

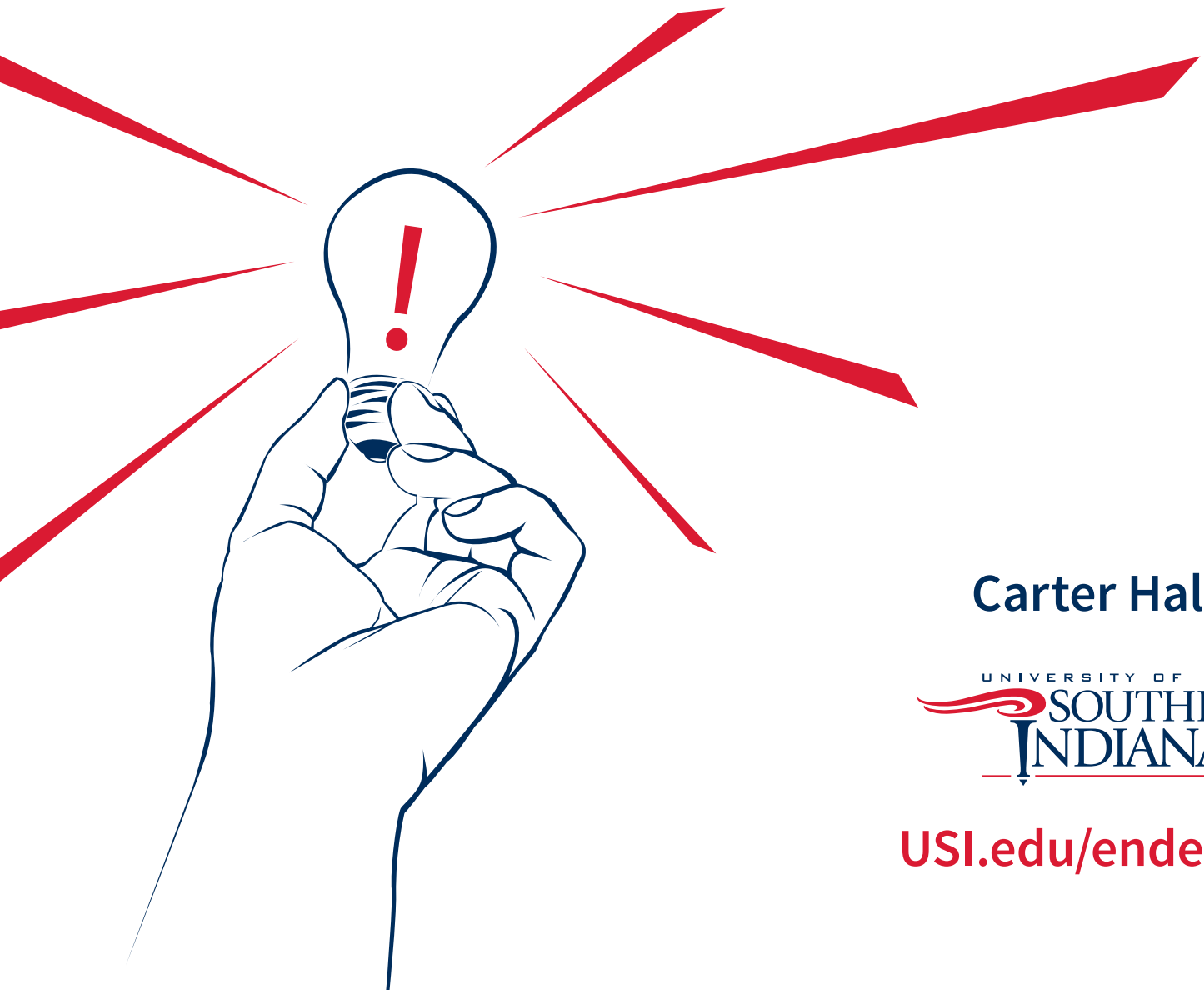
20th Annual Symposium

2022



USI  
ENDEAVOR

AWARDS *for*  
RESEARCH & CREATIVITY



Carter Hall



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



April 7, 2022

Dear Endeavor Symposium Presenters and Sponsors:

Welcome to the 2022 Endeavor Symposium. As I'm sure you've 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, PhD  
Associate Professor of Anthropology  
Director, Endeavor Research and Creativity Awards

## Endeavor Symposium Program

Thursday, April 7, 2022

- Beginning at 8:45     **Check-in** for all presenters and sponsors: Pick up your programs and ID badges at registration table (located in the hallway outside Carter Hall).
- 9 a.m. – Noon     **Poster Sessions**, *University Center, Carter Hall D*  
(note: all posters must be removed from Carter Hall D by Noon).
- 9:40 a.m. – Noon     **Oral Presentations**, Rooms UC 226 and 227 (next to Carter Hall).
- Noon – 1 p.m.     **Endeavor Luncheon** for student participants and mentors, *Carter Hall A-C*. Your badge will serve as your lunch ticket.

### Endeavor Research and Creativity Awards Committee

- Dr. Michael Strezewski     Director of Endeavor Awards for Research and Creativity,  
Associate Professor of Anthropology, College of Liberal Arts
- Dr. Manfen Chen     Professor of Finance, Romain College of Business
- Dr. Jeannie Collins     Associate Professor of Chemistry, Pott College of Science,  
Engineering, and Education
- Ms. Rebecca Deeg     Grant Administrator, Office of Planning, Research, and  
Assessment
- Dr. Ronald Diersing     Associate Professor of Engineering, Pott College of Science,  
Engineering, and Education
- Mr. Rob Millard-Mendez     Professor of Art, College of Liberal Arts
- Dr. Erin Reynolds     Assistant Professor of Health Services/Administration, College of  
Nursing and Health Professions
- Dr. 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. Ronald S. Rochon, President, University of Southern Indiana
- Dr. Mohammed Khayum, Provost
- Dr. Shelly Blunt, Associate Provost for Academic Affairs
- Michele Duran, Senior Administrative Associate, Office of the Provost
- Megan Doyle, Assistant Director of Special Events
- Romain College of Business
- College of Liberal Arts
- College of Nursing and Health Professions
- Pott College of Science, Engineering, and Education
- USI Honors Program

## Endeavor Faculty Mentors

- Dr. Gregory Blair
- Dr. Alex Champagne
- Dr. Charles Conaway
- Dr. Heather Cook
- Mrs. Shellye Davis
- Dr. Kimberley Delaney
- Dr. Khaled Elkhail
- Dr. Julie Eyink
- Mrs. Jennifer Fehrenbacher
- Dr. Brandon Field
- Dr. Chad Gonnerman
- Dr. Eric Greenwood
- Mrs. Emily Holt
- Dr. Kyle Mara
- Dr. Swateja Nimkar
- Dr. Matthew Powless
- Ms. Nancy Raen-Mendez
- Mrs. Amanda Reddington
- Dr. Srishti Srivastava
- Dr. Sarah Stevens
- Dr. Rex Strange
- Dr. Ken Walsh
- Dr. Alyssa Weatherholt
- Dr. Phoneshia Wells
- Dr. Bohan Ye

## 9-10 a.m. POSTER SESSION

### Carter Hall D

Kara Bunselmeyer	Nursing Leadership in Inpatient and Outpatient Settings
Danielle Chivelle and Rebecca Dreher	Got Milk or Caries?
Eleanor Conley	An Evaluation of the Nurse Leaders Role in a Sentinel Event at a Local Hospital
Zachary Cosby	Compliant Mechanism Model of a Grasshopper's Leg
Mikaila Ealum	The Role of Ethnic Identity in Resilience to Adverse Childhood Experiences in African Americans
Taylor Evans and Jesse Cullison	Adaptation of the Ammonia-Free Birch Reduction for Use in the Sophomore Organic Teaching Laboratory
Rachel Gray	Effects of Strength Training Intervention on Prevention of Anterior Cruciate Ligament Tears in Collegiate Women's Soccer Players
Ally Grimes	Post-COVID Syndrome and Suicide
Halle Hehman	Publishing a Magazine Article to Network in Your Profession
Ashley Keller	Post COVID-19 Exercise Programming
Riley King and Gadeer Alkhalifah	Management of Aphtous Ulcers: Laser vs. Amlexanox
Heather Kniepmann, Lauren Lorey, and Kaleigh Oskin	Is Juice Really Better than Soda?
Aurora Mendel	An Exploration into Immersion Teaching and Its Role in the Classroom
William Nelson	Quantum Entanglement via Spontaneous Parametric Down Conversion
Crystal Peterson	Sonography Legislature: A Push for Licensure

Mallory Sandullo	Creating a Plan of Care for Residents in a Nursing Facility in Huntingburg, Indiana
Leigh Seitz	Navigating Evansville Resources for Evansville Community as a Student
Shyann Smith, Alexis Thomas, and Gabrielle Lowe	Treatment or Trauma
Elissa Tam	Getting Under the Skin: An Evolutionary Perspective on Lipids in American Alligator Skin
Abby Wetzel and Anoop Jasti	Jaw Bone Morphology of Suction vs. Ram Feeling Teleosts
Rachel Whitehouse	Incivility in Nursing and the Impact on Retention
Ian Zweifel	Bioinformatics and its Application in COVID-19 Alpha and Delta Spike Protein Variants

**10-11 a.m. POSTER SESSION**  
**Carter Hall D**

Kara Bunselmeyer	Nursing Leadership in Inpatient and Outpatient Settings
Danielle Chivelle and Rebecca Dreher	Got Milk or Caries?
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Zachary Cosby	Compliant Mechanism Model of a Grasshopper's Leg
Mikaila Ealum	The Role of Ethnic Identity in Resilience to Adverse Childhood Experiences in African Americans
Alexandria Etienne, Sophia Gresh, and Alyssa Miller	Do Injunctive Norms Influence Our Willingness to Seek Out Therapy?
Taylor Evans and	Adaptation of the Ammonia-Free Birch Reduction for Use in the

Jesse Cullison	Sophomore Organic Teaching Laboratory
Rachel Gray	Effects of Strength Training Intervention on Prevention of Anterior Cruciate Ligament Tears in Collegiate Women's Soccer Players
Ally Grimes	Post-COVID Syndrome and Suicide
Halle Hehman	Publishing a Magazine Article to Network in Your Profession
Lyndsay Keitel	Hemoglobin Analysis: Humans vs. Lampreys
Ashley Keller	Post COVID-19 Exercise Programming
Riley King and Gadeer Alkhalifah	Management of Aphtous Ulcers: Laser vs. Amlexanox
Heather Kniepmann, Lauren Lorey, and Kaleigh Oskin	Is Juice Really Better than Soda?
Makayla Loeffler	Mental Health Care Kit Project
Elyse Mastison	The National Debt and the Stakeholders Involved
Aurora Mendel	An Exploration into Immersion Teaching and Its Role in the Classroom
Sydney Nalley	The Ordinary View of Death
William Nelson	Quantum Entanglement via Spontaneous Parametric Down Conversion
Crystal Peterson	Sonography Legislature: A Push for Licensure
Mallory Sandullo	Creating a Plan of Care for Residents in a Nursing Facility in Huntingburg, Indiana
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## **11 a.m. - Noon POSTER SESSION**

### **Carter Hall D**

Alexandria Etienne, Sophia Gresh, and Alyssa Miller	Do Injunctive Norms Influence Our Willingness to Seek Out Therapy?
Lyndsay Keitel	Hemoglobin Analysis: Humans vs. Lampreys
Makayla Loeffler	Mental Health Care Kit Project
Elyse Mastison	The National Debt and the Stakeholders Involved
Sydney Nalley	The Ordinary View of Death



## Oral Presentations

### Session 1, UC 226

- 9:40 – 9:55      **Samuel McCollom** – The Wendigo: Traditional vs. Contemporary Conceptions
- 10:00 – 10:15    **Isaac Hopf** – Mario AI: Training an AI Agent to Play Super Mario Bros Using Reinforcement Learning
- 10:20 – 10:35    **Logan Oakley** – Artificially Intelligent Snake Agent via Neural Network and Genetic Training
- 10:40 – 10:55    **Makayla Schirmer** – Living Healthy to Live Well – The Importance of Chronic Disease Self-Management in Healthcare
- 11:00 – 11:15    **Aubrey Swart** – Promotional Copywriting Portfolio
- 11:20 – 11:35    **Joshua Stephenson** – The Power of Critical Thinking: Unraveling the Real and Unreal
- 11:40 – 11:55    **Landon Mayer and Xenia Adames** – Griffin Center HVAC Usage Model

## Oral Presentations

### Session 2, UC 227

- 9:40 – 9:55      **Lydia Horb** – Precipitate Between Sodium Carbonate and Calcium Chloride: A Statistician’s Take on Chemistry
- 10:00 – 10:15    **Rebekah Gardner** – Flight Time of Helicopters: Experimental Design and Analysis
- 10:20 – 10:35    **Hunter Morgan** – Power and Corruption in Middle Earth: Shadow of Mordor and the Lord of the Rings
- 10:40 – 10:55    **Leah Flake** – Impact of Air Pollution from Super Polluters on the Burden of Disease in Southwestern Indiana
- 11:00 – 11:20    **Carli Murkve** – Dom’s Treasure Hunt – A Children’s Book
- 11:25 – 11:45    **Anna Ardelean** – Redlining in Evansville, Indiana

## Oral and Poster Presentation Abstracts

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### Redlining in Evansville, Indiana

**Anna Ardelean**

In the New Deal Era of the 1930s to early 1940s, domestic policy was changing rapidly. One policy enacted by the Home Owners Loan Corporation was designed to combat the recent housing foreclosure crisis by drawing maps of cities across America. These maps were part of a "systemic appraisal process" to assess the stability of loans and investments in different areas of cities. This program is now commonly referred to as "Redlining." This mini-documentary compares the historical redlined maps of Evansville, Indiana to the city today. I explore the concepts of systemic investment/disinvestment and the importance of public policy in socioeconomic life outcomes. I also analyze this policy through the lenses of race, wealth, environment, and labor.

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### Nursing Leadership in Inpatient and Outpatient Settings

**Kara Bunselmeyer**

Leadership in nursing looks different depending on the type of facility that you are working in. Inpatient facilities include hospitals, rehabilitation centers, psychiatric hospitals, and long-term care facilities. Patients must spend at least one night in the facility for it to be considered an inpatient stay. Outpatient facilities include primary care clinics, surgery centers, or diagnostic imaging centers. In other words, it refers to any medical treatment that does not require an overnight stay. In the class NURS: 488 Leadership in Care Delivery, I was able to have clinicals in both an outpatient and inpatient facility. I was able to see firsthand the differences in leadership roles and styles in nursing. This course discussed the leadership styles and qualities, which I expanded on for my project. I also used personal experiences and research to describe the differences between nurse leaders and managers. This research will benefit the nursing profession and other nursing students who are learning about the profession. With this research, I was hoping to clarify the different roles that nursing leaders have and how they impact the profession. I also included the impact that COVID-19 has had on the nursing profession and how it has inspired innovation for nursing leaders.

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### Got Milk or Caries?

**Danielle Chivelle and Rebecca Dreher**

Faculty Mentor: **Mrs. Emily Holt**

Sugar is one reason for the formation of dental caries. Both breastmilk and formula may contain sugar, depending on the manufacturer. Another reason for caries formation is a drop in the pH of the mouth, which occurs during feedings of either type. While breastfeeding has many benefits over formula for

systemic health, is it not as clear if it is a healthier option for the teeth. Do children between the ages 1-3 who were breastfed have more dental caries compared to children who were formula-fed? Feeding frequency for formula fed babies is spaced out longer between feedings because formula is digested slower than breastmilk. Less frequent feedings means fewer opportunities for caries to develop. An observational study found that infants at the age of 2 ½ who had breastfed for at least 6 months were at a higher risk of dental caries when compared to those who were exclusively formula-fed. A meta-analysis study about breastfeeding and early childhood caries showed that when breastfeeding a child until the age of one, there was no increased risk in the development of dental caries. When the children were breastfed past one-year of age, the risk of developing caries increased. With the research in recent years, it was found that breastfeeding children ages 1-3 had slightly higher incidence of dental caries compared to children who drank formula. Establishing a dental home within the first year of a child's life is beneficial because proper counseling can be provided about breastfeeding and formula feeding. Education can also be provided about the prevention of dental caries while breastfeeding, as well as developing oral care habits with the child as soon as the first tooth erupts. Offering pamphlets on this topic at medical offices is another way to introduce the importance of oral care for children.

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## **An Evaluation of the Nurse Leaders Role in a Sentinel Event at a Local Hospital**

**Eleanor Conley**

Faculty Mentor: **Mrs. Shellye Davis**

During the Leadership in Care Delivery Course, University of Southern Indiana students are paired with a leader to observe their role. During this experience, a sentinel event occurred at the local hospital. A sentinel event is an event that occurs at the hands of medical staff which causes harm to the patient. A root cause analysis team was assembled to determine how to move forward from the incident and prevent similar events in the future. This study evaluates the response of the hospitals team and Nurse leader specifically as they responded to this event and examines possible areas for improvement. This examination includes an overview of the case and sentinel event, as well as members of the team who had a role to play in the event and response team. The steps taken by the Nurse Leader will then be evaluated followed by the risk reduction plan and areas for improved response in future.

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## **Compliant Mechanism Model of a Grasshopper's Leg**

**Zachary Cosby**

This project will accurately model a grasshopper's leg using compliant mechanisms. Insect joints are fascinating because of their high performance with such a small size. Analysis of different animals and insects' movements have led to many amazing inventions. This project will use compliant mechanism with other linkages to create a model. Once the model is designed, a prototype will be crafted. In this process, different methods will be used to test the design, such as fatigue testing, stress testing and a deflection test, to find flaws in the design. This will allow multiple iterations to be designed, each being improved on after the other. Ultimately, a final model will be 3d printed and built. From there, possible applications could be analyzed once the motion is fully understood.

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## **The Role of Ethnic Identity in Resilience to Adverse Childhood Experiences in African Americans**

**Mikaila Ealum**

Faculty Mentor: **Dr. Matthew Powless**

Adverse Childhood Experiences (ACEs) are events such as child maltreatment, physical, sexual, and emotional abuse, neglect of a child, and household dysfunction such as a living with an individual with a substance use disorder (Kaier 2015). These ACEs have a major impact on the mental and physical health of individuals. For example, people with one or more ACE have been shown to be more likely to engage in illicit drug use and problem drinking (Felitti et al., 1998). Furthermore, people with ACEs are three times more likely to suffer from a depressive disorder and have an increased risk for suicide (Kaier 2015). Unfortunately, despite all that has been learned about ACEs and their consequences, there is a paucity of literature on how ACEs affect individuals in the Black, Indigenous, and People of Color (BIPOC) community. The seminal work provided by Felitti et al. (1998) on ACEs focused on a sample that was primarily Caucasian and middle-class, where participants completed study questionnaires at a private practice. Due to the unique stressors that members of the BIPOC community face that their White counterparts may be inoculated from (e.g., interpersonal racism), which may also serve to compound the effects of ACEs, this study provides insight into ACEs and their repercussions as they apply to the BIPOC community. Data is in the process of being collected and we intend to present preliminary findings at the symposium.

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## **Do Injunctive Norms Influence Our Willingness to Seek Out Therapy?**

**Alexandria Etienne, Sophia Gresh, and Alyssa Miller**

Faculty Mentor: **Dr. Julie Eyink**

Prior research has indicated that there is a negative correlation between those who need therapy and those who receive psychological therapy, as many people fail to seek out therapy. Furthermore, injunctive norms cause people to avoid societal retribution, offering the theory that injunctive norms lead to a decreased willingness to seek out therapy, as therapy has not always been socially acceptable. This study aims to investigate this issue by analyzing how injunctive norms influence therapy willingness. Participants may be exposed to one of three conditions: reading a positive statement about therapy, reading a negative statement about therapy, or neither, serving as the control. After, participants will fill out a survey where they express their attitudes toward seeking therapy (Attitudes Toward Seeking Professional Psychological Help) and another where they give demographic information. This research hopes to develop a better understanding of how the language we use around seeking psychological help can increase the rates of those who do.

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## **Adaptation of the Ammonia-Free Birch Reduction for Use in the Sophomore Organic Teaching Laboratory**

**Taylor Evans and Jesse Cullison**

Faculty Mentor: **Dr. Ken Walsh**

The Birch reduction is a widely-used mechanism in the organic chemistry industry, and is taught in nearly all organic chemistry classrooms. However, the reaction tends to be dangerous and is not widely taught in the organic chemistry teaching laboratory. This project aims to adapt a safer, more accessible Birch reduction procedure for use in the sophomore organic chemistry teaching lab. The procedure used is ammonia-free, and involves the use of sodium metal suspended in paraffin wax. The sodium metal suspension is safer and more easily handled. Initial experiments have been successful on anthracene and quinoline substrates, but further refinement is necessary to achieve increased yield. Later experiments might also simplify the process further by attempting to remove more complicated steps such as the current requirement of conducting the procedure under inert gas.

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## **Impact of Air Pollution from Super Polluters on the Burden of Disease in Southwestern Indiana**

**Leah Flake**

In 2014, The Center for Public Integrity conducted a nine-month investigation on the toxic and greenhouse gas emissions of 2,000 facilities in the United States. Of these 2,000 facilities, 100 were found to produce a third of all toxic and greenhouse gas emissions and 22 of them appeared on both lists. These 22 are known as super polluters and four of them are in southwestern Indiana (SWIN). These facilities are Duke Energy – Gibson Plant, AES Petersburg, and AEP Rockport Power Plant/Indiana Michigan, and Kaiser in Newburgh, IN. This project will explore how air pollution from these facilities impacts burden of disease in SWIN counties to see if there is an association between the two. SWIN counties include Daviess, Dubois, Gibson, Knox, Martin, Perry, Pike, Posey, Spencer, Vanderburgh, and Warrick county. The project variables for comparison are annual PM<sub>2.5</sub> emissions from the four super polluters and heart attack mortality rate in the 11 SWIN counties. This project will input data sets from the EPA National Emissions Inventory and the Interactive Atlas of Heart Disease and Stroke in the program SPSS to produce a correlation coefficient between the variables. Interpretation of data is not yet available for this study.

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## **Flight Time of Helicopters: Experimental Design and Analysis**

**Rebekah Gardner**

Faculty Mentor: **Dr. Heather Cook**

The planning and design of an experimental process is integral to the reliability of statistical analysis to be performed on the resultant data. By investigating the effects blade angle, weight, paper type, and drop position, we are able to construct a fundamentally sound experimental design in order to understand what factor effects maximize the flight time of a paper helicopter. This presentation will cover the entire experimental process such as design setup, model selection, data collection, analysis, assumption checking, and interpretation of the results.

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## **Effects of Strength Training Intervention on Prevention of Anterior Cruciate Ligament Tears in Collegiate Women's Soccer Players**

**Rachel Gray**

Faculty Mentor: **Dr. Alyssa Weatherholt**

Anterior cruciate ligament, ACL, tears are major knee injuries that most often occur in sports that require quick stopping and starting movements. The game of soccer requires these bodily movements, and thus anterior cruciate ligament tears are quite often seen in the sport. Females are more susceptible to ACL tears because of various anatomical, neuromuscular, and hormonal characteristics. Additionally, due to the intensive surgery, long recovery process post-ACL reconstruction, and risk of long-term effects, like development of osteoarthritis, prevention of ACL tears is important. Currently there is no universally accepted prevention program, however research shows that strength training could be a good option. This project proposes a research intervention that could help determine the effectiveness of strength training on prevention of anterior cruciate ligament tears in collegiate women's soccer players. In this project, the review of literature alludes to strength training being an effective way to prevent ACL tears. The project focuses on collegiate female soccer players and proposes a research intervention that can show the effectiveness of strength training on ACL prevention.

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## **Post-COVID Syndrome and Suicide**

**Ally Grimes**

Faculty Mentor: **Mrs. Shellye Davis**

There has been extensive research and progress on COVID-19 acute manifestations, treatment, and preventative measures. However, as the virus continues to affect the lives of those previously infected, research on the long-term effects becomes increasingly important to patient follow-up and wellbeing. The

purpose of this project is to reveal current research on the symptoms and etiology of post-COVID-19 syndrome (PCS) as it relates to mental health and suicidal thoughts. A review of literature identified several pathophysiological mechanisms for the psychological sequelae of COVID-19. Neuroinflammation, autoantibody accumulation, and post-traumatic stress disorder are recognized as the main causes of mental health changes after COVID-19 infection (Bornstein et al., 2021; Malik et al., 2021; Rubiana-Buitrago et al., 2022). As a result of these processes, PCS can cause fatigue, anxiety, depression, insomnia, seizure activity, and cognitive deficits. Individuals with these long-term psychological symptoms are at increased risk for suicide (Sher, 2021). In understanding the risk factors and pathophysiology of PCS, health care professionals are better able to develop follow-up and treatment strategies (Malik et al., 2021). Suicide prevention and promotion of well-being should be a leading priority as the COVID-19 pandemic progresses and long-term consequences ensue.

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## **Publishing a Magazine Article to Network in Your Profession**

**Halle Hehman**

Faculty Mentor: **Mrs. Jennifer Fehrenbacher and Mrs. Amanda Reddington**

Health care professionals must be lifelong learners by nature of their chosen professions. Research was conducted pertaining to the effects of mouth guards related to the prevention of sports related injuries. As this knowledge gained is beneficial for dental professionals, it was presented at an Evansville Dental Assistant's Society meeting. In an effort to continue to share these findings, a research article has been created and submitted for review to RDH magazine. The first step toward publishing an article in a magazine involves selecting a topic. Next, thorough research is conducted in relation to the chosen topic. The remaining steps pertain to the publication itself. Journal selection is a critical step that includes finding a publisher that accepts the topic and feels it is congruent with the purpose and goals of that particular journal. Furthermore, it is important to reference the publisher's requirements when making this decision. Some require precise word counts, others may be peer reviewed, and some require certain credentials. Once accepted, the author should draft an outline, create the article, and have it reviewed before submission. After submission, the article will be peer reviewed per the magazine's requirements. Then, the author should take the feedback into consideration before submitting the final draft once again. The article is then ready to be published. This process may take months or even years to complete. The article created for submission centers around the prevention of sports related injuries, specifically with a mouth guard. Most sports related injuries impact the oral cavity. Recent studies have linked mouthguard use and prevention or reduced severity of sports related concussions. This is a tremendous step for research related to the dental field. Once clarifying this association, the next greatest area of concern is increasing awareness and acceptance of mouth guard use. It is the hope of the researcher that this work will encourage other dentists, dental hygienists, dental assistants, and orthodontists to incorporate mouth guard education into their practice.

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## **Mario AI: Training an AI Agent to Play Super Mario Bros Using Reinforcement Learning**

**Isaac Hopf**

For this project, I trained an AI agent to play Super Mario Bros using reinforcement learning. Reinforcement learning is a type of machine learning that trains AI agents to accomplish a task through trial and error. When the AI agent takes an action that helps them accomplish the task, they receive a reward. Overall, the goal of the AI agent is to maximize their reward. Reinforcement learning requires several components to work: an environment for the AI agent to operate in, a reward function that determines how to reward the agent, and a learning model that enables the AI agent to learn. Therefore, I investigated how to implement and optimize these components using the latest technologies. I have found that OpenAI Gym works well for the environment and reward function. OpenAI Gym is a popular framework designed to standardize environments for reinforcement learning. It also features many pre-built environments, including Super Mario Bros. As for the learning model, I found Proximal Policy Optimization (PPO) to be reliable and effective. PPO was developed in 2017 and has proven to be comparable or better than other popular learning models. Finally, PPO, as well as other learning models, can be configured with a policy to improve their effectiveness. I have found that Convolutional Neural Network Policy (CNN Policy) works well with visual environments, like Super Mario Bros. For these reasons, I have implemented and optimized OpenAI Gym, PPO, and CNN Policy in my project. Overall, I have created an AI Agent that can competently play Super Mario Bros.

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## **Precipitate Between Sodium Carbonate and Calcium Chloride: A Statistician's Take on Chemistry**

**Lydia Horb**

A common chemistry experiment involves the reaction between sodium carbonate and calcium chloride to produce the precipitate calcium carbonate. This experiment is simple and easy to replicate but can be taken a step further by investigating the effects that factorial design analysis has on the possibility of interaction between variables. Utilizing a factorial design with blocking, data was collected to model the interaction between the fixed and random factors. Sodium carbonate and calcium chloride concentrations were fixed and combined at each level within the fixed blocking variable of water and vinegar solution to prevent premature precipitate. The time for which they were mixed was an additional randomized variable. The significance of these factors was analyzed, as well as the interaction between the chemical concentrations to predict the amount of precipitate formed. This presentation will introduce the involvement of statistics in chemistry and shed light on the ideal design for an otherwise simple experiment.



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## Hemoglobin Analysis: Humans vs. Lampreys

**Lyndsay Keitel**

Faculty Mentor: **Dr. Rex Strange**

Hemoglobin is immensely important for the health and function of Humans (*Homo sapiens*) and Sea Lampreys (*Petromyzon marinus*). Hemoglobin functions in the oxygen transport to the tissues and reversely the carbon dioxide transport to the lungs or gills. Without adequate levels of hemoglobin, prominent health complications can arise. Using a variety of sources and databases such as The National Center for Biotechnology Information (NCBI), individual information was collected on a specific Hemoglobin gene in *Homo sapiens* (HBG1), as well as *Petromyzon marinus* (PMII). The purpose of this project was to analyze each of the genes and compare and contrast the two. Information from a BLAST (basic local alignment search tool) that was ran on the nucleotide sequences of each was part of the information that was considered in the analysis. Results showed very little similarities and more differences between the two genes of choice. These two species were chosen because their lineages diverged over 250+ million years ago, and they interestingly have different hemoglobin expression at each of their respective life stages.

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## Post COVID-19 Exercise Programming

**Ashley Keller**

Faculty Mentor: **Dr. Sarah Stevens**

Over the past couple of years, COVID-19 has had a pronounced impact on the health of populations throughout the world. Individuals who test positive for COVID-19 may present various symptoms including fever, cough, difficulty breathing, fatigue, loss of taste and smell, and many more. However, recent studies have suggested that these symptoms may persist longer than expected. In fact, individuals may continue to be symptomatic months after testing positive. This phenomenon is called post-COVID-19 syndrome. Exercise and rehabilitation have been shown to combat post-COVID-19 syndrome. Therefore, post-COVID-19 exercise programming is essential for patients to fully recover. To maximize the benefits of an exercise or rehabilitation program, individualized exercise testing and prescription must take place. An initial evaluation should be conducted to collect information about the client's baseline measures and abilities. Specific pathophysiology and special considerations should also be noted before administering a program. Following the initial evaluation, an individualized exercise or rehabilitation program may be formulated and prescribed. This rehabilitation and exercise program may be conducted in person or online via telerehabilitation.

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## Management of Aphthous Ulcers: Laser vs. Amlexanox

**Riley King and Gadeer Alkhalifah**

Faculty Mentor: **Mrs. Emily Holt**

Recurrent aphthous ulcers (RAU) are one of the most prevalent conditions of the adult oral cavity and are presented by painful, inflammatory lesions on the oral mucosa. RAU can affect a patient's ability to eat, speak, and perform efficient oral hygiene. Various methods are aimed at reducing size and pain of lesions including topical analgesics, topical corticosteroids, and low-level laser therapy (LLLT). Amlexanox is an example of an oral steroid paste used for treatment of RAU. In a patient with recurrent aphthous ulcers, will LLLT result in a statistically significant greater reduction in ulcer size, pain intensity, and healing time than use of amlexanox? When comparing amlexanox oral paste and LLLT, most systemic reviews confirmed immediate pain relief and quicker healing time of ulcers with use of LLLT. In three studies of similar samples size, participants with minor aphthous ulcers were treated with either amlexanox oral paste or LLLT. Both groups showed a statistically significant reduction in pain and size of ulcers, but higher mean reduction percentages were present for the LLLT groups. While both treatments resulted in statistically significant reduction of pain and size of ulcers, LLLT was statistically more effective than amlexanox. More high-quality clinical studies with large sample sizes are needed to confirm the benefits of LLLT. Topical steroids are the first choice for management of RAU. LLLT is a safe, time-effective, and cost-effective option for treatment of RAU. LLLT provides greater reduction in pain and the number of ulcers compared to topical steroids but is not recommended over topical agents until more high-quality studies are performed.

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## Is Juice Really Better than Soda?

**Heather Kniepmann, Lauren Lorey, and Kaleigh Oskin**

Faculty Mentor: **Mrs. Emily Holt**

Dental caries is the most common disease of children in the United States. The most common acidic beverages that cause caries are soft drinks and fruit juices. While most children are likely not drinking soda daily, fruit juice is a common beverage parents consider healthy. Is it though? Are children who drink fruit juice daily just as likely to develop caries as children who drink soda daily? Acidic beverages can lower the overall pH of the mouth, and when it drops lower than 5.5, this is when enamel can start to break down. When comparing soft drinks to fruit juices, most studies have found that both can be detrimental to the oral cavity. Both soft drinks and fruit juice lower the pH of the mouth and can lead to dental caries. In conclusion, children who drink fruit juice daily are just as likely to develop dental caries as those who drink soda daily. Research shows that the dilution of apple juice can lead to a significant decrease in dental caries for children compared to undiluted apple juice. In addition to diluting fruit juice, parents should limit intake of sugar in foods and drinks, avoid night-time bottle feeding with milk or a drink containing sugar, and brush the child's teeth twice a day with fluoridated toothpaste. Additionally, fluoride varnish or fluoride supplements may be needed for children who do consume a higher number of sugary drinks or foods. It is recommended that fruit juice is not given to a child until 12 months of age. From age 1-3

children should only consume 4 ounces a day; children 4-6 years of age 6 ounces a day, 7 to 18 years old 8 ounces is recommended.

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## **Mental Health Care Kit Project**

### **Makayla Loeffler**

The University of Southern Indiana, Bachelor of Social Work student recognizes that mental health struggles and financial hardships can overlap for many people. This issue is especially prevalent at the student's internship at Tulip Tree Family Health Care (Ft. Branch and Princeton locations). Tulip Tree is a Federally Qualified Health Center; this means that uninsured or underinsured individuals from the community can receive care at the clinic despite their ability to pay due to the clinic's federal funding. While learning about behavioral health therapy with the Licensed Clinical Social Worker, the student recognized that all clients are recommended to continue their mental health coping mechanisms at home by journaling, doing self-care, practicing deep breathing, etc. Many of the clients do not have the means or time to purchase items they need to complete treatment, and the student decided to start the "Mental Health Care Kit" project for her capstone. It involves gathering donations from the community such as coloring books, fidget toys, unused self-care items, books, journals, and so much more. The student has also been doing research about coping mechanisms to create informational handouts and helpful worksheets for clients. The free kits are individualized, given out as a need is recognized, and the client is often given the liberty of choosing which items would work best for them. The project will also involve writing a grant request to take the project further as an honor's component for USI's Honor's Program. The ultimate goal is to gather community support and give clients who are experiencing difficult times the ability to improve their mental health and overall wellbeing.

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## **The Wendigo: Traditional vs. Contemporary Conceptions**

### **Samuel McCollom**

The wendigo, a monster traditionally from the folklore of Native American Algonquin groups, is a creature that has developed a wide variety of depictions over time, morphing in sometimes unexpected ways from what it originally was, to what it has become in modern contexts. By documenting traits of these different interpretations in 29 different appearances in media such as video games and television, as well as what the average person envisions when thinking of a wendigo from a small survey of 22 individuals, we can see how dramatically the concept has changed from the original folktales of the Native Americans.

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## **The National Debt and the Stakeholders Involved**

**Elyse Mastison**

Faculty Mentor: **Dr. Khaled Elkhail**

This analysis provides insight into the history of the national debt and how it can be used to predict the debt's future. This research addresses the national debt as an economic issue of significance while addressing the impact on different stakeholders, including households, businesses, our government and international governments and economies. Research was conducted to create a timeline of the debt from our nation's inception to December 2021. From there, I analyzed how the debt would impact the various stakeholders. After conducting the analysis, I created my own prediction of how the United States government would act to avoid reaching the debt ceiling. It highlights the importance of how the government will need to act with urgency for a solution. This research will predict how the national debt and approaching the debt ceiling will shape our nation's future.

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## **Griffin Center HVAC Usage Model**

**Landon Mayer and Xenia Adames**

Faculty Mentor: **Dr. Brandon Field**

This goal of this project is to develop a thermal model of the Griffin Center building and calculate the steady-state energy usage of the water furnace heat pump for a range of outdoor summer conditions. The water furnace heat pump is a part of the HVAC (Heating, Ventilation, and Air Conditioning) system and is used to cool the Griffin Center. The architectural plans for the Griffin Center will be used to calculate the heat gain from conduction through the windows, walls, and roof of the building. To do this, the walls will be simplified to a single representative wall construction that will be used in the heat gain calculations. The solar load that contributes to the heat gain through the windows and roof will be calculated and added to the total heat gain. Parameters such as heat and humidity due to people in the building will also be considered. The pre-Covid building capacity of 280 people (200 in the Great Hall and 40 in each of the classrooms) will be used. Using the HVAC schedules, the total cooling load will be calculated given the heat gain from outside conditions, sun load, and people inside the building. The cooling load on the HVAC system will be calculated for a range of outdoor humidity and temperature conditions while the target indoor conditions are 72°F and between 40% and 60% relative humidity. The cooling load on the building's HVAC system will be calculated for outdoor conditions between 75°F and 95°F and 60% and 85% relative humidity.

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## **An Exploration into Immersion Teaching and Its Role in the Classroom**

**Aurora Mendel**

Immersion teaching is a relatively new teaching method in the world language classroom, but it has been increasingly gaining popularity in recent years. This teaching method is known by many names: dual language immersion, bilingual immersion, two-way bilingual immersion, two-way immersion, two-way bilingual, among many others. In contrast to other language learning and teaching strategies, immersion teaching delivers a substantial portion of the curriculum in the target or second language rather than treating it as a separate subject. At this moment, I am studying to become a Spanish teacher, and this teaching method has interested me as I journey toward becoming a fully licensed teacher.

Though research into the effectiveness of immersion teaching has been sparse, the research that is available on the topic has been able to offer some helpful insight into what benefits dual language education has for its recipients, including advanced cognitive development, high levels of academic achievement, and cultural awareness. Through immersion learning, students have an opportunity to be more connected to their families and extended families, more prideful in their learning of two languages and cultures, and more likely to have greater opportunities in many career fields in the future. Although language immersion programs have received positive feedback in joining cultures and languages together, backlash and criticism of the method, specifically its focus on bilingual education, have challenged its effectiveness. Some argue that instead of creating bilinguals, immersion teaching fosters monolingualism. In addition, immersion teaching strategies must be well-designed to function properly, as argued by others. Despite its criticisms, immersion teaching's focus on utilizing both the first and second language of the student as well as the integration of native speakers inside the classroom to aid in instruction have both contributed to expanding students' thinking and acquisition of the target language. Improvement is possible to perfect this teaching method with enough research and dedication. Through immersion teaching, teachers can focus more on giving their students a valuable education that expands their minds and enhances their thinking, offering them an opportunity to be aware of the different cultures and languages around them.

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## **Power and Corruption in Middle Earth: Shadow of Mordor and the Lord of the Rings**

**Hunter Morgan**

Faculty Mentor: **Dr. Charles Conaway**

J. R. R. Tolkien's *The Lord of the Rings* has garnered a profound degree of popularity over the nearly seventy years since its publication. Naturally, a work of such cultural and popular magnitude will spawn many adaptations and expansions. One such adaptation of Tolkien's world is *Middle Earth: Shadow of Mordor*, an action game from 2014. In this project, I study the game's role as an adaptation, how it continues the themes of Tolkien's work, and how it asks the audience to consider Tolkien's legendarium and world in a new light. I do this through close reading of the game's script, Tolkien scholarship research, and 30 hours of personal gameplay experiencing the game and its story. Through my exploration of this evidence and the conclusions I draw, the paper reveals how the game uses its gameplay, characters, and

story to confront the player with the experience of being corrupted by power, a central theme of Tolkien's literature that can only be accomplished through the medium of a game.

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## **Dom's Treasure Hunt – A Children's Book**

**Carli Murkve**

Faculty Mentor: **Ms. Nancy Raen-Mendez and Dr. Gregory Blair**

For my project, I wrote and illustrated a children's book. Each page was created as an individual watercolor painting and the book was completed using digital programs for post-production editing and layout. I worked with two faculty members in the Art and Design Department, Nancy Raen-Mendez and Greg Blair, to complete this project. Opening a children's book of colorful pages and admiring the lightheartedness of it, urges the reader to dive into the emotions and narrative of the book. As a child, I loved to admire these type of pages and pulled that love of beauty into a book that illustrates the story of a boy named Dom that goes on a treasure hunt with his pet raven; little by little he finds that the treasure he gathers is trash and needs to be picked up and properly thrown away. As the story progresses, the environment became cleaner, making his hometown more vibrant and full of life. The illustrations and text in this book were developed to reach younger audiences and strives to create new understanding about the importance of properly caring and being responsible for the environment as it affects future generations. This children's book project taught me the ins and outs of being an illustrator on a professional level. With trials such as submitting manuscripts and waiting to be accepted in order to have an opportunity to finding a local publication company to accept my work and work with me. With discussions of my book, we went through the process of trying to figure out book size, formatting for pages, and testing paper weights. Often I reached out to get feedback from other faculty, such as Rob Dickes, to help understand the process of printing and paper weights. Each of my pages is in chronological color order and balancing out the cohesiveness of each color shift was a struggle, such as purple-red to red. Designing with consistency also taught me to plan ahead and be prepared to make fixes even if they are not perfect.

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## **The Ordinary View of Death**

**Sydney Nalley**

Faculty Mentor: **Dr. Chad Gonnerman**

This study was an exploration of the ordinary concept of human death. Its primary goal was to explore whether it is a "philosophical hybrid," encompassing element that aligns with both the biological model of death (where death is characterized as the irreversible loss of organismic functioning as a whole) and the consciousness-based model of death (where death is defined as the irreversible loss of consciousness). Study 1 examined how participants attributions of death in response to a scenario that we provided them. The results indicate that were sensitive to both biological factors and consciousness-based factors. Study 2 examined how difficult it was for participants to transform in their mind an image of a dead person so that this person comes to have cardiopulmonary functioning or comes to have consciousness-supporting cortical activity. The overall results were found to be consistent with the hybrid hypothesis.

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## **Quantum Entanglement via Spontaneous Parametric Down Conversion**

**William Nelson**

Faculty Mentor: **Dr. Eric Greenwood**

Quantum entanglement is the process by which two particles are formed that have paired quantum states, or mathematically their wave functions cannot be factorized. For this experiment, spontaneous parametric down conversion was used to achieve an entangled state. This process involves a photon entering a Beta Barium Borate crystal which is then converted to two entangled photons through conservation of momentum. These entangled photons can then be detected by simultaneous coincidence on detectors set at opposing angles from the incident beam. Three degrees was used in this case. Our purpose with this experiment was to acquire, set up, and test optics and detection equipment for use in the physics department in conjunction with the lectures to promote better understanding of quantum mechanics as well as availability for undergrad research projects.

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## **Artificially Intelligent Snake Agent via Neural Network and Genetic Training**

**Logan Oakley**

Faculty Mentor: **Dr. Srishti Srivastava**

There are numerous uses for artificially intelligent neural networks in scientific and business areas. One of the less consequential areas where these agents can be used is in games. Still, these applications work to build understanding and make good testing grounds for AI techniques due to the low risk and varied environments. Because of this, I plan to use a Neural Network to decide what moves a Snake playing agent will make. This network will consist of layers of nodes, each node is connected to all nodes of the previous layer. Through these connections we can adjust weights to attempt to reach the emergence of intelligent actions. To train this net and alter the weights I will use a genetic algorithm, creating a population of agents and keeping the best to repopulate with the intent of reaching optimal performance.

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## **Sonography Legislation: A Push for Licensure**

**Crystal Peterson**

Faculty Mentor: **Dr. Phoneshia Wells**

Sonography is crucial for identifying malfunctioning organs or pathogens in the body. Diagnostic medical sonographers in Indiana and in 45 other states are not required to be licensed professionals. In other words, the person taking a patient's ultrasound may not have met minimum standards proving their educational and clinical competency. Since sonography is largely technologist-dependent, a lack of licensure may have negative ramifications for patients and lead to additional health care costs. The

purpose of this literature review is to identify the status of state requirements of sonographers and current efforts to change such legislation. Through my research, I found that there is a gap in the precision of images during exams performed by certified and noncertified sonographers. This gap is pivotal for the reason that if the sonographer does not see and take a clear image of something, the doctor will never see it. Previous attempts to require licensure have not passed due to the lack of educational opportunities in this field as well as a possible sonographer shortage. Licensure of diagnostic medical sonographers should be enforced in Indiana because it would ensure public safety by the requirement of meeting minimum standards, decrease medical error and waste, and increase the potential for third-party payment by decreasing liability. The expansion of institutional accreditation consequentially leads to an increased number of certified sonographers, hence has implications for increased quality across the field of sonography.

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## **Creating a Plan of Care for Residents in a Nursing Facility in Huntingburg, Indiana**

**Mallory Sandullo**

Faculty Mentor: **Mrs. Shellye Davis**

The Southwest Indiana Area Health Education Center (SWI-AHEC) connects and educates students in health care professions on caring for underserved communities. For the final project in this program, the students visited The Waters of Huntingburg Rehabilitation and Skilled Nursing Facility in Huntingburg, Indiana to make a nutritional recipe and participate in exercises with the residents. One aspect of a nurse's scope of practice is developing a plan of care for each of their patients, so as a nursing major I used the opportunity of visiting this facility to determine how interdisciplinary leaders work together to develop a plan of care for each resident. I spoke with members of the interdisciplinary team at The Waters of Huntingburg to determine what role they played in individualizing these plans to meet the resident's and their family's needs. This project will be a culmination of the information I gathered throughout this process.

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## **Living Healthy to Live Well – The Importance of Chronic Disease Self-Management in Healthcare**

**Makayla Schirmer**

Faculty Mentor: **Dr. Swateja Nimkar**

The cost of chronic diseases within Indiana's population is one that continues to escalate despite the advances in healthcare and increasing knowledge of disease prevention. The concept of self-management for chronic disease is an alternative approach newer to healthcare that mainly assists in moving away from a curative, disease-orientated healthcare model to a holistic, health-orientated one. Various studies have been completed for chronic disease self-management, showing promising outcomes for a variety of populations. These programs are inconsistent across disease entities however, resulting in a need for universal review of self-management programs. The purpose of this project was to review the Chronic Disease Self Management Program (CDSMP) created by Stanford in 2010-2014 now being utilized by USI's



Geriatrics Workforce Enhancement Program. This program was designed to aid in providing care to people with one or more chronic conditions. Data collection review of CDSMP was completed through the implementation of CDSMP Leader Training, conducting workshops, and utilizing organized Action Plans. This study is ongoing with Leader training scheduled in February 2022, client workshops (both in person and via zoom) March 2022, and completion of program implementation in May 2022.

This presentation aims to discuss the findings obtained from the program as well as the ongoing data and anticipated future impact of the completion of the program. Self-management definitions and concepts are reviewed and broken down into more applicable approaches that can be utilized by practitioners, caregivers, instructors, and patients alike to better increase the chances of health success and positive results for those struggling with chronic illness. Additionally, this CDSMP program is compared to previously implemented CDSMP programs across the United States via literature review.

#### WHAT CDSMP REVIEWS:

- Managing Symptoms
- Healthy Eating
- Medication Usage
- Stress Management
- Making Informed Treatment Decisions
- Dealing with Your Health Care Provider
- Setting Goals

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## **Navigating Evansville Resources for Evansville Community as a Student**

### **Leigh Seitz**

As a social work student, it has been made known by numerous professors that the community of Evansville, IN is not aware of the resources available to them, such as crisis hotlines, food pantries, emergency shelters, and resources for all kinds of abuse. Some of the reasons people do not use these resources are shame, discrimination, lack of transportation, and location. However, the main reason that most people give, and the one that is most often mentioned in social work, is that people do not know the resources that are available to them or what those resources do. As an intern at Carver Community Center, I have seen this problem firsthand as a social work student. To help improve this, I have made a resource guide that includes centers for abuse and neglect, domestic violence shelters, emergency shelters, counseling services, and crisis lines. Along with this list are the addresses and phone numbers of each place. This resource guide has already begun to be distributed to the Carver Community to allow the people to know what resources are available to them and when to use them. In addition to the research guide, I will be writing a short article for possible publication describing what it was like to work in this community and make this guide as a student. I will also be describing the difference that I have seen it make in the lives of the clients I have seen throughout my internship.

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## Treatment or Trauma

**Shyann Smith, Alexis Thomas, and Gabrielle Lowe**

Faculty Mentor: **Mrs. Emily Holt**

Biofilm removal is a component of periodontal debridement. Biofilm removal can be accomplished with either rubber-cup polishing (RCP) or air-powder polishing (APP). Without correct technique, polishing with either RCP or APP devices may damage gingival tissues. In patients with periodontal disease, will APP result in more or less gingival trauma than RCP? The studies appraised in the research included subjects who had periodontal disease. All trials had similar scoring, frequency, and follow-up criteria. The Trauma Index (TI) was utilized to score gingival trauma immediately after, seven days, and twenty-one days after polishing treatment in two similar studies. RCP showed statistically significant reduction in gingival trauma seven and 21 days after treatment when compared to APP. Gingival trauma was statistically higher after APP was performed and the subjects preferred RCP over APP. Specifically, APP using sodium bicarbonate powder caused the more significant gingival trauma and gingival epithelial erosion when compared to other APP powders. RCP and APP methods showed similar efficacy in biofilm removal as well as reduction in inflammation; however, it was consistently shown that RCP had a faster healing time and showed statistically significant reduction in gingival trauma when compared to APP. Gingival trauma can be eliminated by implementing RCP during periodontal therapy rather than APP. APP causes increased gingival trauma even with the correct technique being implemented. It is important for the dental hygienist to implement a treatment plan that is beneficial and effective based on each specific patient needs. RCP should be used for all patients unless periodontal disease is not present and heavy stain and biofilm are present. Proper instrumentation with APP devices should be enforced to reduce gingival trauma. Correct power and water settings, distance/angle that APP is held from the surface being treated, and time of treatment are essential for the use of APP as these factors have been reported to cause epithelial erosion.

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## The Power of Critical Thinking: Unraveling the Real and Unreal

**Joshua Stephenson**

Faculty Mentor: **Dr. Bohan Ye**

As an incoming freshman at the University of Southern Indiana, I had no idea what I wished to do with my life. For a year and a half I possessed a major that I cared not for that would lead to a career that I personally did not find fulfilling. This aimless academic wandering persisted until I was fortunate enough to discover the fields of economics and philosophy. Majoring in the fields of economics and philosophy lends credence to one developing a particular set of skills and aptitudes. Through my studies at the University of Southern Indiana I have cultivated strong analytical and critical thinking skills that will be carried with me all for the rest of my life. Through my education I have developed theories regarding the existence (or lack thereof) of human free will, explored the mysteries of human knowledge, and even developed a research question to understand the nature of human risk taking. Through my cultivation of critical thinking skills I wish to demonstrate the power that economics and philosophy offers to those that

choose it as a discipline. By showing my fellow students at USI what I have been able to accomplish thanks to my education I hope to inspire students to pursue economics and philosophy themselves as a result. Through this presentation I hope to highlight my academic journey and my evolution from an unmotivated and confused freshman to a focused and dedicated senior student. After discussion with honors program director, Sarah Stevens, this work proves to be worthwhile and meaningful self-reflection of the power critical thinking skills can have and how they can meaningfully change the lives of those that dedicate themselves to the disciplines that cultivate such skills so effectively.

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## Promotional Copywriting Portfolio

### Aubrey Swart

The field of humanities has been plagued with one commonly posed question: so, what do you plan to do with that degree? American society has been conditioned to associate academic and professional success with the fields of science and medicine — which are noble fields to pursue — but many people fail to see the opportunities presented in the fields of literature and art. For my project, I have partnered with the University of Southern Indiana (USI)'s College of Liberal Arts to compose copy, which promotes the academic and professional opportunities available for those who are pursuing or who have a degree in the humanities. Also, as an English major, I have taken a special interest in composing copy to promote the academic and professional opportunities available for those who are pursuing or who have a degree in English. The academic and professional opportunities I write about include the various events, workshops, seminars, scholarships, successful alumni, or anything else the College of Liberal Arts or the English Department may want to promote. Through my copywriting, I hope to elicit an eager response from USI students to get involved and take advantage of the resources provided by the university. The final product of my project will be a portfolio composed of all the promotional copy I have written for USI's College of Liberal Arts and English Department, as well as a five-page reflective essay that explains my reasoning behind each piece and how the project has advanced my study and practice of professional writing.

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## Getting Under the Skin: An Evolutionary Perspective on Lipids in American Alligator Skin

### Elissa Tam

Faculty Mentor: **Dr. Alex Champagne**

In terrestrial vertebrates, skin helps maintain homeostasis by limiting water loss, mitigating physical stress, and protecting against pathogens. The outermost layer of the skin, the stratum corneum (SC), is especially well-studied because it interfaces directly with the environment. The SC is a matrix composed of corneocytes embedded in layers of several distinct lipid classes. However, the exact morphology and lipid composition of the SC varies greatly among animals depending on their environment and evolutionary history. Crocodylians, including the American Alligator (*Alligator mississippiensis*), are semi-terrestrial reptiles belonging to a clade called the Archosaurs, a group that also includes birds and dinosaurs. Their SC consists of a mosaic of thick  $\beta$ -keratinized scales connected by thin, pliable  $\alpha$ -

keratinized interscale regions. It is believed that the majority of lipids in crocodilian SC are associated with these  $\alpha$ -keratin regions, but the specific composition of lipids has never been analyzed. In this study, we used thin layer chromatography to identify, quantify, and compare lipid classes in American Alligator SC from the arm and neck regions. Our results indicate that lipids in alligator skin consist primarily of cerebrosides (~20% of all lipids), ceramides (~25%), and free fatty acids (~30%) with smaller amounts of triacylglycerol, cholesterol, and cholesterol esters. The SC of the arm had less triacylglycerol and cholesterol esters than the neck, which may reflect small differences in function between these regions. Of special interest in our findings was the high percentage of cerebrosides in alligator skin. Cerebrosides are not found in mammalian SC, but are prominent in bird SC, where they play a major role in water conservation and skin pliability. This similarity between alligator and bird skin may reflect their shared evolutionary history as the only living Archosaurs, and may lend insight into the lipid composition of extinct Archosaurs such as dinosaurs.

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## **Jaw Bone Morphology of Suction vs. Ram Feeding Teleosts**

**Abby Wetzel and Anoop Jasti**

Faculty Mentor: **Dr. Kyle Mara**

Teleost fishes employ a number of different feeding mechanisms including suction, ram, and biting. Suction feeding utilizes the opening of the buccal cavity to generate negative pressure and water flow through the mouth and out the gills, thus pulling the prey into the mouth. On the other hand, ram feeding occurs when the fish accelerates through the water column with its buccal cavity open to capture its prey. A wider opening to the buccal cavity would be beneficial for this type of feeding mechanism. In this project, we compare jaw bone structure for both suction and ram feeding fishes. The jaws in all teleosts are made up of three main components: the dentary, maxilla, and premaxilla. Previous studies show that an increase in cranial kinesis provides an increase in suction potential due to having more skull linkages. With a greater expansion of the buccal cavity the fish is able to generate more negative pressure to capture its prey. In contrast, a larger gape would be beneficial to ram feeding fishes. Therefore, we predicted that the jaw bones of the ram feeding fishes will be greater in volume and length than the jaw bones of the suction feeding fishes. We used freely available CT databases to obtain scans to visualize the bone structure. Using FIJI and 3D slicer, we modified CT image stacks of various suction and ram feeding fish species to reconstruct 3D renderings of each jaw bone and obtain subsequent measurements. We isolated each of the three bones involved in feeding and gathered information concerning the volume and sizes of the jaw bones of these fish. The bone measurements will be visualized and data discussed for each group.

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## **Incivility in Nursing and the Impact on Retention**

**Rachel Whitehouse**

Faculty Mentor: **Mrs. Shellye Davis**

Incivility in healthcare, specifically within the nursing practice, is a growing problem with inconceivable consequences. Nurses globally are fleeing their places of employment due to the severity of incivility they suffer at the hands of doctors, management, and fellow nurses. Incivility can be classified as repetitive rude actions or words that may or may not have negative intent behind them. These actions can include an impolite comment, excluding a fellow coworker, gossiping, rolling one's eyes, and much more. Incidences of incivility are more likely to occur in environments of chronic high stress, long work hours, and burnout. All characteristics that are common, if not guaranteed, in the nursing practice. Not only are healthcare employees experiencing incivility in the workplace, but nursing students have reported facing instances of incivility or bullying in nursing school. Preventative action is needed to help decrease the occurrence and magnitude of incivility in healthcare. This is a concern now more than ever, due to the decrease in incoming nurses and the increase in individuals aging into the elderly population. Based off the data I have collected; it appears that incivility in nursing is an ominous concern that required immediate action for the sack of all healthcare professionals and the community with which they serve.

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## **Bioinformatics and its Application in COVID-19 Alpha and Delta Spike Protein Variants**

**Ian Zweifel**

Faculty Mentor: **Dr. Kimberley Delaney**

The purpose of this project was to dive into the vast world of bioinformatics and all that it has to offer, specifically in regard to the Alpha and Delta variants of SARS-CoV-2. In a world where technology is one of the most important and central components of our daily lives, it is important to see the many different ways it can be used. In the field of biology, technology is used in the form of bioinformatics, the use of computational tools to analyze, study, and store biological data. This branch of science has been around for the past few decades, however, it grows more important as technology advances. We set out to understand exactly what bioinformatics is, how it is used today, investigated the history behind it, and how it has grown alongside technology. Additionally, we used our knowledge to investigate differences between the SARS-CoV-2 Alpha and Delta variants using bioinformatics.

# Plan to Attend

The 2023 Endeavor Undergraduate  
Research and Creative Work Symposium  
University Center

Thursday, April 6, 2023



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

University of Southern Indiana

