer, we verified that the lipid bodies were not contaminated with glyoxysomes, so the only Beta-Oxidation activity we were observing was taking place in the lipid bodies. We did this by examining lipid body preparation for catalase activity, a marker enzyme for glyoxysomes.

We also continued to collect information on the oxygen requirements of the acyl CoA Oxidase reaction. In the previous summer, Mark Sherer observed that this enzyme was able to use a higher level of oxygen than what is present in the atmosphere. We began repeating Mark's experiments to find the optimal oxygen concentration for the enzyme.

Joe Warfel V.

Zero-Divisor Graphs for Direct Products of Commutative Rings

Michael Axtell, Sponsor

Joe Warfel is a senior mathematics major from LaPorte, Indiana. "This presentation is based on work that I did during a mathematics research internship at Wabash last summer, and which I extended during the following semester for my senior project."

Describing what I did requires a lot of definitions, which I present in the following two paragraphs; however, a previous familiarity with graph theory and algebra in general, or even with the definitions given below, will not be assumed in the presentation. The last paragraph describes the particular focus of my research, and outlines a few of the results.

A *ring* is an algebraic system consisting of a set with two operations, addition and multiplication. These operations work in essentially the same way as the familiar addition and multiplication operations of the natural numbers. A *commutative ring* is a ring in which multiplication is commutative; that is, in which $a*b=b*a$ for all elements a, b in the ring. The *direct product* is a method for combining two rings, and the direct product of two rings R_1 and R_2 , denoted $R_1 \diamond R_2$, is also a ring. The *zero-divisors* of a commutative ring are any elements a, b in the ring such that $a*b = 0$ though neither a nor b is 0, and the set of zero-divisors of a ring R is symbolized $Z(R)$.

A recently-developed method for studying rings uses a part of mathematics generally not associated with rings, graph theory. A simple *graph* can be associated with a commutative ring R ; this is called the *zero-divisor graph* and is symbolized $\mathfrak{i}(R)$. It is made by drawing a vertex for each element in $Z(R)$ other than the zero element, and connecting two elements a and b with an edge if and only if $a*b = 0$. The *distance* between two points a and b in a graph is the least number of edges that must be traversed to go from a to b , and the *diameter* of a graph G , denoted $diam(G)$, is the longest distance in the graph.

My study originally focused on the how $diam(\mathfrak{i}(R_1))$ and $diam(\mathfrak{i}(R_2))$ are related to $diam(\mathfrak{i}(R_1 \diamond R_2))$, and I proved a set of six theorems that describe this. However, beyond this, my study moved into a study of which graphs can be realized as $\mathfrak{i}(R)$ for some R , and more generally what can be learned about R by studying $\mathfrak{i}(R)$, especially for the case $diam(\mathfrak{i}(R))=2$.

Anthony Warren

Integrated Schools: A Solution to the Northern Ireland Problem

Phil Mikesell, Sponsor

Anthony Warren is a senior political science and speech double major from Apple Valley, Minnesota. He says, "During my junior year at Wabash I studied abroad at University College Dublin for five months. My interests in Ireland go back in time as ancestors on both sides of my family originally come from the northern province of Ulster, or what is now known as Northern Ireland."

Due to my close connection with Ireland, I have always been interested in the Northern Irish conflict. My time spent in Ireland allowed me to see and learn about the conflict between differing religions firsthand, as opposed to simply reading books and hearing second hand news reports on the topic. After making several trips to Northern Ireland and having numerous conversations with friends about the problems, I learned a great deal more about the subject from differing perspectives. I often wondered if there were any possible solutions to the problems still persisting in Northern Ireland. Then I thought back to the problems facing blacks and whites in the South, and the progress made after the Civil Rights Movement. My paper offers a solution to the problems facing Northern Ireland: Integrated Schools.

Jeremiah D. Wilcox and Joshua R. Coons
Early American Blues: An Examination of Performances and Contextual Meanings
James Makubuya, Sponsor

Jeremy Wilcox is a freshman religion major from Indianapolis, Indiana. Josh Coons is a freshman from Hobart, Indiana, whose major is undecided. They write, "We presented an extra credit presentation in Music 102 over a topic that is interesting and quite enjoyable to research. After the presentation was finished, Professor Makubuya suggested that we should present it at the Celebration and we accepted the suggestion and ran with it."

The early blues, as a form of expression, were certainly much more than statements of "misery." At their base, they were a sort of exalted or transmuted expressions of criticism or complaint, the very creation of which served as a balm or antidote to both the performers and their audiences. The early blues had the capacity to transform sadness or suffering into more bearable or even more ecstatic emotion/s.

In addition to discussing the fact that the early blues were originally a traditional, unwritten type of music existing primarily in the oral tradition, our presentation will also focus on the key originators/performers and the formal characteristics of this early music genre.

Specifically our presentation will discuss such early originators as "Son House," Benny Goodman, etc. We shall also examine the instrumental resources these blues singers used, the blues stanza framework of eight or twelve bars, the themes of the blues, the element of rhyming in the typical four-line stanza, and the dropping or cutting off of the voice in the middle or near the end of a line.

