

14th Annual Symposium

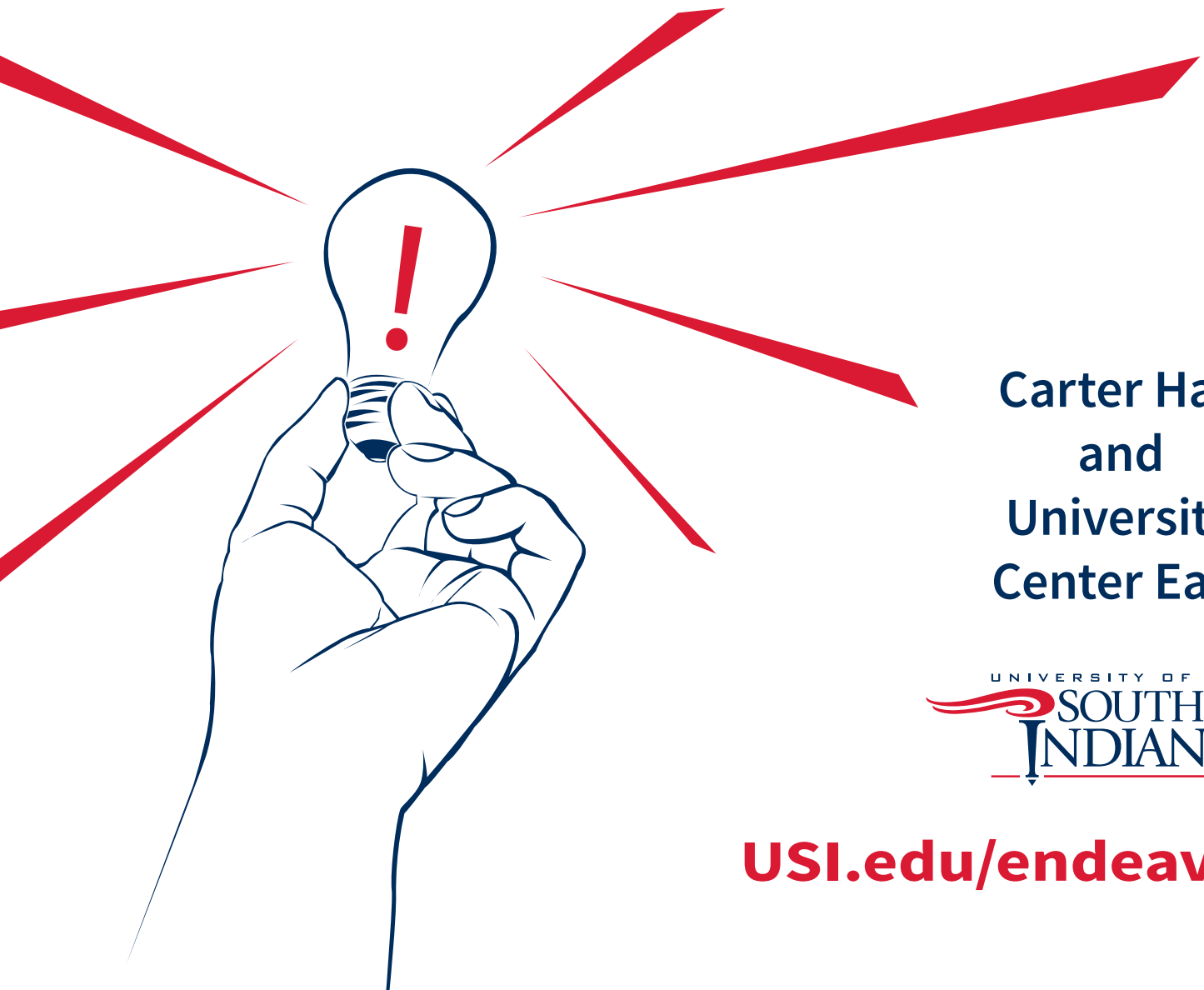
2015

USI

ENDEAVOR!

AWARDS *for*

RESEARCH & CREATIVITY



Carter Hall  
and  
University  
Center East



[USI.edu/endeavor](http://USI.edu/endeavor)



April 2015

Dear Endeavor! Participant:

Welcome to the 14<sup>th</sup> Annual Endeavor! Undergraduate Research and Creative Works Symposium at the University of Southern Indiana! As a participant in the Symposium, you are deepening your undergraduate learning experience and exhibiting initiative that is valued by graduate degree programs and employers.

During the Symposium, take the opportunity to get to know students and faculty from other departments and universities. Building networks outside your discipline is an important part of preparing for the next step after you complete your undergraduate education.

Congratulations on being a participant in USI's Endeavor! Symposium and best wishes to you.

Sincerely,

A handwritten signature in black ink that reads "Linda L. M. Bennett". The signature is written in a cursive style with a large initial "L" and "B".

Linda L. M. Bennett, Ph.D.  
President



April 4, 2015

Dear Endeavor Symposium Presenters and Sponsors:

Welcome to the 2015 Endeavor Symposium. As I'm sure you come to appreciate, combining research and learning is one of the best ways to get the most out of your time here at USI, and I hope that the experience has helped to develop strong ties to your education – ties that you will take with you after you leave the university.

You have worked hard on your projects and we are proud to give you the chance to present the results of your work to the USI community.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Strezewski". The signature is fluid and cursive, with a large loop at the end.

Michael Strezewski, Ph.D.  
Director  
Endeavor Research and Creativity Awards

## Endeavor Symposium Program

Thursday, April 9, 2015

- 7:30 – 8:30 a.m.      **Check-in** for all presenters and sponsors: Pick up your programs and ID badges at registration table (located in 2<sup>nd</sup> floor UC hallway, next to Conference Services Desk)
- 8:30 – 11:50 a.m.      **Oral Presentations**, Rooms UC 2217, and 2218
- 8 a.m. – Noon          **Poster and Artwork Sessions**, *University Center, Carter Hall D*
- 12:10 – 1:10 p.m.      **Endeavor Luncheon** for student participants and mentors, *Carter Hall A-C*. Your badge will serve as your lunch ticket.
- 1:10 – 1:30 p.m.      Breakdown of all poster materials and displays

### Endeavor Research and Creativity Awards Committee

- Michael Strezewski      Director of Endeavor Awards for Research and Creativity, Associate Professor of Anthropology, College of Liberal Arts
- Rebecca Deeg          Grant Administrator, Office of Planning, Research, and Assessment
- Ronald Diersing        Associate Professor of Engineering, Pott College of Science, Engineering, and Education
- Khaled Elkhail         Associate Professor of Finance, Romain College of Business
- Leigh Anne Howard     Associate Professor of Communication Studies, College of Liberal Arts
- Erin Reynolds          Assistant Professor of Health Services/Administration, College of Nursing and Health Professions
- Mary Ann Shifflet      Contract Assistant Professor of Economics, Romain College of Business (Honors Council Representative)
- Edmir Wade          Associate Professor of Chemistry, Pott College of Science, Engineering, and Education

## Acknowledgements

The Endeavor Committee thanks the following for their support of the Endeavor Research and Creativity Award Program and Endeavor Symposium:

- Dr. Linda Bennett, President, University of Southern Indiana
- Dr. Ronald Rochon, Provost
- Dr. Shelly Blunt, Assistant Provost for Academic Affairs
- College of Business
- College of Liberal Arts
- College of Nursing and Health Professions
- Pott College of Science, Engineering, and Education
- USI Honors Program
- USI Office of Special Events

## Endeavor Faculty Mentors

- Dr. Aimee Adam
- Dr. Daniel Bauer
- Dr. Brian Bohrer
- Ms. Joy Cook
- Ms. Joan DeJong
- Dr. Trent Engbers
- Ms. Emily Holt
- Dr. Glen Kissel
- Ms. Jeanette Maier-Lytle
- Mr. John Morris
- Dr. Christopher Rivera
- Dr. Jeff Seyler
- Dr. Susan Spencer
- Dr. Edmir Wade
- Dr. Gongjun Yan
- Mr. Eric Altheide
- Dr. Richard Bennett
- Dr. Jeannie Collins
- Dr. Julian Davis
- Dr. William S. Elliott
- Dr. Priya Hewavitharanage
- Dr. Mari Hopper
- Dr. Eric McCloud
- Mr. Rob Millard-Mendez
- Dr. Elizabeth Passmore
- Dr. Kent Scheller
- Dr. Rebecca Sparks-Thissen
- Dr. Rex M. Strange
- Dr. Ken Walsh

## 8-9 a.m. POSTER SESSION

### Carter Hall, A-C

Taylor Blackford	Determining Pharmaceutical Components in Various Water Sources
Diana Cavanah, Rachel Eickhoff, Erin Garbukas, Chynna Hall, Cory Heck, Abby Krahling, Jessica Lawson, Christopher Luttrell, Maria Nguyen, Lauren Owens-Cobb, Adam Rakestraw, and Geoffrey Taylor	<i>Have You Seen Me?:</i> Students Explore the Art and Science of Clay Facial Reconstructions
Laura Chamness	Synthesis of a Mixed POCOP Pincer for Use in Dehydrogenation Reactions
Beth A. Cossey	Luciferase: Modeling and Expression
Alayna Griffin, Jordan Wassmer, and Breanna Young	Physical Activity, Health, and Nutrition Intervention at Low Performance Schools
Bethany Komaskinski, Erica Logsdon, and Megan Wess	Grain Drain: A Dental Hygiene Perspective on Increased Awareness of Celiac Disease
Ian Parker	Analyzing Projectile Motion Uncertainties
Caleb Starr	Synthesis of Carbohydrate Based Organocatalysts for Enantioselective Aldol Reactions
Evan Taylor	A Novel Cold Trap Method for Analyzing Exhaust Emissions at the University of Southern Indiana
Emily Tepool and Jordyn Lewis	Providing Oral Care to Individuals with Disabilities

## 9-10 a.m. POSTER SESSION

### Carter Hall A-C

Taylor Blackford	Determining Pharmaceutical Components in Various Water Sources
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Laura Chamness	Synthesis of a Mixed POCOP Pincer for Use in Dehydrogenation Reactions
Beth A. Cossey	Luciferase: Modeling and Expression
Danielle Eckert, Aaron Williams, Evan Taylor, and Craig Roberts	USI Spectrometer Design
Aaron Feldhaus	Variability in Mudrocks Overlying Coal Seams of the Carbondale Group (Pennsylvanian) in Southwestern Indiana
Kayla Fields	Magnetic Resonance Imaging and the Potential Dangers of Burns
Alayna Griffin, Jordan Wassmer, and Breanna Young	Physical Activity, Health, and Nutrition Intervention at Low Performance Schools
Andie L. Nagel	Chromatin Diminution in <i>Lampetra aepyptera</i>
Nehal Ninad	Stiffness Components of Wings in Three Species of Lycaenid Butterflies
Ian Parker	Analyzing Projectile Motion Uncertainties

Jessica Richards	Tracking Changes in BMI, Blood Lipid, Glucose and Insulin Levels in Young Adults over the Span of Undergraduate Education
Brandon Root	Designing a Shallow Groundwater Monitoring Study to Support Re-Introduction of an Indiana State Endangered Amphibian
Douglas Rose and Adam Ferrari	Dithiepin-based Host Molecules for Potential Pharmaceutical Applications
Caleb Starr	Synthesis of Carbohydrate Based Organocatalysts for Enantioselective Aldol Reactions
Michael Stephens	Early Diagenetic Origin of Mudrock Concretions from the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California: Implications for Preservation of Primary Sedimentary Fabrics
Evan Taylor	A Novel Cold Trap Method for Analyzing Exhaust Emissions at the University of Southern Indiana
Emily Tepool and Jordyn Lewis	Providing Oral Care to Individuals with Disabilities
Reuben Warshawsky, Jason Vaal, Kelsey Stickler, and Dimitry Bachynsky	Design and Synthesis of Dimeric BODIPY Molecules for Dye-sensitized Solar Cells
Thad C. Whittington and Robert C. Monsen	Gel Electrophoresis versus Capillary Zone Electrophoresis



## 10-11 a.m. POSTER SESSION

### Carter Hall, A-C

Danielle Eckert, Aaron Williams, Evan Taylor, and Craig Roberts	USI Spectrometer Design
Aaron Feldhaus	Variability in Mudrocks Overlying Coal Seams of the Carbondale Group (Pennsylvanian) in Southwestern Indiana
Kayla Fields	Magnetic Resonance Imaging and the Potential Dangers of Burns
Julia Huffman	Bringing the Medieval Garden to Hammond Castle
Daniel Mann	Requirement of the Inner Membrane Protein, YhiM, for <i>E. coli</i> Growth in High Temperature and Reduced Salinity Environments
Daniel Mann	A Comparison of Local and Tropical Plants Used as Herbal Remedies and Their Chemical Make-Up
Cecil Neville	<i>Belles Heures</i>
Nehal Ninad	Stiffness Components of Wings in Three Species of Lycaenid Butterflies
Jessica Richards	Tracking Changes in BMI, Blood Lipid, Glucose and Insulin Levels in Young Adults over the Span of Undergraduate Education
Brandon Root	Designing a Shallow Groundwater Monitoring Study to Support Re-Introduction of an Indiana State Endangered Amphibian
Payton Schwing and Charlene Seger	Alcohol Abuse Intervention for Dental Professionals
Michael Stephens	Early Diagenetic Origin of Mudrock Concretions from the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California: Implications for Preservation of Primary Sedimentary Fabrics
Thad C. Whittington and Robert C. Monsen	Gel Electrophoresis versus Capillary Zone Electrophoresis

## 11 a.m.- noon POSTER SESSION

### Carter Hall, A-C

Diana Cavanah, Rachel Eickhoff, Erin Garbukas, Chynna Hall, Cory Heck, Abby Krahling, Jessica Lawson, Christopher Luttrell, Maria Nguyen, Lauren Owens-Cobb, Adam Rakestraw, and Geoffrey Taylor	<i>Have You Seen Me?:</i> Students Explore the Art and Science of Clay Facial Reconstructions
Julia Huffman	Bringing the Medieval Garden to Hammond Castle
Bethany Komasinski, Erica Logsdon, and Megan Wess	Grain Drain: A Dental Hygiene Perspective on Increased Awareness of Celiac Disease
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Andie L. Nagel	Chromatin Diminution in <i>Lampetra aepyptera</i>
Cecil Neville	<i>Belles Heures</i>
Douglas Rose and Adam Ferrari	Dithiepin-based Host Molecules for Potential Pharmaceutical Applications
Payton Schwing and Charlene Seger	Alcohol Abuse Intervention for Dental Professionals
Reuben Warshawsky, Jason Vaal, Kelsey Stickler, and Dimitry Bachynsky	Design and Synthesis of Dimeric BODIPY Molecules for Dye-sensitized Solar Cells

## Oral Presentations

### Session I, UC 2217

- 8:30 – 9:00      **Aaron Williams, Jesse Rhodes, and Tanner Hayes** – Designing a High Altitude Radio Controlled Glider
- 9:10 – 9:30      **Lindsey Holmes and Shelby Spray** – Get [Your Station] Trending Now!
- 9:40 – 10:00     **Tyler Abbott** – Mormon Attitudes about Religious Leaders in Politics: A Comparison
- 10:00 – 10:30     **BREAK (OR SIEPIERSKI?)**
- 10:30 – 10:50     **Arnish Singh** – E-Commerce (**MAY NOT ATTEND – GONGJUN YAN**)
- 11:00 – 11:20     **Derrick Mishler** – Parasocial Interaction with Disadvantaged Characters on a Television Series
- 11:30 – 11:50     **Craig Belwood, Adrian Small, Presley Roy, Antonio King, Christy Thompson, and Shawnte Gaston** – Adapting Discipline Techniques: Liberal Arts vs. Conservatory

### Session II, UC 2218

- 8:30 – 9:00      **Jonathon Fulkerson** – p53 Inhibits 2-CEES-Mediated Centrosome Duplication in Saos2 Cells
- 9:10 – 9:30      **Matthew Koewler** – Exploring Materials and Techniques with 3D Printing
- 9:40 – 10:00     **Lindsey Holmes** – It Wasn't an Overnight Success, but it Did Become a Success
- 10:00 – 10:30     **BREAK (ADAM BOOHER??)**
- 10:30 – 10:50     **Duncan Taylor** – Plants in Amazonian Peru
- 11:00 – 11:20     **Alishah Salman** – Islamophobia: Western Portrayals of Islam
- 11:30 – 11:50     **Austin Rahmoeller, Aaron McCullough, Mitchell Meurer, and Logan Ball** – Institute of Management Accountants Student Case Competition

## Oral and Poster Presentation Abstracts

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### **Mormon Attitudes about Religious Leaders in Politics: A Comparison**

**Tyler Abbott**

Faculty Mentor: **Dr. Trent Engbers**

The Church of Jesus Christ of Latter-day Saints is known for having important theological, political, and social differences from other Christian denominations. Throughout the history of the LDS Church, heavy political involvement on the part of its leaders has been notably evident, especially within the state of Utah. The separation of church and state is a difficult issue to address within American politics, especially when discussing such religious groups such as the Latter-day Saints, who have a seemingly higher tendency of political involvement.

The research question of this study is as follows: Is there a difference in attitudes between Latter-day Saints and people of other faiths concerning the appropriate roles of religious leaders in politics? To address this question, a survey of 106 individuals was conducted in Salt Lake City, Utah, in March 2015. The survey included four parts, which addressed the individual's views on the acceptability of political participation among religious leaders, the individual's own political participation, the individual's religious participation, and demographics. Participants in this survey included 63 Latter-day Saints and 43 people of other faiths. In this research, Latter-day Saints were compared to three other groups: Catholics, Protestants, and atheists/agnostics. The hypothesis was that Latter-day Saints are more likely to be accepting of religious leaders being involved in politics. The reason behind this hypothesis lies in the structure and organization of the LDS Church, where the line between leaders and "regular" members is largely undefined. The results of this research serve to test this hypothesis.

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### **Adapting Discipline Techniques: Liberal Arts vs. Conservatory**

**Craig Belwood, Adrian Small, Presley Roy, Antonio King, Christy Thompson, and Shawnte Gaston**

Faculty Mentor: **Mr. Eric Altheide**

There are significant differences that come from attending a Liberal Arts college as opposed to a conservatory-styled approach to the study theatrical performance. The six of us who traveled to New York City to the Open Jar Institute have each had the benefit of sharing in a true college experience, and although we are getting training necessary to us, it is still a limited amount. But while in New York City we were introduced to a world that is much like a conservatory, where you are surrounded by your craft and focus on nothing else. Each has their pros and cons and we hope to find a way to marry the two and find a good balance.

A disciplined actor is simply an instrument used in a healthy, yet repetitive manner. An artistic individual needs to accept having a routine habit of maintaining exercises in order to excel. The Open Jar Institute

firmly believes in providing select students to receive an intensive one-on-one training with some of Broadway's biggest stars, performers, directors, choreographers, agents and casting directors. The attitude of the performer strictly relies on the stamina and disciplined taught upon by their motives. Learning from the most disciplined individuals in the business increases the chances of flourishing in the entertainment industry.

We were involved in hands on research that can immediately benefit the course and longevity of our future careers. The knowledge and experience gained with the help of this grant provided valuable techniques and methods that will allow us to meet the standards of performers today.

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## **Determining Pharmaceutical Components in Various Water Sources**

**Taylor Blackford**

Faculty Mentor: **Dr. Brian Bohrer**

There are many sources of water in the world. Not all of these sources have the most clean and pure water. Pharmaceuticals may be polluting different systems of water, and there are not many ways to see the possible pollution. The purpose of this study is to see whether or not a water source is contaminated with pharmaceuticals, and depending on the water source, showing the results of the study to people who can change this problem. Those people would be those in charge of various water purification systems, and especially the systems where the water is ingested. This was done by optimizing the Gas-Chromatography/Mass Spectrometry to obtain peaks of various medicines, and then testing different sources of water to determine the possible pharmaceuticals and the relative abundance of these pharmaceuticals.

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## **Medievalism in America**

**Adam Booher**

Faculty Mentor: **Dr. Elizabeth Passmore**

The Middle Ages are a period in history that resulted in the creation and implementation of tools, belief systems, and artistic expression that have been used for the many centuries that followed. Through my research at The Cloisters Museum in New York, I was able to study a tapestry known as "The Tapestry of the Nine Worthies." This tapestry is the perfect representation of how medievalism through art has been passed through time to tie century after century together through academic study.

Jean Duc de Berry, John D. Rockefeller, and John Hays Hammond Jr, are three men who lived lives that were periodically intertwined through their love of medieval art, even though they lived in completely different time periods. It is said that "The Tapestry of the Nine Worthies" was either created for Jean Duc de Berry, or at the behest of him. After his death, it went through a journey of being destroyed by family after family, and it was even cut up and used as curtains. John D. Rockefeller worked tirelessly to create the Cloisters Museum and to reconstruct the tapestry into its former glory. In comparison, John

Hays Hammond Jr. possessed such a love of the Middle Ages that he built a castle as a wedding gift for his wife, and spent his lifetime filling it with rare medieval artifacts from around the world.

Throughout my time in New York and Massachusetts studying the lives and interests of these three men, it is clear that they all were avid academics in terms of studying this crucial period in our history. My presentation will discuss my findings in an analysis of the styles of art that tied these three different men together, as well as photos and notes on specific works of medieval art and architecture that prove medievalism has and for a long time will affect the ways we understand how much of a necessity the Middle Ages were in relation to where we are today.

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## ***Have You Seen Me?:* Students Explore the Art and Science of Clay Facial Reconstructions**

**Diana Cavanah, Rachel Eickhoff, Erin Garbukas, Chynna Hall, Cory Heck, Abby Krahling, Jessica Lawson, Christopher Luttrell, Maria Nguyen, Lauren Owens-Cobb, Adam Rakestraw, and Geoffrey Taylor**

Faculty Mentors: **Dr. Susan Dale Spencer and Mr. Rob Millard-Mendez**

Twelve anthropology students worked in pairs to complete a clay facial reconstruction under the guidance of a biological anthropologist and an artist. All of the skulls were identical plastic casts from the Anatomical Chart Company, Model CS20V mounted with cervical vertebrae on a stand. Six facial reconstructions of an individual with unknown sex, age and ancestry were completed using Stephan and Simpson's 2012 tissue thickness depths and advice from *askaforensicartist.com*. The completed reconstructions looked similar to each other due to the standard tissue depths. However, the eyes, nose and lips varied by the artistic skills of the students. These results were consistent with the literature. Over the course of the project, students had fun and bonded with each other. The standard tissue depths helped them understand how the soft tissue connects with the facial skeleton. They also developed an appreciation for the work of forensic artists. We present student criticisms of standard tissue depths and discuss whether facial reconstructions are more art than science.

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## **Synthesis of a Mixed POCOP Pincer for Use in Dehydrogenation Reactions**

**Laura Chamness**

Faculty Mentor: **Dr. Jeff Seyler**

Organic substrates rich in hydrogen are being considered for use in automobiles as a gasoline alternative. Dehydrogenation catalysts, such as iridium pincer complexes, are necessary for use of these substrates. Pincer ligands are part of the iridium complexes that have shown promise for removal of hydrogen from hydrocarbons. This ongoing project focuses on the synthesis of a POCOP pincer with mixed organic functional groups on the two phosphorous atoms. Such mixed complexes have been prepared with PCP and PCOP based pincers. This presentation will provide a report on the progress of our efforts to generate related mixed POCOP pincer ligands.

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## **Luciferase: Modeling and Expression**

**Beth A. Cossey**

Faculty Mentor: **Dr. Jeannie Collins**

The amino acid sequence and three-dimensional structure for luciferase from several organisms will be compared to the enzyme from the firefly. The gene encoding the firefly enzyme inserted into plasmids with either SP6 or T7 RNA polymerase promoter will be used to express the protein. Before expression, the plasmids will be inserted into *E. coli* cells using transformation buffer with either rubidium chloride or potassium chloride. Transformation efficiency for the two cations was compared.

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## **USI Spectrometer Design**

**Danielle Eckert, Aaron Williams, Evan Taylor, and Craig Roberts**

Faculty Mentor: **Dr. Glen Kissel**

For the National Student Solar Spectrograph Competition, the University of Southern Indiana Spectrometer Team developed a cost effective Czerny - Turner spectrometer for the purpose of educating junior high and high school students about spectrometry. The spectrometer will be used to measure the concentration of potassium permanganate in water. Using a 260 – R Richardson grating, with a blaze wavelength of 500 nm, a Czerny – Turner spectrograph was designed with a Canon PowerShot SX600 as the detector. The JPEG images will be processed with MATLAB to produce absorbance vs. concentration curves displayed in a manner that is user friendly for a student audience.

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## **Variability in Mudrocks Overlying Coal Seams of the Carbondale Group (Pennsylvanian) in Southwestern Indiana**

**Aaron Feldhaus**

Faculty Mentor: **Dr. William S. Elliott**

The USI 1-32 well is located at 37.951°N and 87.670°W in Vanderburgh County, Indiana. The total depth of the well is 780 feet, with three cored intervals: Springfield Coal of the Petersburg Formation (395 to 415 feet), Servant Coal of the Linton Formation (540 to 560 feet), and the Seelyville of the Staunton Formation (655 to 675 feet). Our lithologic descriptions and interpretations provide further insight into sea level change and resultant paleoenvironmental conditions that occurred in southwest Indiana during the Late Middle Pennsylvanian.

For this study, mudrocks overlying the coals were cut, polished, and described to identify sedimentological variation. The mudrock overlying the Springfield Coal is gray to black with discrete

wavy laminations and abundant disseminated pyrite. There is a gradual increase in bioturbation from an ichnofabric of 1 directly above the coal to 4 two feet above the coal. Trace fossils include Chondrites, Palaeophycus, Phycosiphon, and Planolites. Discrete laminations within this interval also contain broken skeletal debris, including brachiopod and molluscan fauna. The mudrock overlying the Survant coal is greenish gray to light gray, finely laminated with discrete bioturbated intervals consisting primarily of Palaeophycus with an ichnofabric of 2. Additionally, disk-shaped, 1 to 4 cm diameter siderite concretions occur sparsely in the mudrock interval above the Survant Coal. Above the Seelyville Coal, the mudrock is gray to dark gray, finely laminated with disseminated pyrite and sparse phosphate nodules consisting of aggregates of peloids. There is minor bioturbation in the mudrock overlying the Seelyville Coal.

The variation in bioturbation and mineral content implies diverse depositional settings and environmental conditions of mudrocks overlying coals in the Middle Pennsylvanian of southwest Indiana. For example, the mudrocks overlying the Springfield and Seelyville coals are interpreted to be the result of deposition associated with a transgressive marine setting. In contrast, the mudrocks overlying the Survant Coal are interpreted to be deposited in a continental setting with minimal marine incursion. The variation in depositional settings of these mudrocks ultimately dictates the sulfur content of their respective underlying coal.

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## **Magnetic Resonance Imaging and the Potential Dangers of Burns**

**Kayla Fields**

Faculty Mentor: **Ms. Joy Cook**

Magnetic resonance imaging is a relatively safe diagnostic modality, but many incidents of burn injuries have been sustained during clinical MRI procedures. This presentation will discuss the causes of burn injuries and recommend ways of minimizing their occurrence. Increasing technologists' knowledge of burn injuries, their identification, the potential causes and prevention are essential to a successful and injury free MRI examination. When technologists stay aware of potential dangers, they can safely deliver quality exams and produce overall improved patient care.

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## **p53 Inhibits 2-CEES-Mediated Centrosome Duplication in Saos2 Cells**

**Jonathon Fulkerson**

Faculty Mentor: **Dr. Richard Bennett**

Mustard gas is a simple molecule that was first used as a chemical weapon in World War I. It is a powerful vesicant and alkylating agent that causes painful blisters on epithelial surfaces and increases the incidence of cancer in those exposed. The mechanism of mustard gas toxicity and tumorigenesis is not well understood but is thought to be mediated by its ability to induce oxidative stress and DNA damage. Interestingly, several proteins (including p53) that have been shown to either be targets of mustard gas or mediate mustard gas toxicity have also been shown to regulate centrosome duplication. Centrosomes are small, non-membrane bound organelles that direct the segregation of chromosomes



during mitosis through the formation of the bipolar mitotic spindle. Cells with more or less than two centrosomes during mitosis can segregate their chromosomes unequally, resulting in chromosome instability, a common phenotype of cancer cells. In our studies, we show that subtoxic levels of a mustard gas analog, 2-chloroethyl ethylsulfide (2-CEES), induces centrosome amplification and chromosome instability (CIN) in cells lacking p53. Additionally, we show that the reintroduction of p53 protein to cells exposed to subtoxic levels of 2-chloroethyl ethylsulfide (2-CEES) reduces centrosome amplification, which may retard the mutation rate necessary for tumorigenesis. These data may support previous demonstrations of mustard gas toxicity targeting p53.

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## **Physical Activity, Health, and Nutrition Intervention at Low Performance Schools**

**Alayna Griffin, Jordan Wassmer, and Breanna Young**

Faculty Mentor: **Dr. Renee Frimming**

The Physical Activity, Health, and Nutrition Intervention at Low Performance Schools is an intervention program specifically designed to focus on schools with students from a low socio-economic background. Thirty (n=30) 3rd to 5th grade students aged 8-10 from two local elementary schools participated in the program. The first 45-minute session consisted of physical activity with a 10-minute break followed by a 45-minute health and nutrition session twice a week (Tuesday/Thursday). The fitness component included activities based on flexibility, aerobic fitness, and muscular strength & endurance. The health and nutrition program focused on activities designed to engage students in critical thinking about their own eating habits and making healthy snacks. Pre-test and post-test data were collected and analyzed. There was no significant effect on the student's eating or fitness habits.

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## **It Wasn't an Overnight Success, but it Did Become a Success**

**Lindsey Holmes**

Faculty Mentor: **Mr. John Morris**

This talk will present reflections on lessons learned on how to manage and program a college radio station from someone who has been very successful in her position. The author will share what led to success and offer perspectives on what might be done differently (since hindsight is always 20-20). In other words, what she did right, what she would never do again, and all the great things in between that helped her achieve success in college radio.

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## Get [Your Station] Trending Now!

### Lindsey Holmes and Shelby Spray

Faculty Mentor: **Mr. John Morris**

Want to get more likes on Facebook, retweets on Twitter, and followers on Instagram? Learn how to promote your station's brand by using Google Analytics and other handy tips and tricks. Expand your social media presence and discover new ways to connect with your followers in this fun and exciting session.

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## Bringing the Medieval Garden to Hammond Castle

### Julia Huffman

Faculty Mentor: **Dr. Elizabeth Passmore**

The gardens of the Middle Ages were important to the culture and to the growth of the society. A lot of plants were used for many different things, both medicinally and agriculturally. Plants were used to flavor foods and cure sickness as well as providing a pretty view.

On the Medieval Studies Society trip, I examined the gardens at the Cloisters and learned what was common in different kinds of gardens and how gardens were usually arranged. I applied the knowledge from the Cloisters to Hammond Castle, where a lot of the outside ground has become grown over and doesn't have as much of a medieval feel as one would expect. I documented pictures of the ground so that I could recreate the grounds but with gardens that would set the atmosphere more. These gardens also provide an educational value because it helps people to know what was available as far as medicine and how much the garden meant to a household in the medieval era.

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## Exploring Materials and Techniques with 3D Printing

### Matthew Koewler

Faculty Mentor: **Ms. Joan DeJong**

Although the technology is well proven in engineering fields, the impact of 3D printing on the art and design world is still constantly growing and developing. The purpose of this research was to explore techniques and characteristics of a collection of 3D printing filament materials that would benefit a designer or artist. 3D printing filament materials can range from hard plastic, elastic rubber, color changing, soluble materials, and composites that use wood or metal in the filament. Acetone vapor bath and nylon dye surface treatment processes were explored for changing the surface quality or color of a material on a printed ABS or nylon object. The process of using a filament extruder kit was also explored

to create homemade recycled 3D printing filament from pelletized materials such as ABS plastic.

In addition to material exploration, this research also explored the process of using a professional-grade high resolution 3D sculpting software program called ZBrush at an introductory level as well as open-source modeling and slicing software and 3D printing from it. ZBrush allows the user to manipulate 3D geometry and objects like virtual clay on a computer in ways that traditional CAD software cannot allow. Other open source software like SketchUp, Blender, MeshMixer, and Slic3r can model or slice the object with much more customization and printing options. Multiple other processes such as using a 3D printing service bureau such as Shapeways, file import/export, computer workflow and file organization, print bed adhesives, dual extrusion printing, installing and using 3D printed upgrade extruder blocks, and using an upgraded glass build plate were also explored.

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## **Grain Drain: A Dental Hygiene Perspective on Increased Awareness of Celiac Disease**

**Bethany Komaskinski, Erica Logsdon, and Megan Wess**

Faculty Mentor: **Ms. Emily Holt**

Public awareness of gluten-induced gastrointestinal illness has increased. Gluten-free products are the biggest nutritional hype with the sales of gluten-free products nearing 10 billion a year. This increased awareness and sales of gluten-free products have allowed the public to feel like they are making a healthier choice when consuming products that are labeled as gluten-free. However, processed gluten-free food products do not necessarily equate to being healthy. The processed food products that are marketed as gluten-free often contain increased amounts of sugar and fat than their gluten containing counterparts. These carbohydrate laden products include pastas, cereals, muffins, etc. An increased intake of carbohydrates can lead to an increase in the risk of forming dental caries. Therefore, dental patients who are following a gluten-free diet should be aware of the need to seek out dietary choices that contain lower amounts of carbohydrates. Many people never experience problems when consuming products that contain gluten. However, within the last 50 years due to the hybridization and biochemical alterations in wheat production, there is an ever-growing amount of people who experience gluten-mediated reactions for example, celiac disease. Individuals with celiac disease develop inflammation and damage to the villi of the small intestine when gluten is ingested. Currently, the only treatment for celiac disease is a strict gluten-free diet. The better dietary choice for those on a gluten-restricted diet include fresh fruits, fresh vegetables, and meats since they naturally do not contain gluten. Dental professionals need to be educated on clinical symptoms, nutrition, and dental modifications pertaining to celiac disease, as we may be the first health professional who recognizes a problem.

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## Requirement of the Inner Membrane Protein, YhiM, for *E. coli* Growth in High Temperature and Reduced Salinity Environments

**Daniel Mann**

Faculty Mentor: **Dr. Rebecca Sparks-Thissen**

*E. coli* is a bacterium that is able to survive and reproduce in different environments. It contains a gene which codes for an inner membrane protein, YhiM. Several experiments have shown that YhiM is regulated in response to a number of cellular stresses. We hypothesized that YhiM might also have a direct effect on the growth of this organism in certain conditions, like high temperature and reduced salinity. We tested the ability of YhiM mutants to grow in high temperature and low salt conditions using optical density and viable cell counts. When the wild-type organism, possessing the YhiM protein, and the mutant, lacking the YhiM protein, were put in conditions of 37 °C with NaCl in the media, both organisms grew, but the mutants possessed a hour and a half longer lag phase. We then tested whether our mutants could grow at 37 °C without NaCl. The mutants had a longer lag phase, about half hour longer than when the NaCl was present. We next tested whether YhiM was necessary for growth at high temperature. When the wild type and mutants were placed in growing conditions of 41 °C the mutants grew slower than the wild-type with a longer lag phase and during exponential growth. When the wild-type and mutants were placed in conditions of 41 °C and lacking salts in the media, the wild-type was able to grow, but no growth of the mutant bacteria was detected. The conditions of high temperature and no salinity provides for minimal, if any, growth for the YhiM lacking mutants. The data indicates that the YhiM is necessary for the survival and growth in additional conditions of cellular stress. In particular, data indicates that YhiM plays a role in mediating growth and survival in high temperature and low salt conditions.

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## A Comparison of Local and Tropical Plants Used as Herbal Remedies and Their Chemical Make-Up

**Daniel Mann**

Faculty Mentor: **Dr. Edmir Wade**

Many plants are used throughout the world as herbal remedies, and are used as an alternative route to traditional medicine today. Plant specimens were collected by a student who traveled to Ghana, and these specimens are used for a number of medicinal and home remedies in the Ghana region. The plants collected in Ghana were compared to plants collected in the Evansville, Indiana region of the US Midwest and also a few from the country of Belize, Central America. The present work compares what these have to offer as far as home remedies for locals in these areas. The goal of the experimental study was to isolate the active ingredients and secondary metabolites present in these plants, to see if they correspond to the symptoms they treat. Currently, potential methods of extraction are also being identified and developed. These methods of extraction for the active ingredients include super-critical extractions and solvent gradient extractions.

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## Parasocial Interaction with Disadvantaged Characters on a Television Series

**Derrick Mishler**

Faculty Mentor: **Dr. Aimee Adam**

During the past several decades, psychologists have been fascinated with the media's effects on society. Specifically, their interests have spurred research in parasocial interactions: one-sided relationships or attachments often with celebrities or television characters (Cohen, 2003). Previous research has found when individuals identify with and perceive themselves as similar to media characters, this increases parasocial interaction with the characters (Tian & Hoffner, 2010). Also, research has found that individuals tend to find perceived disadvantaged characters as more attractive (Michniewicz & Vandello, 2013). The current study utilized *The Walking Dead* television program to examine the effects of similarity and identification with characters on parasocial interaction. The study also sought to better understand the effects of perceived character disadvantage on parasocial interaction. An online survey was distributed to students enrolled in introduction to psychology who were *Walking Dead* fans and received credit for completion. The survey was also distributed to fans of *The Walking Dead* through social media websites. Participants answered questions about both their favorite and least favorite characters of *The Walking Dead*. Survey questions included a television affinity scale (Rubin, Perse & Powell, 1985), a parasocial interaction scale (Rubin et al., 1985), a perceived disadvantageousness scale (Paharia, Keinan, Avery & Schor, 2009), a character identification scale (Cohen, 2001), and a character similarity scale (McCroskey, Richmond & Daly, 1975). As expected, when comparing responses of their favorite and least favorite characters, participants rated their favorite *Walking Dead* characters as more disadvantaged, more similar to themselves, and who they identified with more.

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## Chromatin Diminution in *Lampetra aepyptera*

**Andie L. Nagel**

Faculty Mentors: **Drs. Rebecca Sparks-Thissen and Rex M. Strange**

Genomic stability is assumed necessary for the maintenance of structure and function in an organism, whereas genomic instability is associated with disease, such as malignancies. However, chromatin diminution, the process by which a significant amount of genomic content present in the germline is eliminated from somatic cells during normal development, has been documented not only in invertebrates, but also two species of vertebrates: hagfish and *Petromyzon marinus* (sea lamprey). We investigated whether chromatin diminution also occurs in a species of freshwater lamprey, *Lampetra aepyptera*. We attempted to isolate and sequence DNA eliminated from the germline of both *L. aepyptera* and *P. marinus* using PCR subtractive hybridization, with *P. marinus* serving as the positive control. PCR subtractive hybridization was unsuccessful for both species despite troubleshooting the various steps in the process. We have decided to acquire fresh specimens and change methodology to a terminal restriction fragment (TRF) analysis in which we compare the average telomere length in the germline to that in the somatic line.

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## ***Belles Heures***

**Cecil Neville**

Faculty Mentor: **Dr. Elizabeth Passmore**

My presentation will cover the *Belles Heures*, which were produced by the Limbourg brothers, for John, Duke of Berry. John, Duke of Berry was an influential patron of the arts in the Middle Ages and the third son of the King of France. The *Belles Heures* was a Book of Hours or medieval prayer book, in which many biblical stories were portrayed, but not the Bible in its entirety. It also contained various prayers and ritual observances. It was valued because of its highly decorative nature. It is the only book the Limbourg brothers, who were illuminators, completed. The *Tres Riches Heures*, which was a later prayer book produced for John, Duke of Berry, was even more luxuriously illustrated, but these works are considered masterpieces. Therefore, I went on a trip to New England to study the *Belles Heures* manuscript, as well as the medieval context in which it existed. Through this art form, many key ideas were brought to light. One of these ideas is the refinement of art, one is the technology of the manuscript, and the other is making art to last. One of the things that sets apart a Book of Hours from the medieval world from a woodcut of the period is its longevity. While there are surviving woodcuts and other more perishable works of art, they are far more rare, while many medieval manuscripts have survived into the present day. Many of these are not parts of books, but whole books, which makes their survival all the more remarkable, since each surviving manuscript book is full of priceless artwork, from start to finish. Another key innovation of the *Belles Heures* is seriously refined art. Not only is this art world class, it is produced within a book that is only 9 3/8" by 6 5/8". The craftsmanship of these surviving treasures is truly remarkable. Through my reproduction of a manuscript leaf from this original, I will reveal how great a treasure the *Belles Heures* is.

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## **Stiffness Components of Wings in Three Species of Lycaenid Butterflies**

**Nehal Ninad**

Faculty Mentor: **Dr. Eric McCloud**

Geometry and material properties of insect wings contribute to their deformation during flight. Flexural stiffness is a measure of the combination of both geometry and material properties. Work has been done to characterize flexural stiffness of whole insect wings. However, no work has been done to directly measure the contributions of the different components of wings to the overall flexural stiffness. Insect wings consist of two components: interveinal membrane and veins. The overall flexural stiffness of insect wings depends on interveinal membrane and veins. This study focuses on comparing the flexural stiffness of forewings and hindwings of three different butterfly species of the butterfly family Lycaenidae: *Celastrina ladon* (the Spring Azure), *Satyrrium calanus* (the Banded Hairstreak), and *Cupido comyntas* (the Eastern Tailed Blue). The latter species tends to fly low to the ground, between zero and three feet, and is considered a weak flyer. The former two fly higher and are considered strong flyers. We expect the flexural stiffness of the forewings of the Banded Hairstreak and Spring Azure to be greater than Eastern Tailed Blue forewings. We measured flexural stiffness of forewings and hindwings

of each species along the span of each wing. Results show that Banded Hairstreak forewings have the highest flexural stiffness while Eastern Tailed Blue forewings have the lowest. The same is true for the veins of all species except at the most distal ends. This may be due to change in the material properties of the veins at the distal end. Our results indicate that stronger flyers have stiffer forewings and veins contribute a large percentage of the stiffness of forewings and hindwings.

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## **Analyzing Projectile Motion Uncertainties**

**Ian Parker**

Faculty Mentor: **Dr. Kent Scheller**

Projectiles were shot 500 times from a Pasco device at both  $0^\circ$  and  $27^\circ$  to acquire a statistically appreciable data set corresponding to the launcher's range. Analysis of this data showed that the projectiles landed according to a Gaussian distribution; thus, this mandated that there must be an uncertainty in the range. Using partial differentiation and the kinematic equations, a theoretical uncertainty and range of a projectile when launched at  $27^\circ$  was calculated. Variables involved in the uncertainty propagation included the launching height, the projectile's initial velocity, the time of travel, the launching angle, and the range. Comparing the theoretical range and its associated uncertainty with the experimental range and its statistical spread showed an overlap in the uncertainties.

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## **Institute of Management Accountants Student Case Competition**

**Austin Rahmoeller, Aaron McCullough, Mitchell Meurer, and Logan Ball**

Faculty Mentor: **Ms. Jeanette Maier-Lytle**

Every year the Institute of Management Accountants (IMA) holds a National Case Competition. This presentation will be a brief overview of what the IMA is and the competition. We will also talk about USI's history in the competition and this year's case.

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## **Tracking Changes in BMI, Blood Lipid, Glucose and Insulin Levels in Young Adults over the Span of Undergraduate Education**

**Jessica Richards**

Faculty Mentor: **Dr. Mari Hopper**

Rapid weight gain is often accompanied by development of insulin resistance. The college years have frequently been linked to weight gain, yet the prevalence of insulin resistance in this demographic has not been reported. This longitudinal study tracked changes in weight, and fasting insulin (FI), glucose, HDL and LDL over the course of four years of undergraduate education. Baseline measurements were

obtained from 48 freshman students (23 men and 25 women). Baseline FI indicated nearly one-third of the subjects were hyperinsulinemic. In accordance with the American Diabetes Association, baseline HDL ( $51.4 \pm 3.5$  mg/dL), LDL ( $91.9 \pm 7.0$  mg/dL) and glucose ( $85.66 \pm 1.3$  mg/dL) fell within normal ranges. Measurements were repeated near the end of the subjects' senior year with 15 men and 13 women remaining enrolled (58% retention). Average weight gain over four years was  $5.1 \pm 2.5$  lbs. However, weight change showed considerable variability. Therefore, subjects were further divided into three groups: 1. weight gain  $> 5$  lbs (WG;  $n=14$ ); 2) weight loss  $> 5$  lbs (WL;  $n=8$ ); 3) minimal weight change (defined as a change less than 5 lbs) (MC;  $n=6$ ). The three groups displayed nearly identical fasting glucose levels, (WG  $90.3 \pm 1.5$ ; MC  $89.0 \pm 2.2$ ; and WL  $88.9 \pm 1.8$  mg/dL). The WG group demonstrated significantly higher fasting insulin than MC ( $12.4 \pm 1.2$   $\mu$ U/mL vs  $9.0 \pm 0.9$   $\mu$ U/mL) and tended to be higher than the WL group ( $9.6 \pm 1.6$   $\mu$ U/mL). Additionally, LDL tended to be higher and HDL lower in the WG group when compared to MC and WL. In this convenience sample of limited size, college students who gained  $>5$  lbs demonstrated significantly higher fasting insulin levels. Elevated fasting insulin in the WG group likely contributed to subjects' ability to maintain fasting glucose levels that did not differ from the MC and WL groups. It would be of interest to repeat this study with a larger sample, repeat with a similarly aged cohort not enrolled in college, and also continue to track these subjects to further investigate changes in physiological parameters associated with weight.

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## Designing a Shallow Groundwater Monitoring Study to Support Re-Introduction of an Indiana State Endangered Amphibian

### Brandon Root

A shallow groundwater monitoring program is targeting endangered species management on reclaimed coal mine land managed by the Patoka River National Wildlife Refuge, U.S. Fish and Wildlife Service (PRNWR). The monitoring effort is designed to provide resource managers with hydrologic data to support a proposed re-introduction of a state endangered amphibian, the crawfish frog (*Lithobates areolatus*). Suitable habitat for crawfish frogs requires three conditions: (1) Wetlands to be used as breeding sites; (2) large grassland complexes for habitat; and (3) a sustained population of adult crawfish as their burrows are used by the frogs to escape predation. Upland crawfish may burrow where the water table does not exceed 1.5 meters below the ground surface. A hydrologic study of the area was designed to evaluate the potential preferred areas for re-introduction as indicated by PRNWR refuge specialists. Shallow well transects and surface water monitoring of adjacent wetlands will provide PRNWR staff with data needed to make important wildlife management decisions. Specific sites identified by resource managers as preferred for re-introduction that have been examined are deemed unsuitable for crawfish frog habitat. Soil cores were extracted down to 1.8 meters without any indication of the water table within the mine spoil at desired depths. After sufficient time was allowed for infiltration, the shallow wells remained dry. Surface water depths in targeted wetlands have declined from 0.40 to 0.04 meters at one site and 0.37 to 0.21 meters at a second location during the period between May-July 2014. At each site, uplands immediately adjacent to wetlands do not have saturated groundwater at the necessary depth. Pending further data, this research has provided resource managers the data necessary to make decisions that would prevent a failed re-introduction of an endangered species.



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## **Dithiepin-based Host Molecules for Potential Pharmaceutical Applications**

**Douglas Rose and Adam Ferrari**

Faculty Mentor: **Dr. Edmir Wade**

Host Molecules, their synthesis, and capacity for hosting metals and small organic molecules dates back to the early 20th century. In this study, the synthesis of a highly conjugated dithiepin host molecule is attempted. The host is synthesized from anthracene, small diols, and benzene-1,3,5-tricarboxaldehyde. The precursors were developed in previous research projects with the total synthesis being outlined in this project. Applications of this cage include a potential drug delivery system, which encapsulates and protects the drug compounds. The structure of the cage could potentially protect the drug guest from degradation by the external environment or protect the surrounding environment from a harsh drug. The high level of conjugation from the dithiepin structure to the aromatic rings allows for UV applications in detection and quantification. This could offer the world of pharmaceuticals a new way to deliver drugs; where the drug itself no longer needs to survive the reactive external environment.

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## **Islamophobia: Western Portrayals of Islam**

**Alishah Salman**

Faculty Mentor: **Dr. Christopher Rivera**

Islam is non-violent in practice. This has been the case since the origin of the religion. Mohammad and his teachings demonstrate that he is by no means against non-Muslims or minority groups. In this contemporary age, media and political figures rhetorically and literally represent Islam as something to be feared. The concept of fearing Islam is known as Islamophobia and it is a Western construct. The language and images that media and politicians use to represent entire regions of the world that are predominantly Muslim stereotype that regions' people and create a global sense of fear of Islamic people. The aim of this paper is to critique this Western notion of Islamophobia and to show how its effects are bad for both Muslims and non-Muslims. Through analyzing Christian blogs by Westerners living in the US, I argue that the messages that these individuals are sending is dangerous in that it creates a false understanding of Islam.

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## **Alcohol Abuse Intervention for Dental Professionals**

**Payton Schwing and Charlene Seger**

Faculty Mentor: **Ms. Emily Holt**

Individuals who abuse alcohol require specialized dental and overall health-related services. Many dental and health-related risks stem from abusing alcohol. Dental providers must be able to identify the

signs and symptoms of alcohol abuse so early intervention can occur, even when the patient is unwilling to admit that there is a problem. This addiction can begin at a young age with easy access to parents' alcoholic products. Early consumption of alcohol can turn into alcohol dependency over the years. This presentation describes the steps a dental team should take after determining there is an addiction of alcohol, oral signs and symptoms of alcohol abuse, and treatment options for the addiction. Dental professionals can make a difference in a person's life through intervention with patients that won't ask for help.

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## **E-Commerce**

### **Arnish Singh**

Faculty Mentor: **Dr. Gongjun Yan**

NepalBiz.net is an ecommerce site that is under construction at this time. The author, along with faculty member Dr. Gongjun Yan, is using HTML5, CSS and java script to develop the page and eventually will design an APP for mobile devices. This will help Nepal, an underdeveloped country, to join the global business market.

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## **Synthesis of Carbohydrate Based Organocatalysts for Enantioselective Aldol Reactions**

### **Caleb Starr**

Faculty Mentor: **Dr. Ken Walsh**

Enantioselective organocatalysts encompass a very important and rapidly evolving area of synthetic organic chemistry research. The ability to create compounds with specific stereochemistry holds widespread value, especially when it comes to the pharmaceutical industry. Much work has already been done in this area using amino acids as scaffolds for the creation of these organocatalysts. Another potentially useful but not as well characterized group of potential scaffolds are the carbohydrates. Carbohydrates that have amine group substituents have been described in the literature and so this research was expanded upon. These amine substituted carbohydrates are the initial target of this research; later their effectiveness at catalyzing enantiospecific aldol reactions will be examined. Investigation of the synthetic route to these organocatalysts and preliminary analytical results will be discussed.

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## Early Diagenetic Origin of Mudrock Concretions from the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California: Implications for Preservation of Primary Sedimentary Fabrics

**Michael Stephens**

Faculty Mentor: **Dr. William S. Elliott**

The Hornbrook Formation (Upper Cretaceous) consists of approximately 1,200 m of mudrock, sandstone, and conglomerate exposed along the northeastern flank of the Klamath Mountains in southwestern Oregon and northern California. The Hornbrook Formation is subdivided into five members: Klamath River Conglomerate (oldest), Osburger Gulch Sandstone, Ditch Creek Siltstone, Rocky Gulch Sandstone, and Blue Gulch Mudstone (youngest). For this study, 20 mudrock concretions were examined from the Blue Gulch Mudstone Member collected near the town of Hilt in Siskiyou County, California.

In the field, mudrock concretions are spherical- to disk-shaped, 20- to 180-cm in diameter, and are encased in siliciclastic mudrock. The concretions are oriented with the long axes parallel to bedding, and occur as isolated bodies and/or bands within mudrock intervals. In several instances, thin (2 to 4 cm) sandstone beds in close stratigraphic proximity wrap around and drape mudrock concretions. Several concretions contain vertical fractures filled with calcite that produce a brecciated fabric. In the laboratory, concretions contain 65 to 75 wt. % calcite as determined by dilute hydrochloric acid digestion; mudrocks encasing the concretions are not calcareous. Preliminary geochemical analyses of the siliciclastic sediment from the concretions by X-ray fluorescence spectroscopy yielded 72.7 to 78.0 wt. % SiO<sub>2</sub>, 12.8 to 15.8 wt. % Al<sub>2</sub>O<sub>3</sub>, 0.6 to 1.0 wt. % MgO, and 1.7 to 3.8 wt. % FeO compared to encasing mudrocks with values of 63.5 to 64.9 wt. % SiO<sub>2</sub>, 18.5 to 19.4 wt. % Al<sub>2</sub>O<sub>3</sub>, 2.6 to 3.0 wt. % MgO, and 6.3 to 7.6 wt. % FeO. There were no distinguishable differences for TiO<sub>2</sub>, MnO, CaO, Na<sub>2</sub>O, K<sub>2</sub>O, and P<sub>2</sub>O<sub>5</sub>.

Overall, the mudrock concretions in the Hornbrook are interpreted to have formed in an early diagenetic environment, as evidenced by contorted bedding and fractures resulting from differential compaction associated with burial after their formation. Additionally, early diagenetic formation of the concretions resulted in differing chemical transformations of the encasing mudrock. Finally, the early diagenetic origin of these concretions may preferentially preserve primary sedimentary fabrics and textures that would otherwise be obliterated by compaction.

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## **Plants in Amazonian Peru**

**Duncan Taylor**

Faculty Mentor: **Dr. Daniel Bauer**

One aspect that helps to create culture is the plants that are cultivated and utilized in an area. Plants in Amazonia are utilized for a variety of purposes, including, medicinal and economic. Home gardens are quite common and research indicates a broad distribution of cultivated plant resources. Alongside Dr. Bauer, I conducted surveys and interviews pertaining to botanical resource use in three villages of Amazonian Peru. My research focused on documenting the distribution of plant species in household gardens in order to better understand community variation in gardening practices. In doing so, information about plant use and distribution was gathered. Information about livestock was also gathered. This data ultimately attempts to answer the question of whether remote communities have an increased reliance on home gardens as compared to communities that have greater outsider contact and therefore a lesser need to rely on garden products.

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## **A Novel Cold Trap Method for Analyzing Exhaust Emissions at the University of Southern Indiana**

**Evan Taylor**

Faculty Mentor: **Dr. Brian Bohrer**

The abundance of harmful chemicals that make up exhaust emissions pose a threat towards a person's respiratory and overall health. Some of the illnesses associated with air pollution include cardiovascular disease, asthma, chronic obstructive pulmonary disease, lung cancer, and diabetes. The risk of developing an illness due to air pollutants caused by exhaust emissions increases when habitation is closer to highways. The University of Southern Indiana is a textbook example of this, in that students reside next to a highway. In addition, the abundance of commuters adds to the daily amount of exhaust fumes experienced by students, faculty, and staff. This research hopes to elucidate the chemical moieties that students, faculty, and staff at the University of Southern Indiana are subjected to on a day-to-day basis. Also, it seeks to measure the abundance at which these chemical moieties exist. A novel cold trap has been constructed so that exhaust emissions may be captured and analyzed.

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## Providing Oral Care to Individuals with Disabilities

**Emily Tepool and Jordyn Lewis**

Faculty Mentor: **Ms. Emily Holt**

People with disabilities constitute the nation's largest minority group. A disability can be classified as physical or intellectual. Being disabled creates many disparities in receiving oral hygiene. Family, friends, neighbors, or hired help are not educated in oral hygiene or its importance. In Indiana, thousands of those with intellectual disabilities have care givers trying to provide their oral needs, and 14,000 of them have caregivers over the age of 62. This creates a growing need for people to be able to provide oral care. This presentation was designed to make the audience comfortable with taking care of someone else's oral needs. We will cover the financial and physical disparities of the disabled, common oral findings, and how to help with the basics of oral hygiene.

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## Design and Synthesis of Dimeric BODIPY Molecules for Dye-sensitized Solar Cells

**Reuben Warshawsky, Jason Vaal, Kelsey Stickler, and Dimitry Bachynsky**

Faculty Mentor: **Dr. Priya Hewavitharanage**

Human society will be facing a global energy problem in the near future due to the increasing energy demand, the gradual depletion of fossil fuels, and the greenhouse effect caused by fossil fuel combustion. Solar energy, produced by photovoltaic technology, is considered to be the most promising solution to the global energy crisis. However, high production costs have prevented their widespread applications. Dye-sensitized solar cell (DSSC) is a low cost and high efficiency alternative to solar cells. DSSC mimic the photosynthetic process in plants. The search for more stable and highly efficient organic dyes for DSSC has received great attention in recent years. We have designed and synthesized new dimeric dye molecules based on BODIPY chromophore for potential application in DSSC. These molecules absorb various wavelengths of visible light and efficiently transfer energy between subunits.

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## Gel Electrophoresis versus Capillary Zone Electrophoresis

**Thad C. Whittington and Robert C. Monsen**

Faculty Mentor: **Dr. Jeannie Collins**

*Stemonitis flavogenita* is a myxomycete which has multiple stages in its life cycle. The aphanoplasmodial and coralloid plasmodial stages are the focus of our research. Myxomycetes, slime molds, move throughout their environment during these stages. This process is under the control of cytoskeletal proteins. Many cytoskeletal proteins are likely involved in motility of the organism. Proteins were extracted from the organism and following centrifugation, fractions were separated on a denaturing

polyacrylamide gel and then stained with Coomassie blue dye. Western blot analysis is underway using antibodies against vimentin, a cytoskeletal protein. Capillary zone electrophoresis was used to examine proteins from the organism as a means of decreasing analysis time.

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## **Designing a High Altitude Radio Controlled Glider**

**Aaron Williams, Jesse Rhodes, and Tanner Hayes**

Faculty Mentor: **Dr. Julian Davis**

In the past, the USI high altitude balloon team has been interested in releasing a paper airplane (glider) from world record heights using their high altitude balloon as a means of transport. Our senior design team decided to take this idea one step further and design, construct, and fly a radio controlled glider dropped from the high altitude balloon. To complete this mission our team had to design a glider that was aerodynamically and structurally sound enough to carry the live video, radio control, and avionics systems. There are several constraining requirements that had to be addressed in the completion of this project; most importantly the guidelines set by the FAA. After discussing our project with the appropriate FAA officials, the conclusion was made that our team would have to apply for a Certificate of Authorization (COA) in order to complete our mission as intended. Due to time constraints this was not an option; however, our team was informed that if the control system was removed the remaining components would be allowed to fly without the COA. With this in mind, the team proceeded to design and construct an uncontrolled version of our high altitude glider. This version of the glider was tested on October 25, 2014, with help the USI high altitude ballooning class. Many of the components were successfully tested and were proven to function correctly under operation conditions. Most of the errors encountered during the test flight have been identified and corrected in the design for the controlled version of the glider. The results from the flight will be useful in preparing for a potential future radio controlled flight of the high altitude glider. Our team has laid the foundation for others such as the high altitude balloon team to successfully drop a radio controlled version of the high altitude glider.

## Plan to Attend

The 2016 Endeavor! Undergraduate  
Research and Creative Work Symposium  
University Center

Thursday, April 7, 2016



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