



# Acknowledgements

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## Greetings!

The University of Arkansas - Fort Smith proudly welcomes you to the 17th Annual Student Research Symposium. Our faculty and staff are committed to fostering an environment that promotes learning and discovery. As you will see in today's presentations, our students have accepted the challenge, explored unique areas of research, and synthesized their results in the form of lectures, studio art, demonstrations, posters, and performances. These presentations represent the academic diversity of UAFS's programs and the intellectual excellence of our students and their faculty mentors. On their behalf, thank you for your participation. I invite you to engage the presenters during the question-and-answer segments of their presentations. Your active involvement ensures that UAFS remains a dynamic and engaged academic community.

Namárië

Dr. Shadow Robinson  
Provost and Vice Chancellor for Academic Affairs

# Student Research Symposium

Library 122 – Presentations in Engineering and Computer Science

Noon Issair Rodriguez, Dylan Jetton, and Alexandria Yang – [Lunar Terrain Vehicle](#)

12:30 Charlee Hickman, Evan Piovesan, Han Tran, and Alex Tran – [e Autonomous Vehicle Challenge](#)

1:00 Carter Freeze, Tahlia Bergeron, Tyler Johnson, and Cody Mizell – [NumaGuard: Automating Shoulder Surfing Attacks on Mobile Phones](#)

1:30 Michael Resendiz, Marco Garcia Montes, Josue Martinez, and Cameron Taylor – [NumaFARM: An Autonomous Robotic S\(Chaarleb0 F\)4 0.3rm24 \(Uy M\)12.s24 \(ual](#)



# Student Research Symposium

Library 209 – Presentations in English and Literature

Noon Isabella Serrano – Escaping Blood: The Intersection of Race and Gender Identity in Brit Bennett's Novel "The Vanishing Half"

12:30 Rebecca Morrison – "The pen has been in their hands": The Preservation of Female Autonomy in Austen's "Persuasion"

1:00 Tatum Leary – Weaponizing Femininity and Romance: Gender as a Performance and Compulsory Heterosexuality in The Hunger Games Trilogy

1:30 Gabbie Stokes – "Pride and Prejudice and Zombies": The Unmentionable Parody Adaptation

Health Science 121 – Presentations in Accounting and Public Transportation

Noon Noah Ottman – The Current State of Corporate Social Responsibility

12:30 Joy Wootton – Accounting for Cryptocurrencies by GAAP Standards

1:00 Dalton Oxford – A Study of Crime Relations to Public Transit Commuting in Pre-COVID America

Health Science 124 – Presentations in History, Political Science, and Costume Design

Noon Korina Lopez – The Nightmare Beyond the Battlefield: A Glimpse into Civil War Prison Camps

12:30 Mitchell Collins – The Rise of Political and Social Distrust, Division, and Disenfranchisement in Modern Institutions

1:00 Gavin Garrett – Cut, Curate, Costuming: A Costume Designer's Process

Health Science 133 – Presentations in Chemistry, Biochemistry, and Latino Studies

Noon Khuong (Peter) Ta –

## Poster Presentations Noon to 2 p.m., Boreham Library

- Table 1 – Chemistry: Sully Sanford – Molecular Dynamics Study of Organochlorine Ligand Interaction with Human Serum Albumin
- Table 2 – Biochemistry: Luke Jodoin – Investigating Galectin Glycoprotein Interaction with Sialoglycans and Nanoparticles
- Table 3 – Evolutionary Biology: Armonii Dixon and Kiara omas – Phylogenetic Analysis and Molecular Adaptation Events in Whales and Dolphins
- Table 4 – Evolutionary Biology: Ciera Grijalva – Molecular Evolutionary Analysis of Jelly sh: Insights from COI and cyt-b Gene Sequences
- Table 5 – Evolutionary Biology: Laney Wagner – Exploring Evolutionary Dynamics in Old-World Mice and Rats: A Molecular Analysis of COI and cyt-b Gene Sequences
- Table 6 – Biology: Nayda Barbry, Samantha Gates, and Lana Putman – Probiotics: Capsules, Gummies, and Liquids and the Impact of Delivery Methods on Growth Rates
- Table 7 – Biology: Analise Black, Anna Carden, and Noah Tawney – Land-use and Di use Pollination: A Look at Jack Nolan Lake in Greenwood, Arkansas
- Table 8 – Cell/Developmental Biology: Evan Wittig – Exploring Genetic and Environmental Factors that Control Di erentiation of Pseudoplasmodium in Dictyostelium discoideum
- Table 9 – Geoscience: Kaleb McLaughlin – Distribution of Detrital Sediment Captured in McKay Bay Member Knoll Reef, Upper Peninsula, Michigan
- Table 10 – Geoscience: Abigale Kelly, Perla Romero, and Matt Van Tassel – Looking at the Accuracy of Polycam® 3D Scanning Software on LiDAR and Optical Photogrammetry Devices in Field Research

# Student Research Symposium

Table 11 – Geoscience: Emily Mero – X-Ray Diffraction and Petrographic Analysis of Magnet Cove Carbonatite Core, Arkansas

Table 12 – Hydrogeology: Abigail Carico – A Darcy Column for Demonstration and Research in Hydrogeology

Table 13 – Hydrogeology: Juan Lopez and Kendal Dixon – A Benchtop Model of Piezometers Used to Determine the Vertical Flow of Groundwater

Table 14 – Nursing: Gracie Larru and Polly Hoang – Pediatric Suicide Risk Associated with Social Media Use: A Literature Review

Table 15 – Nursing: Gerbert Floreschavez – Male-Oriented Recruiting, Job Satisfaction, and Retention Practices in Nursing

Table 16 – Dental Hygiene: Samantha Baughman, Jenny Kindle, and Parker Lemley – The Evolution of Dental Radiology Safety

Table 17 – Dental Hygiene: Dulce Gutierrez, Leslie Guerra, Amy Le, and Abigail Mussett – Look Out Fluoride, Etilaf1,g.9 (z and K)ol fluoride, E





# Student Research Symposium

## Lunar Terrain Vehicle

Presented by: Issair Rodriguez, Dylan Jetton, and Alexandria Yang

Faculty Sponsor: Dr. Kevin R. Lewelling

Field of Research: Engineering

UAFS mechanical and electrical engineering students have designed and constructed a Lunar Terrain Vehicle (LTV) as a response to a NASA request for information. This engineering group constructed a full-scale LTV prototype that features a folding mechanism reducing storage space. The current LTV is capable of handling two astronauts at a speed of 5 mph with an expected driving time of 20 hours. The LTV features include all-wheel drive with 360° wheel rotation, LED headlights, rear camera, and a human machine interface.

The LTV has also provided a platform for freshman engineering students to get involved with research and design. Over 75 fall 2023 freshman engineering students were challenged to design and implement unique features on the LTV: these included LED headlights, back up camera, and touch screen controls.

This presentation will review LTV design analysis and construction; how theory, reality, economics influenced the LTV design. We will discuss several things learned when constructing this LTV that will guide a new generation of LTV design. Also, we will discuss future LTV work.

# Student Research Symposium

## Autonomous Vehicle Challenge

Presented by: Charlee Hickman, Evan Piovesan, Han Tran, and Alex Tran





# Student Research Symposium

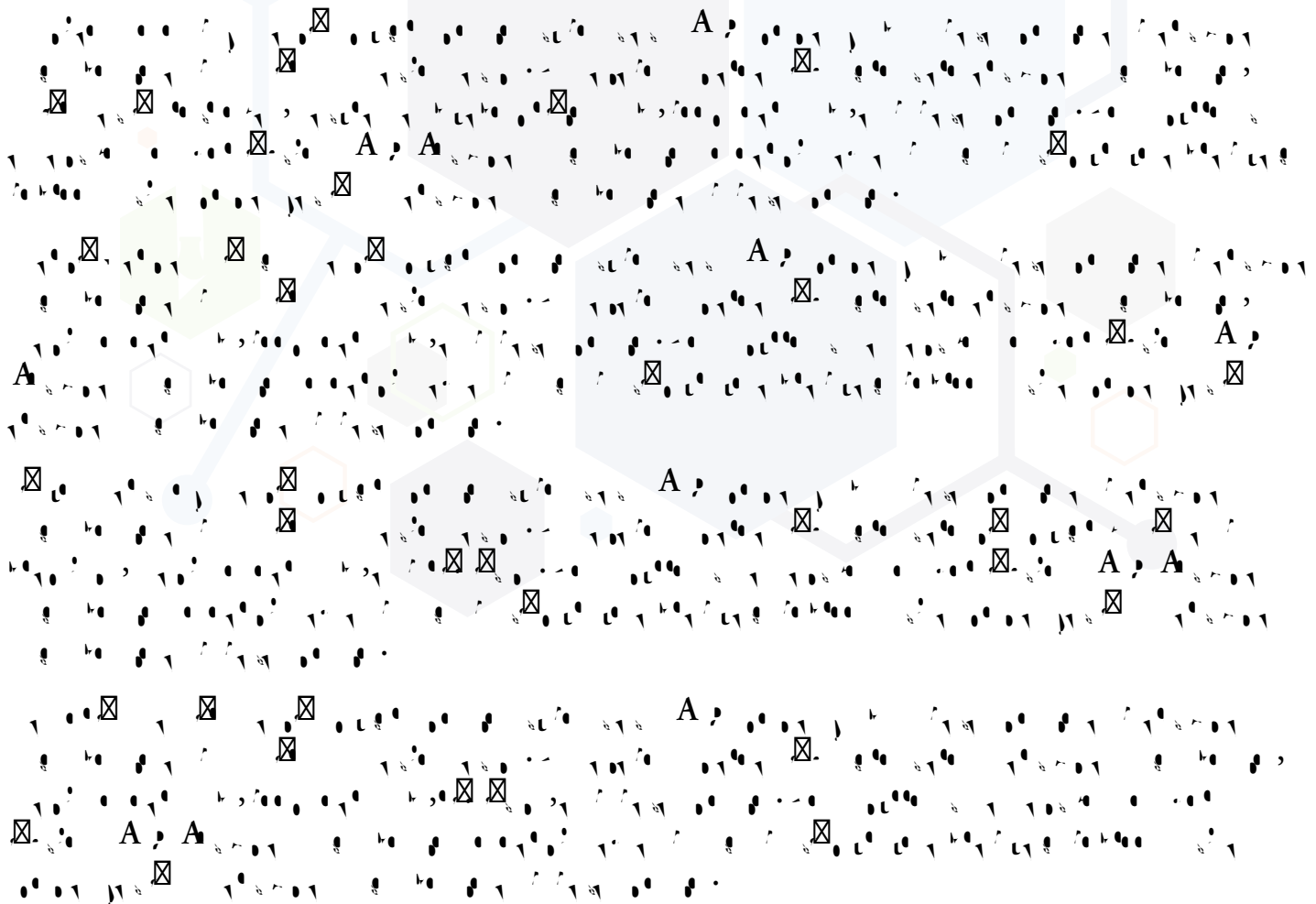
## NumaFARM: An Autonomous Robotic System for Sustainable Farming

Presented by: Michael Resendiz, Marco Garcia Montes, Josue Martinez, and Cameron Taylor

Faculty Sponsors: Andrew Mackey and Israel Cuevas

Field of Research: Computer Science

Autonomous robotic systems powered by artificial intelligence and computer vision provide new pathways for sustainability in farming for the state of Arkansas. In this presentation, we present NumaFARM, an autonomous robotic system that is capable of automating farming practices using artificial intelligence, computer vision, and deep learning. Our proposed system autonomously manages crops for crucial farming operations, including planting, irrigation, and harvesting. Through real-time monitoring of crop health to automated harvesting using autonomous robotics, NumaFARM seeks to improve efficiency, productivity, and resource allocation for one of Arkansas's largest industries.



# Library 202 Presentations in Electrical Engineering & Control Engineering

Noon Joshua Bean

12:30 Michael Arellano, Luis Romero, and Tanner Harmon

1:00 Christopher Limon, Bryce Barentine, and Felipe Ortiz

1:30 Tyler Walker and Bryer Duboise



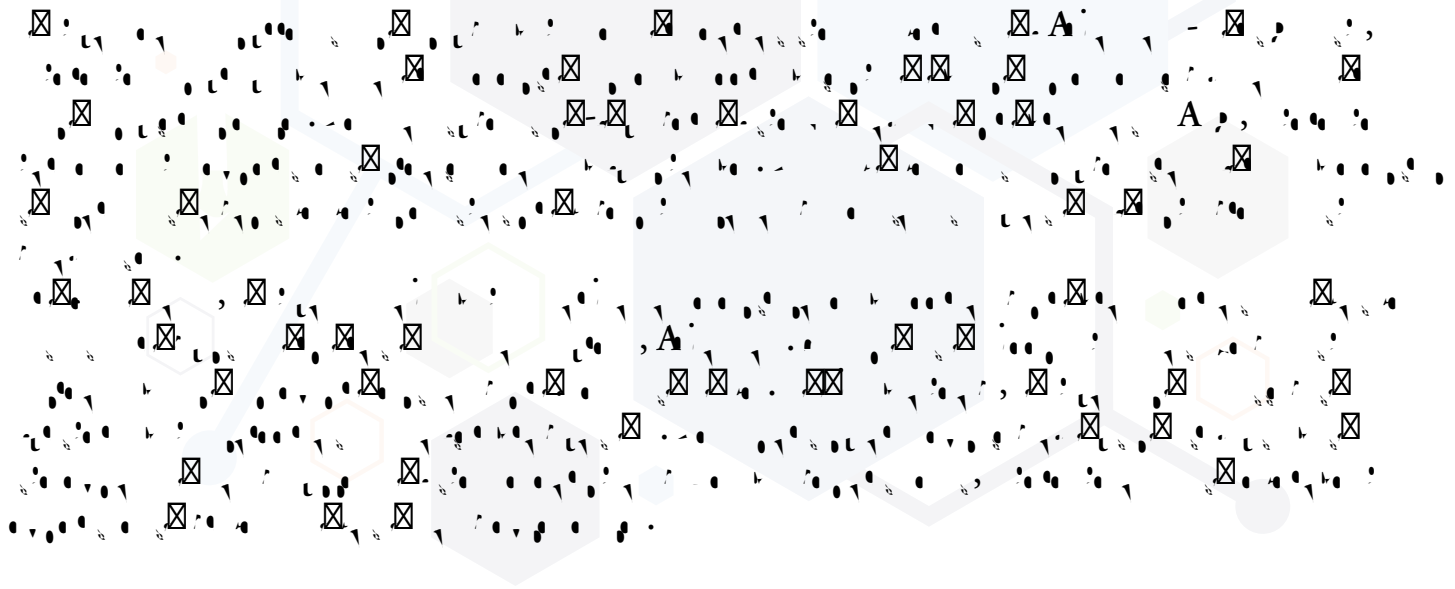
## Digitization of Earth Gradient Cable Fault Localization Methods

Presented by: Joshua Bean

Faculty Sponsor: Dr. Kiyun Han

Field of Research: Electrical Engineering

Since the 1970s earth gradient techniques have been fundamental in locating cable faults. These techniques typically involve A-Frames, which utilize a transmitter to send a high voltage pulse through a faulted cable. The receiver then measures the voltage generated in the soil as it returns to the transmitter, indicating the fault's location. Traditionally, such devices employed analog displays like galvanometers, to provide visual feedback to the user. However, with the evolving industry landscape, these analog components are increasingly difficult to procure, prompting a growing demand for digital solutions. This presentation aims to highlight the advantages of developing a digital fault locator that leverages this traditional method. It will delve into the challenges encountered in designing such a device, the solutions implemented to overcome these obstacles, the rationale behind specific design choices, and, finally, the presentation of a fully functional digital fault locator prototype.



# Student Research Symposium

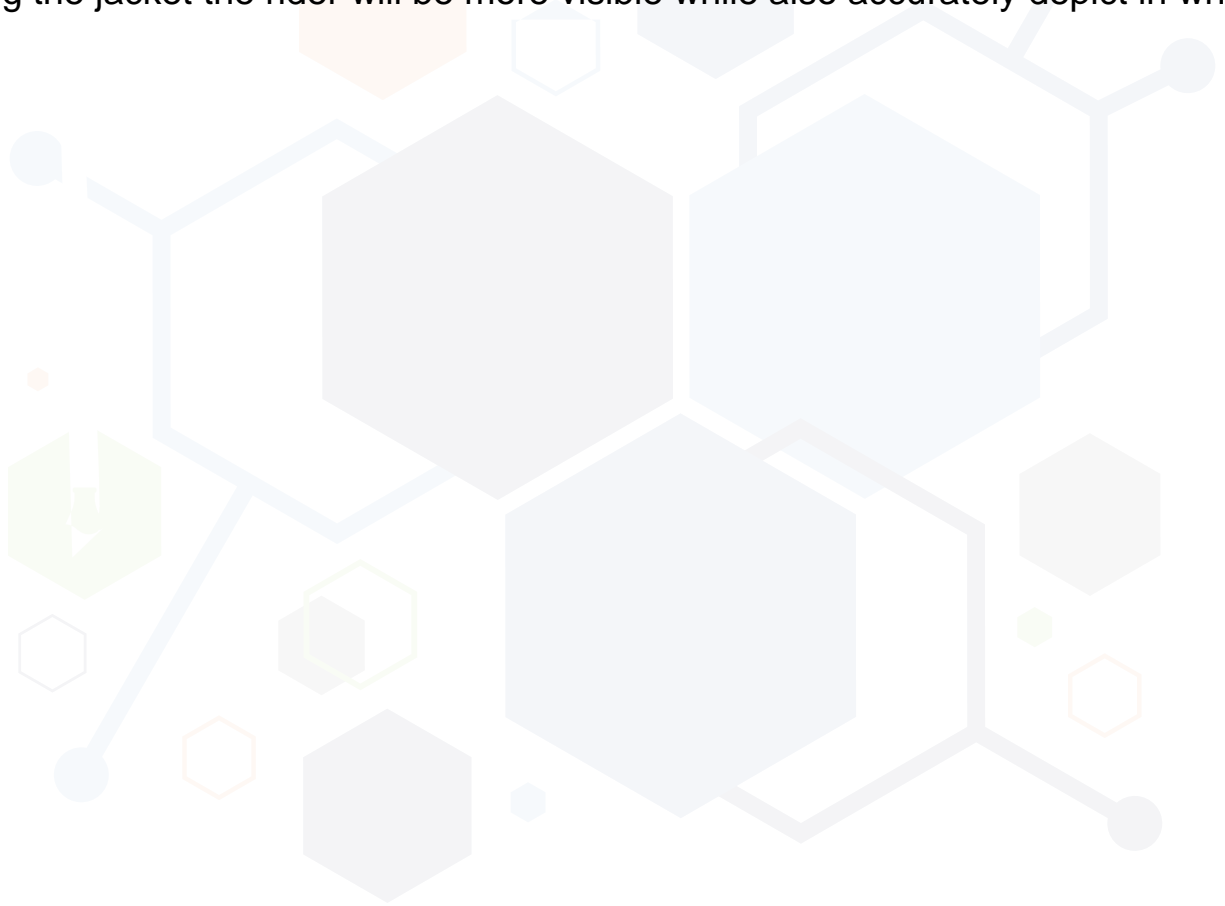
## Luminescent Jacket

Presented by: Michael Arellano, Luis Romero, and Tanner Harmon

Faculty Sponsor: Dr. Kiyun Han

Field of Research: Control Engineering

Traversing on roadways requires crucial communication between all roadway users to ensure utmost safety for everyone. An estimated combined 85,000 motorcyclists/cyclists are involved in an accident each year according to multiple sources. We determined that the Luminescent Jacket would be a great starting place to address this matter. The Luminescent Jacket would allow users to enhance their sense of safety and be able to operate their respective form of transportation wearing the jacket the rider will be more visible while also accurately depict in which direction



# Student Research Symposium

## Wireless Incorporated Car Cooler System

Presented by: Christopher Limon, Bryce Barentine, and Felipe Ortiz

Faculty Sponsor: Dr. Kiyun Han

Field of Research: Electrical Engineering Technology

In response to the intense and continuously increasing summer heats, the WICCS (wireless Incorporated Car Cooler System) was developed to combat excessive internal car temperatures. Sun shades do not provide comfortable entry to a vehicle during the hottest months of the year. Our design uses water as the circulating coolant and utilizes gel-based ice packs. A small water pump is used to circulate water through a mini radiator, fans are used to circulate hot air from the car around the fins of the radiator. The system will be comprised of a main unit and controller unit, these units will be able to communicate via LoRa based communication modules. Through study and experimentation, our project will provide data on the overall usefulness of a product such as this at varying temperatures. Implementation of this design allows us to record useful information on the effectiveness of hardware such as Arduino, power supplies and communication modules when subjected to extreme/maximum temperature values. Statistics recorded for temperature differences achieved using sun blocking shades with versus without our intended design will be the focus of the research project.





# Student Research Symposium

## Wearable Digital Multimeter

Presented by: Tyler Walker and Bryer Duboise

Faculty Sponsor: Dr. Kiyun Han

Field of Research: Electrical Engineering Technology

The digital multimeter (DMM) is a ubiquitous tool within modern industry, used by the local HVAC company as much as NASA; however, despite how common it is, it still has its faults. With our project, the “Wearable Digital Multimeter,” we hope to solve at least one of them by making it far easier to access both out in the field and inside the factory by attaching the very same tool to a technician’s wrist in a way that is both convenient and safe for any environment they might find themselves in. This project uses a standard PCB board, an LCD display, a spring mechanism for retractable wire leads, a flashlight, and self-fastening straps. The retractable wire leads of the device will be used to measure resistance, voltage, current, and continuity and display the results on the





# Student Research Symposium

## Correlation in Student Involvement on Campus and Student Success

Presented by: Braden Nguyen

Faculty Sponsor: Dr. Nicha Otero

Field of Research: Psychology

While undergraduate students across universities perform poorly, possibly leading to academic failure, research studies have explored one factor to explain student success, which is campus involvement. Although it is impractical to identify a single measure of student success or lack thereof, grade point average (GPA) is one of many indicators of how well a student is succeeding. Longitudinal research studies have also been conducted that tracked students and their GPA and how it corresponded with involvement on campus. The current study examined the relationship between student involvement and student success. We hypothesize that there is a positive correlation between student involvement and student success. Students from the University of Arkansas – Smith were asked to complete a six-item demographic questionnaire along with two surveys about their involvement. The results revealed there was a strong positive relationship between student involvement and student success. Previous works from Bergen-Cico and Viscomi (2011, 2013) support the findings that students' participation in activities enhances the likelihood of doing well in their courses. Future research will investigate if there is a true difference between student classification and involvement with student success, types of involvement, and recommended quantity of such involvement.

# Student Research Symposium

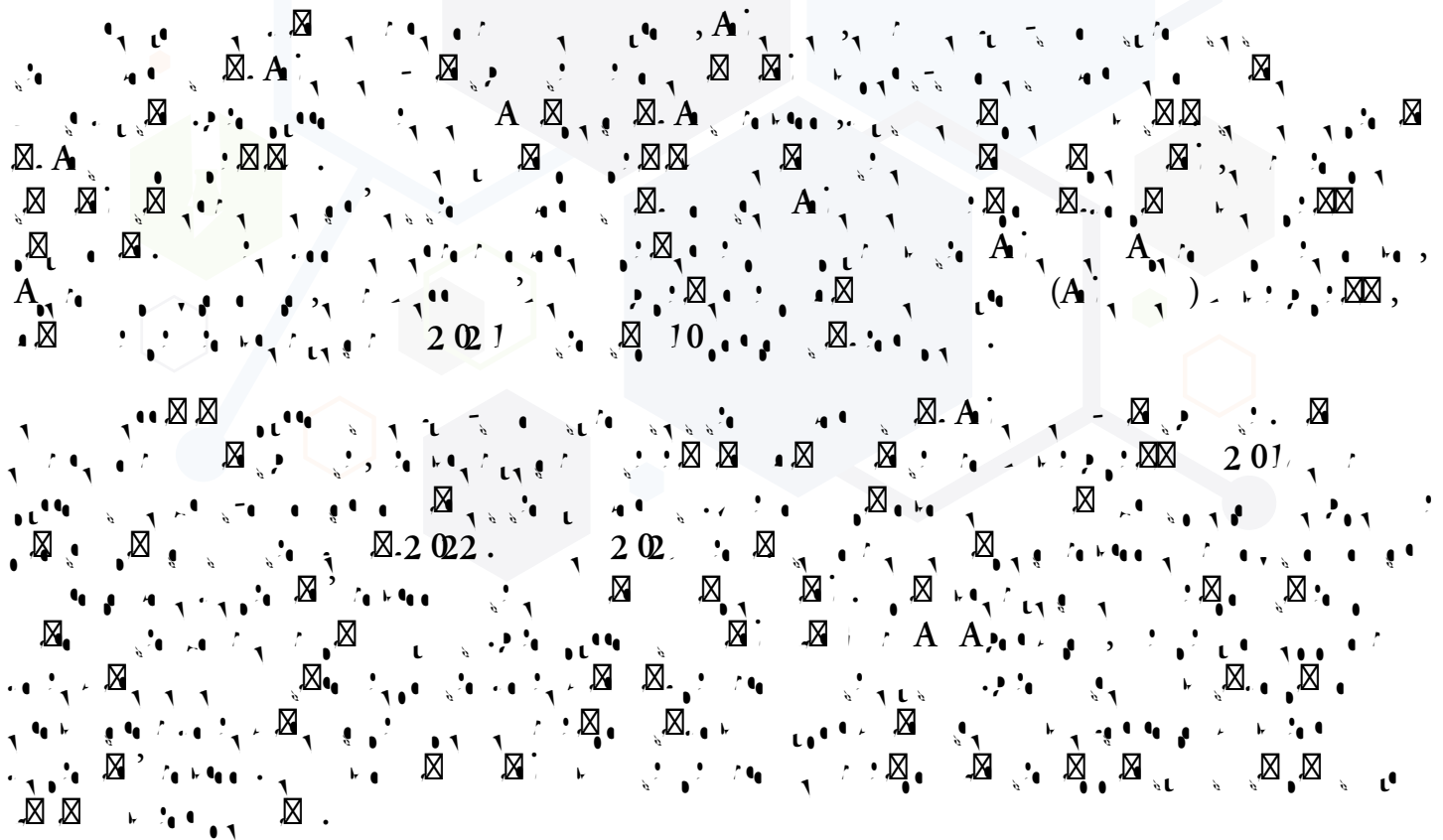
## The Neurobiology of Maternal and Paternal Behaviors

Presented by: Lilly Brasuell and Jaylin Barroso

Faculty Sponsor: Dr. Nicha Otero

Field of Research: Psychology

This research review covers the neurobiology of maternal and paternal behaviors. The cause of this neurobiological shift is within the complexities of the social learning processes, brain circularity, and hormonal regulations. Many of these behavioral shifts are due to survival instincts that people have naturally. These natural instincts are what make it possible for offspring to thrive, grow, and adapt in the real world. The study will also show the positive impacts these parenting behaviors have on the child and parent. Many parenting behaviors are known to influence and shape the child's characteristics. These behaviors may arise due to biological factors such as hormones. Particular hormones include oxytocin, estrogen, progesterone, prolactin, testosterone, and vasopressin. The areas of the brain that undergo these changes include the hypothalamus, amygdala, prefrontal cortex, and the nucleus accumbens. These regions of the brain are highly active in maternal and paternal behaviors. The research will investigate the different parenting styles that occur because of these biological influences.



# Student Research Symposium

## The Physiological Process of Emotions and Trauma

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Faculty Sponsor: Dr. Nicha Otero

Field of Research: Psychology

This paper is a systematic review of previous research that aims to explore the physiological processes involved in the experience of emotions and stressful or traumatic events, which can lead to long-lasting responses to our environment. Physiological processes, regarding trauma and emotions, are a complex. Trauma and emotions may be either temporary or chronic and trigger different parts of the nervous system, including the autonomic nervous system (both the sympathetic and parasympathetic divisions), limbic system, and hypothalamic-pituitary-adrenal (HPA) axis. The body's physiological responses to stress, also known as emotions and trauma, influence the long-term outcomes for itself. Dysregulation between stress responses may cause other mental health issues as well, such as affect cardiovascular health, the immune system, emotional responses, memory, regulation, and the overall well-being of a person. Furthermore, understanding the intricacies of the different systems involved within stress responses may also help further the research and progress for the treatment of individuals with post-traumatic stress disorder.



# Student Research Symposium

## Generational and Historical Trauma Affecting Native Americans

Presented by: Madison Cossey

Faculty Sponsor: Dr. Nicha Otero

Field of Research: Psychology

To what extent does the enduring legacy of generational and historical trauma significantly shape the contemporary well-being, mental health, and cultural resilience of Native American communities today? Native Americans continue to experience the detrimental impacts of generational and historical trauma, as evidenced by persistent mental health disparities, social challenges, and cultural disruptions within their communities. This project is a quantitative and qualitative research design that used Google Forms as a survey tool and interviews for a more in-depth perception. The survey and interviews were conducted virtually and in-person with anyone willing to participate. Findings indicate that Native American individuals and communities are indeed impacted by the lingering effects of generational and historical trauma. This underscores the significant impact of generational and historical trauma on Native American communities. The data highlights the enduring influence of historical events on the well-being and experience of Native individuals. Recognizing and understanding these challenges is crucial for developing targeted interventions and support systems that address the unique needs arising from the complex interplay of generational and historical trauma within Native American communities. The data advocates for proactive measures to disrupt the continued perpetuation of trauma and to promote healing and resilience among Native communities.



# Library 209 Presentations in English & Literature

Noon Isabella Serrano

12:30 Rebecca Morrison

1:00 Tatum Leary

1:30 Gabbie Stokes



# Student Research Symposium

## Escaping Blood: The Intersection of Race and Gender Identity in Brit Bennett's Novel "The Vanishing Half"

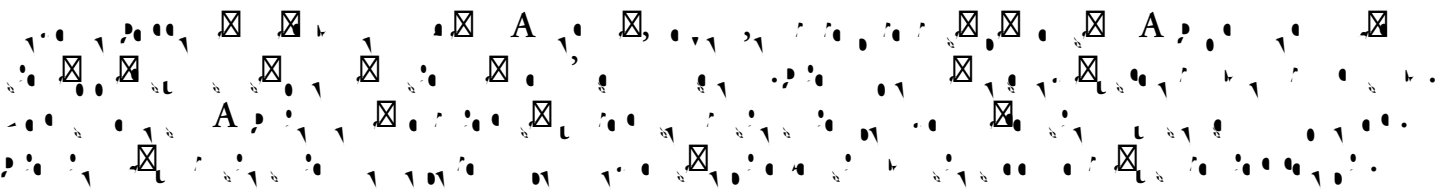
Presented by: Isabella Serrano

Faculty Sponsor: Dr. Lindsay Lawrence

Field of Research: English

In "The Vanishing Half" (2020), Brit Bennett explores how different dimensions of identity intersect, specifically the intersection of race and gender. Bennett positioned her novel during the second half of the twentieth century to reflect the overlapping strands of racism and sexism faced by her dual protagonists Desiree and Stella. "The Vanishing Half" is a part of a long history of narratives exploring how racial passing as white alters a character's identity beyond just their race, in particular the passing of whiteness alters a woman's experiences in sexism. Racial passing is when a person classified as a member of a racial group is accepted or perceived as another. Bennett reimagines the well-worn elements of racial passing literature through one of her protagonists Stella Vignes is a light-skinned black woman who passes as white, whereas her identical twin Desiree stays true to her roots and remains a black woman. Desiree and Stella serve as the perfect foil to one another, although their womanhood is uniting, the white privileges granted to Stella and not to Desiree create a divide.

Drawing primarily from the work of Kimberlé Crenshaw's intersectionality theory, along with Simone De Beauvoir and bell hooks, Crenshaw's term "intersectionality" (1989) suggests that the experience of black women is double discrimination of racism and sexism. Therefore, to only contemplate the experience of Desiree and Stella's female identity as molding their daily experience would be a misdiagnosis, because the sexist discrimination Desiree and Stella face is heavily influenced by their racial identity as black and white women. Desiree's discrimination as a female is compounded by her race, while Stella only considers her womanhood as causing her unjust treatment rather than how her passing as white contributes to her sexist inequality. I argue that in Bennett's novel "The Vanishing Half," Desiree and Stella's diverse experiences exemplify that sexism is not monolithic, but heavily impacted by other points of advantages and disadvantages in their identity, primarily their race.





## “The pen has been in their hands”: The Preservation of Female Autonomy in Austen’s “Persuasion”

Presented by: Rebecca Morrison

Faculty Sponsor: Dr. Lindsay Lawrence

Field of Research: English

Jane Austen’s 1811 novel “Persuasion” satirizes nineteenth century society’s perceptions of gender. The protagonist, Anne, is believed to have missed her opportunity to find security and fulfillment through marriage. Eventually, she finds love with a man who completely respects and admires her, despite Anne being in her late twenties – an incredibly progressive narrative choice for the time. Many scholars, including Warhol and Morrison, have previously analyzed Anne’s portrayal and gender in “Persuasion,” but my focus is on how Austen uses the confines of a socially-acceptable heterosexual relationship to demonstrate the potential for equality within marriage. Utilizing works of feminist theory by Butler and de Beauvoir, as well as articles from scholars such as Warhol and Brown, I suggest that Austen’s masterful depiction of a relationship in which female autonomy is prioritized is invaluable to those within a patriarchal society. My stance is staunchly in opposition to critics who have condemned Austen’s work as anti-feminist. I argue through the use of essentialist and constructionist theory that Austen, while still upholding certain traditional beliefs, helps argue for improved conditions for women within the parameters of a socially acceptable marriage by crafting a successful, nonconforming relationship in her novel “Persuasion.”

## Weaponizing Femininity and Romance: Gender as a Performance and Compulsory Heterosexuality in The Hunger Games Trilogy

Presented by: Tatum Leary

Faculty Sponsor: Dr. Laura Witherington

Field of Research: English/Literature

Suzanne Collins's *The Hunger Games Trilogy* swept the nation when the first novel was released in 2008 and again when the first of four films was released in 2012. This series features Katniss Everdeen as she fights her way through the death match of "*The Hunger Games*," the rough political climate of "*Catching Fire*," and the warfare of "*Mockingjay*." I argue Katniss weaponizes femininity and heterosexuality through performing aspects of gender to survive and then overthrow an oppressive government. Specifically, I address the evolution of her performance across the trilogy. Katniss moves from a dainty, little lovesick girl in "*The Hunger Games*," to a woman preparing for her wedding and being a mother in "*Catching Fire*," and finally to the face of the rebellion in "*Mockingjay*."

Abstract: This research paper explores the ways in which Katniss Everdeen weaponizes femininity and heterosexuality to survive and overthrow the oppressive government in Suzanne Collins's *The Hunger Games Trilogy*. The paper examines the evolution of her performance across the trilogy, from a dainty, little lovesick girl in *The Hunger Games*, to a woman preparing for her wedding and being a mother in *Catching Fire*, and finally to the face of the rebellion in *Mockingjay*.

## “Pride and Prejudice and Zombies”: The Unmentionable Parody Adaptation

Presented by: Gabbie Stokes

Faculty Sponsor: Dr. Cammie Sublette

Field of Research: English

Reviews of “Pride and Prejudice and Zombies” are mixed; while many in the academic world and those who are faithful fans of Jane Austen approach this adaptation with disdain, there exists another group of Austen fans who appreciate and look forward to any media that alludes to or draws inspiration from Austen’s world. Austen’s divided fanbase does not have much overlap with the zombie crazed fans of the apocalypse, so the ability for “Pride and Prejudice and Zombies” to draw from all three groups shows the breadth of appeal that this adaptation has on fanbases and devotees. Drawing from Henry Jenkins’ work on convergence culture and scholarly analyses of the responses of fans of Jane Austen to “Pride and Prejudice and Zombies,” this paper will discuss the intersection of convergence culture and fandom in the discourse surrounding the 2009 novel adaptation “Pride and Prejudice and Zombies” as well as its subsequent film adaptation in relation to the fidelity that the adaptations pay to the original text.



# Health Science 121 Presentations in Accounting & Public Transportation

Noon Noah Ottman

12:30 Joy Wootton

1:00 Dalton Oxford



# Student Research Symposium

## The Current State of Corporate Social Responsibility

Presented by: Noah Ottman

Faculty Sponsor: Dr. Randall Stone

Field of Research: Accounting

This scholarly investigation analyzes the contemporary landscape of Corporate Social Responsibility (CSR), a concept that obligates enterprises to uphold a heightened level of accountability transcending governmental mandates. CSR posits businesses not merely as entities functioning within society but as integral components thereof. Given the disparate regulatory frameworks established by diverse organizations and governmental bodies pertaining to CSR, this investigation endeavors to dissect the manner in which distinct industries and nations navigate and adhere to CSR principles. This study undertakes a comparative analysis of CSR models to furnish a more nuanced understanding of the concept and its ramifications. Moreover, this inquiry adopts a holistic perspective by examining CSR through the lens of both the stakeholder and corporate entities, with a particular focus on Tesla, Inc.'s impact on stakeholders and the perspectives and implementation of CSR by financial analysts and accountants. The conclusions drawn from this investigation underscore the exigency for further systematic inquiry into the subject matter, thereby advocating enhanced scholarly attention to the concept of CSR.

# Student Research Symposium

## Accounting for Cryptocurrency by GAAP Standards





# Health Science 124 Presentations in History, Political Science, & Costume Design

Noon Korina Lopez

12:30 Mitchell Collins

1:00 Gavin Garrett





# Student Research Symposium

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Civil War Prison Camps  
Presented by: Korina Lopez



# Student Research Symposium

## The Rise of Political and Social Distrust, Division, and Disenfranchisement in Modern Institutions

Presented by: Mitchell Collins



# Student Research Symposium

## Cut, Curate, Costuming: A Costume Designer's Process

Presented by: Gavin Garrett

Faculty Sponsor: Dr. Elizabeth Momand

Field of Research: Costume Design

For centuries the costumes of theatrical productions have evolved from the simplicity of the Ancient Greek and Roman style to the exaggerated fashion of the Renaissance to the realistic style of contemporary and modern theatre. With the director's vision, the goal of a costume designer is to accurately portray the actor as their character in the correct time-period and within the given circumstances of the text. When costuming a show, a designer can take one of two routes: curating or crafting. Crafting consists of designing patterns, choosing fabrics, and completing the construction of every garment, while curating is like a game of search and rescue for the perfect pieces.

My process as the costume designer for the UAFS Music and Theatre production of "9 to 5: The Musical" has been one of curation. Following my director's vision, I have had to curate this show by searching through our costume shop, thrifting pieces that fit into the 1970s style, as well as pieces that support the fantasy section of the musical. With a cast of 22 people and each person having more than one costume, this task has proven to be a challenging, yet rewarding experience.



# Health Science 133 Presentations in Chemistry, Biochemistry, & Latino Studies

Noon Khuong (Peter) Ta

12:30 Lyndsie Hicks

1:00 Marlene Toledo

1:30 Daniela Morales Hernandez





# Student Research Symposium

## Investigating the Interaction of Human Serum Albumin with Organochlorine Pesticides: A Case of Dynamic vs Static Quenching

Presented by: Lyndsie Hicks (co-researcher Luke Jodoin)

Faculty Sponsors: Dr. Rahul Yadav and Dr. Archana Mishra

Field of Research: Biochemistry



## La educación de hogar como fuerza sin fronteras / Homeschooling as a Force Without Borders

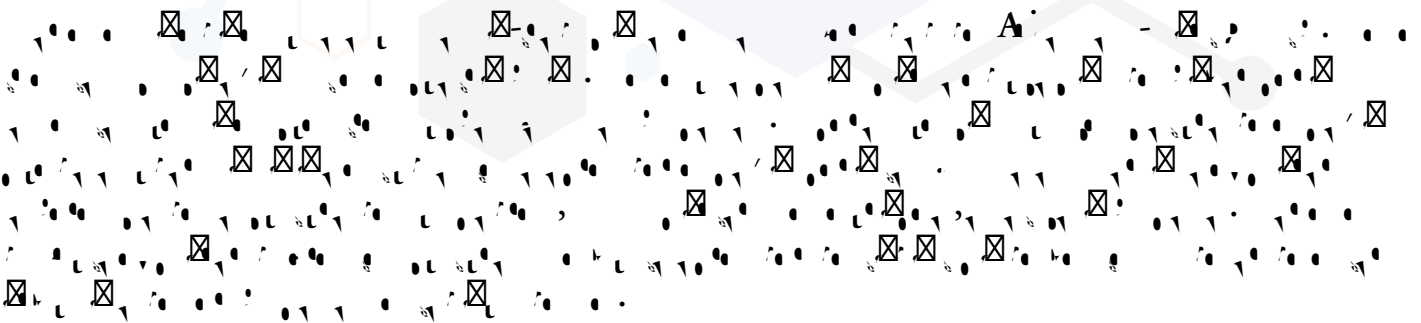
Presented by: Marlene Toledo

Faculty Sponsor: Dr. Mary Sobhani

Field of Research: Latino Studies

Las familias hispanas en Estados Unidos, particularmente inmigrantes recién llegados, tienen el derecho de saber de sus opciones para la educación y crianza de sus hijos. Estar bien informados capacita a la familia a tomar el mejor rumbo de aprendizaje para las necesidades de esa familia. A pesar de que hay un crecimiento de familias eligiendo la educación en hogar -- ya que permite moldear un plan de estudio que de otra forma no reciben en las escuelas públicas -- existe una falta de familias hispanas en las comunidades de educación de hogar. Este trabajo de investigación argumenta que esto se debe en gran parte a la falta de información y recursos para esta población hispano-hablante. La educación en hogar fortalece los lazos entre la relación de padres e hijos lo cual puede contribuir positivamente a la sociedad y promover el bienestar y desarrollo económico de nuestras comunidades.

Hispanic families in the United States, particularly immigrant families who have just arrived to this nation, have the right to know all their options for the education and upbringing of their children. Possessing information on educational options equips each family to decide the best path of learning for its needs. Although there is an increase in the number of families choosing homeschooling -- it allows parents to customize a curriculum that their children might not otherwise receive in public schools -- there is a lack of Hispanic families in homeschool communities. This study argues that this is due in part to the lack of information and resources available for this population. Homeschool education strengthens ties between parents and children which can contribute positively to society and promote well-being and economic development in our communities.









## Molecular Dynamics Study of Organochlorine Ligand Interaction with Human Serum Albumin

Presented by: Sully Sanford

Faculty Sponsor: Dr. Archana Mishra

Field of Research: Chemistry

Table 1

This study is aimed to understand the binding properties between organochlorine pesticides and the most abundant serum albumin, human serum albumin (HSA). HSA is a carrier/reservoir for various endogenous biomolecules such as steroids, fatty acids, bilirubin, and vitamins. HSA can also readily bind to many small molecules circulating in the blood, affecting the pharmacokinetics/ADME of these molecules. HSA is a 66 kDa monomeric, multidomain (domains I, II, and III) protein characterized by two main ligand binding sites, Sudlow I and II.

Here, we have determined the molecular interaction of an organochlorine class of herbicide and insecticide, quinclorac (QUC) and 4,4 dichlorodiphenyldichloroethane (4,4-DDD), with HSA using molecular docking and simulation. These organochlorines have high toxicity (low LD50) and long half-life and can remain in soil, water, and organisms for an extended time. Here, we study the binding of these two pesticides with HSA at Sudlow I based on the experimental findings using fluorescence. These pesticides were also chosen because of their di-ortho ring molecular properties.

Molecular docking was first performed to determine the pesticide's binding affinity for the ligand-binding site, Sudlow I (with 1ep1n in s1oc) sD), with Schrödinger Maestro. Further, molecular dynamics simulations (MD) of HSA with and without pesticide in the binding pocket were performed using GROMACS and CHARMM force fields. Results obtained from the docking and MD simulation study show the structural characteristics of two molecularly different pesticides that interact with the Sudlow-I binding site of HSA.

## Investigating Galectin Glycoprotein Interaction with Sialoglycans and Nanoparticles

Presented by: Luke Jodoin (co-researcher Lyndsie Hicks)

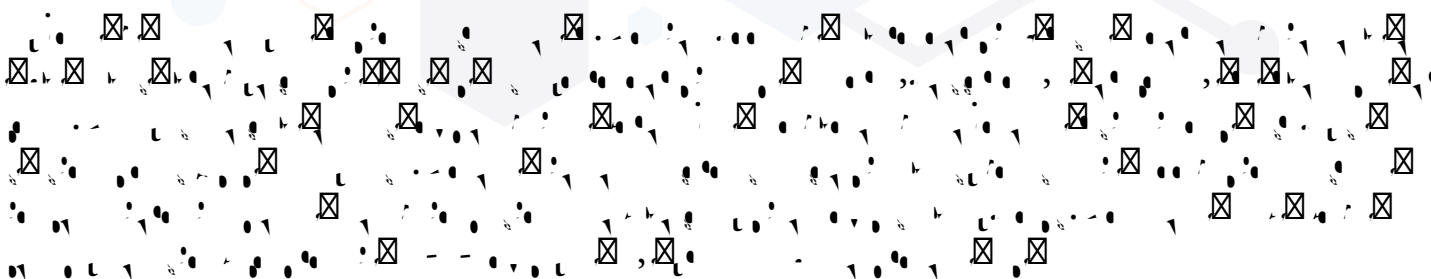
Faculty Sponsors: Dr. Rahul Yadav and Dr. Archan Mishra

Field of Research: Biochemistry

Table 2

Mammalian cells carry various surface glycoproteins important for regulating cellular processes such as inter/intracellular signaling, cytoskeletal remodeling, cell-cell recognition, and adhesion. Galectins are one such class of lectin glycoproteins that bind to surface glycan, to which sialic acid is often a terminal glycan (sialoglycan). Lectins, including galectins, can recognize and bind various cis-/trans-sialoglycans to activate/inhibit signaling pathways. Studies have shown altered glycosylation in tumor cells compared to normal cells, which could be utilized to detect cancer-specific glycans and early detection of tumor progression. This study aims to determine (1) glycan recognition and selective binding to lectins (galectin and bacterial lectin) and (2) Make a lectin and nanoparticle probe for selective recognition of glycans.

In the first aim, we have utilized Schrodinger induced fit docking to study the selective binding of lectins with various sialic acid glycans (N-acetylneuraminic acid, N-glycolylneuraminic acid, N-acetylneuraminic acid- $\alpha$ (2,3)-galactose, N-acetylneuraminic acid- $\alpha$ (2,6)-galactose, N-acetylneuraminic acid- $\alpha$ (2,6)-N-acetylgalactosamine, and N-acetylneuraminic acid- $\alpha$ (2,8)-N-acetylneuraminic acid). In aim two, we have determined the absorption of human galectin-3 and bacterial lectin onto bare (20 nm) and serum-coated gold nanoparticles using the surface plasmon resonance phenomenon. The results show a red shift in the SPR signal of gold nanoparticles, indicating protein adsorption to both bare and serum-coated nanoparticles. In conclusion, our initial results show that lectin-nanoparticle probes can be developed as a probe to detect specific sialoglycans.



## Phylogenetic Analysis and Molecular Adaptation Events in Whales and Dolphins

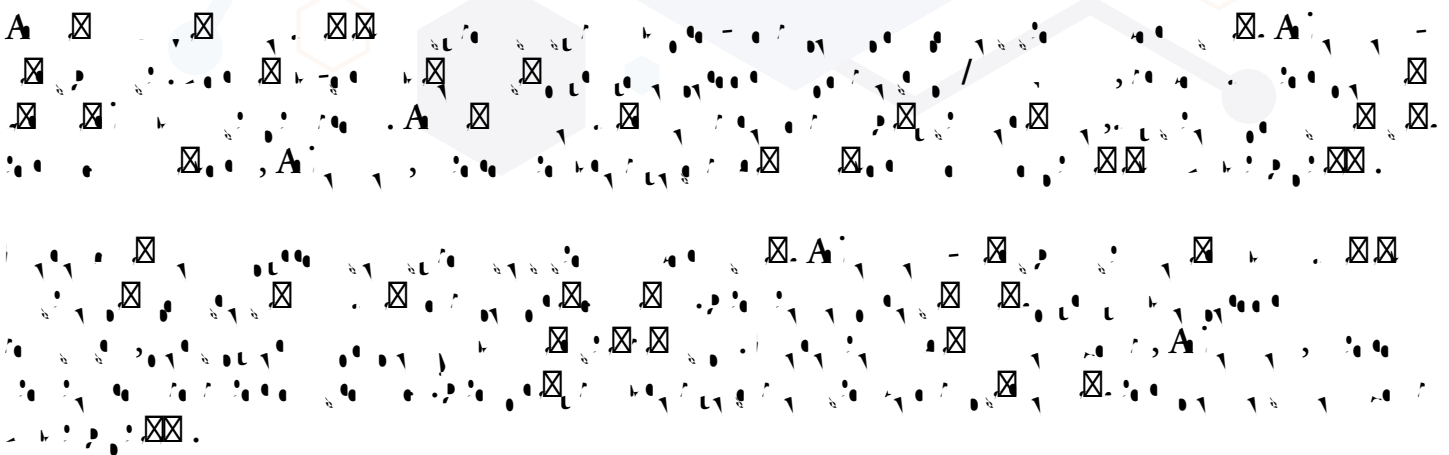
Presented by: Armonii Dixon and Kiara Thomas

Faculty Sponsor: Dr. David McClellan

Field of Research: Evolutionary Biology

Table 3

This poster presentation showcases the comprehensive methodology employed to investigate the evolutionary dynamics within whales and dolphins through molecular analysis of the cytochrome oxidase subunit 1 (COI) and cytochrome b (cyt-b) full protein-coding mitochondrial gene sequences. The study involved assembling a robust dataset from the GenBank database (<https://www.ncbi.nlm.nih.gov/genbank/>), utilizing the Molecular Evolutionary Genetics Analysis (MEGA) software version 11 (Stecher, Tamura, and Kumar, 2020). Sequences were aligned using the Clustal W algorithm (Larkin et al., 2007) within MEGA to ensure accuracy, consistency, and homology. Phylogenetic reconstruction was performed using MEGA with the Maximum Likelihood optimality criterion, enabling the elucidation of evolutionary relationships among the diverse species of whales and dolphins. This approach provides insights into the genetic divergence and evolutionary history of the COI and cyt-b gene sequences. Furthermore, the resulting phylogenetic tree structure served as a foundation for estimating the timing of molecular adaptation events in COI and cyt-b since the divergence of cetaceans from the other Cetartiodactyla. The TreeSAAP software package (Woolley et al., 2003) facilitated this analysis, allowing for the identification and characterization of adaptive changes in the protein-coding regions of these genes. Through this interdisciplinary approach combining bioinformatics tools and evolutionary genetics principles, our study contributes to a deeper understanding of the evolutionary processes shaping the genetic diversity and adaptation in current marine mammal populations.



# Student Research Symposium

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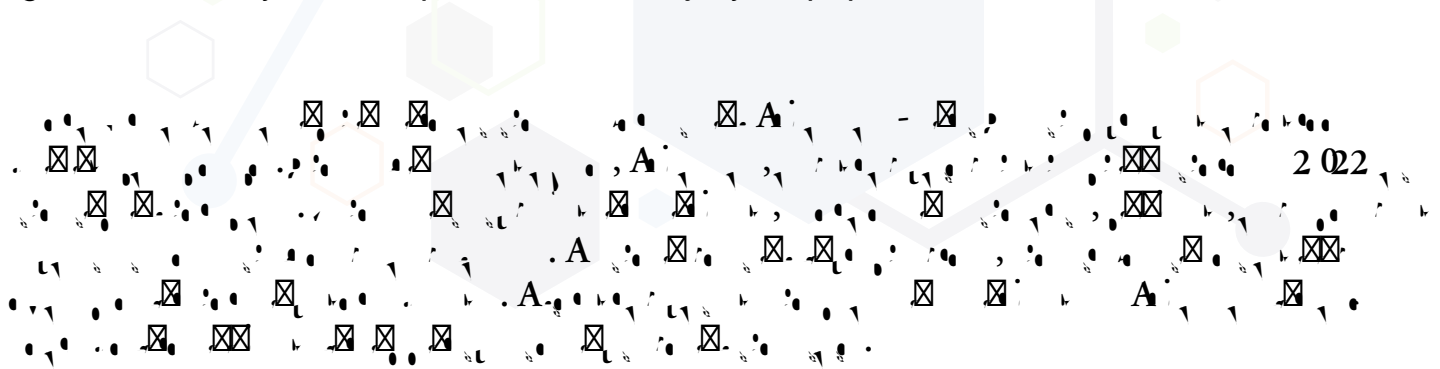
Presented by: Ciera Grijalva

Faculty Sponsor: Dr. David McClellan

Field of Research: Evolutionary Biology

Table 4

This poster presentation presents a methodical exploration of the evolutionary dynamics within jellyfish (Phylum Cnidaria), focusing on the molecular analysis of cytochrome oxidase subunit 1 (COI) and cytochrome b (cyt-b) full protein-coding mitochondrial gene sequences. The study involved the meticulous compilation of an appropriate dataset sourced from the GenBank database (<https://www.ncbi.nlm.nih.gov/genbank/>), facilitated by the utilization of Molecular Evolutionary Genetics Analysis (MEGA) software version 11 (Stecher, Tamura, and Kumar, 2020). Sequences were meticulously aligned using the Clustal W algorithm (Larkin et al., 2007) within MEGA to accurately ensure homology. Phylogenetic reconstruction was carried out employing the Maximum Likelihood optimality criterion within MEGA, thereby unveiling the intricate evolutionary relationships among selected jellyfish species. This approach offers valuable insights into the genetic differentiation and evolutionary trajectories within this enigmatic marine taxon. Furthermore, the resulting phylogenetic framework served as a cornerstone for estimating the temporal occurrence of molecular adaptation events in COI and cyt-b. Leveraging the capabilities of the TreeSAAP software package (Woolley, 2003), our analysis unveiled significant adaptive changes within the protein-coding regions of the genes. Through combining advanced bioinformatics tools with fundamental principles of evolutionary genetics, this interdisciplinary investigation sheds light on the evolutionary mechanisms governing genetic diversity and adaptation in extant jellyfish populations.



# Student Research Symposium

## Exploring Evolutionary Dynamics in Old-World Mice and Rats: A Molecular Analysis of COI and cyt-b Gene Sequences

Presented by: Laney Wagner

Faculty Sponsor: Dr. David McClellan





## Land-use and Diffuse Pollution: A Look at Jack Nolan Lake in Greenwood, Arkansas

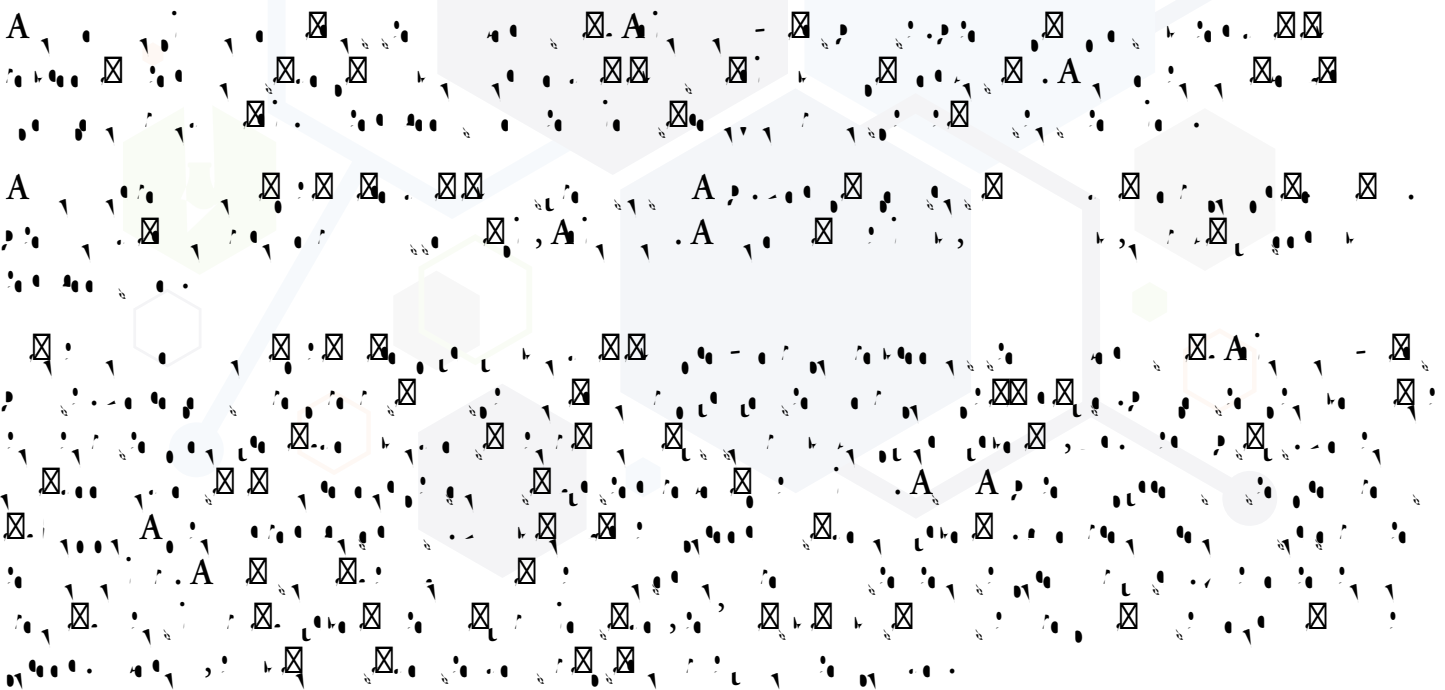
Presented by: Analise Black, Anna Carden, and Noah Tawney

Faculty Sponsor: James Brandli

Field of Research: Biology

Table 7

With increased population comes increased infrastructure such as industry, agriculture, and residential dwellings. Each of these land-use activities have the potential to make pollution worse including pollution caused by land-use due to runoff. It is understood that land-use directly impacts water quality in some way. This study aims to understand the impacts of land-use on Jack Nolan Lake in Greenwood, Arkansas and to improve the decision-making associated with land-use. During this project, water samples will be taken and analyzed for Phosphate, Nitrate, COD, Turbidity, herbicide, E. Coli, coliforms, and PH levels at different depths. The information gained through this study will be used to help develop in the future a forecasting AI to predict land-use runoff from bodies of water.





## Exploring Genetic and Environmental Factors that Control Differentiation of Pseudoplasmodium in Dictyostelium discoideum

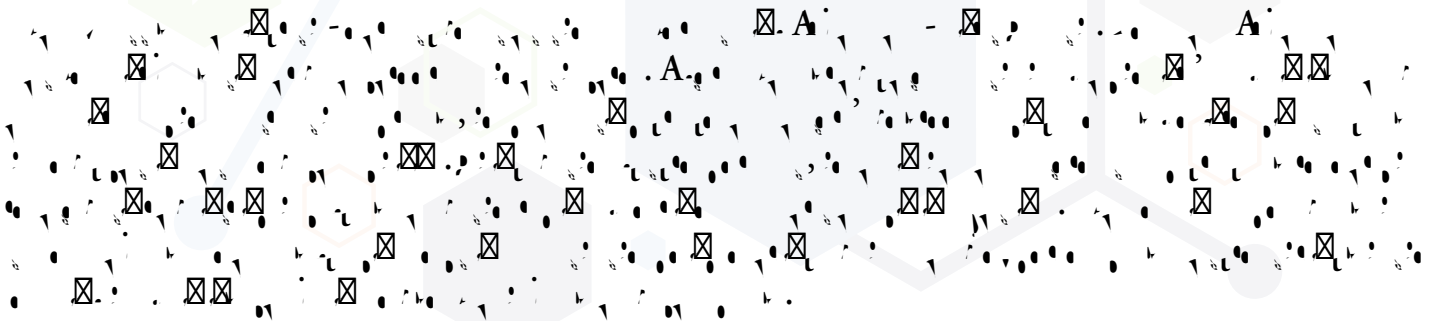
Presented by: Evan Wittig

Faculty Sponsor: Dr. Sandhya Baviskar

Field of Research: Cell and Developmental Biology

Table 8

One of the multicellular stages during Dictyostelium development life cycle is the pseudoplasmodium stage, also known as the slug stage, which is formed at 14 to 16 hours of development. A slug is a 1-2 mm long tubular structure consisting of differentiated cells. A slug looks relatively undifferentiated but contains several cell types such as anterior pre-stalk cells, posterior pre-spore cells, and in the posterior region, anterior-like cells. We conducted experiments to explore if slug cells can undergo differentiation and found that differentiated cells of slug in the presence of food source, either bacteria or nutrient medium, undergo differentiation but not in presence of non-nutrient medium like phosphate development buffer. These findings have prompted us to explore the expression of developmentally regulated genes and role of environment factors in differentiation of slug cells. Using RT-PCR technique, the expression of two developmentally regulated genes: *ecmA* and *pspA* will be studied in differentiated cells because their expressions are required to form a slug. We will explore if there is any relation between expression of developmentally regulated genes and environmental factors such as light, temperature and humidity.



## Distribution of Detrital Sediment Captured in McKay Bay Member Knoll Reef, Upper Peninsula, Michigan

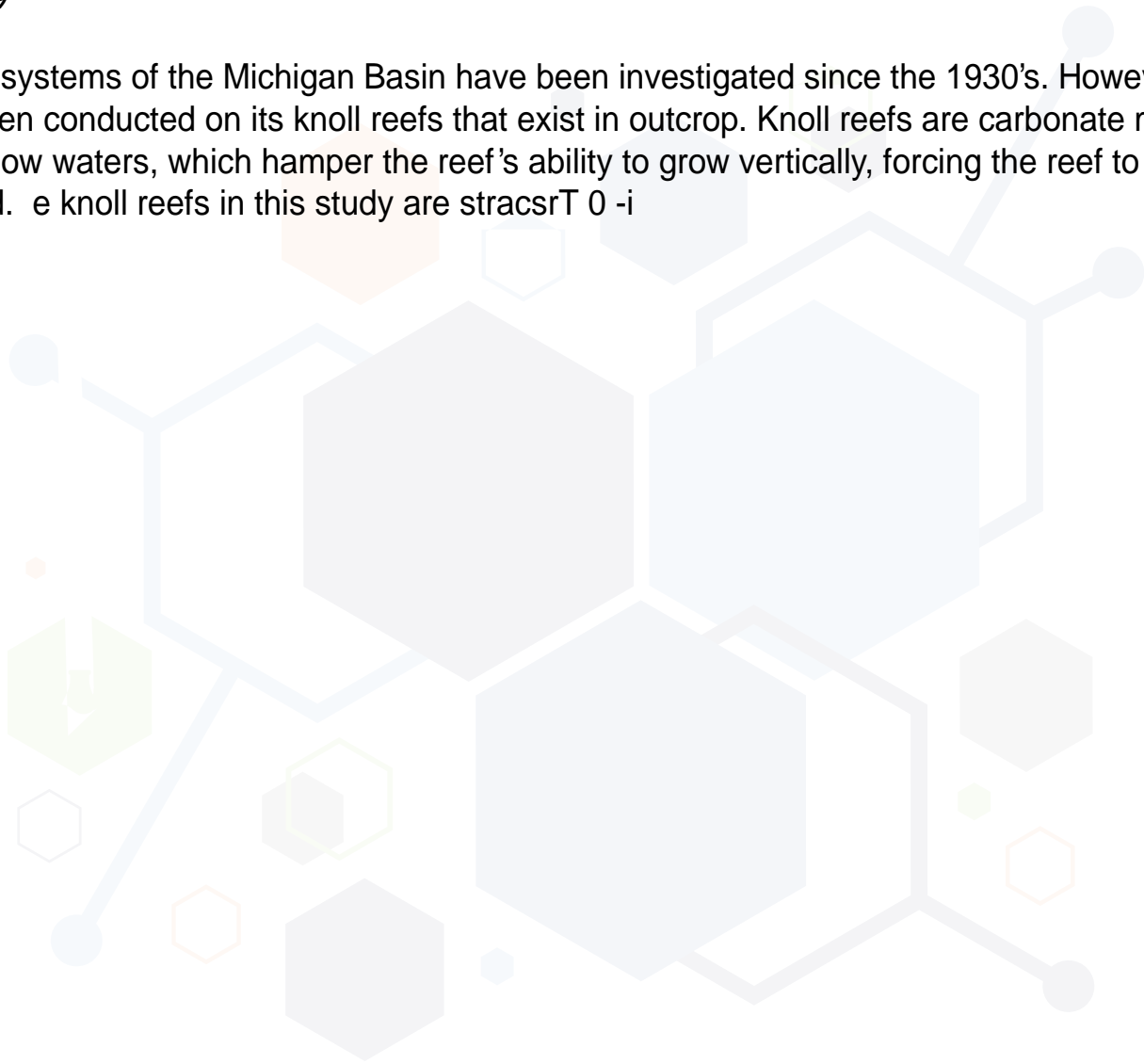
Presented by: Kaleb McLaughlin

Faculty Sponsor: Dr. Maurice Testa

Field of Research: Geoscience

Table 9

The reef systems of the Michigan Basin have been investigated since the 1930's. However, little research has been conducted on its knoll reefs that exist in outcrop. Knoll reefs are carbonate mounds that form in shallow waters, which hamper the reef's ability to grow vertically, forcing the reef to grow horizontally instead. The knoll reefs in this study are stracsrT 0 -i





## X-Ray Diffraction and Petrographic Analysis of Magnet Cove Carbonatite Core, Arkansas

Presented by: Emily Mero

Faculty Sponsors: Dr. Maurice Testa and Dr. Dave Mayo

Field of Research: Geoscience

Table 11

Geothermal activity such as hot springs are known to precipitate calcium carbonate ( $\text{CaCO}_3$ ) minerals producing rocks such as tufa, travertine and sometimes associated with carbonatite. The precipitation of  $\text{CaCO}_3$  is caused by the reduction of  $\text{CO}_2$ , which is less soluble in warmer waters. Geothermal heating of water in natural springs drives this precipitation of  $\text{CaCO}_3$  in areas of Arkansas including Magnet Cove. Magnet Cove, Arkansas is an alkalic igneous rock complex that is composed of a series of ring dikes of Mississippian in age. These dikes have intruded into faulted and folded Paleozoic sedimentary rocks. One of these igneous dikes is carbonatite, a rare carbonate-rich igneous rock. The formation of carbonatite remains unclear to this day. It may form from magmatic solutions, hydrothermal metasomatism, or a combination of both. If carbonatite is formed through hydrothermal metasomatism, then it is likely formed through repeated events of redeposition and recrystallization. On the other hand, if carbonatite is formed through magmatic means, then its parental magma must be some type of alkalic composition.

In this study, a carbonate-rich core sample was taken from Magnet Cove at the depth range of 10 feet to 55 feet below ground. Five samples were processed for analysis at every 10 feet. Petrographic and X-ray Diffraction (XRD) analysis was conducted on each sample to investigate the mineralogy and better understand the chemical alterations the area experienced.





# Student Research Symposium

## A Benchtop Model of Piezometers Used to Determine the Vertical Flow of Groundwater



## Pediatric Suicide Risk Associated with Social Media Use: A Literature Review

Presented by: Gracie Larru and Polly Hoang

Faculty Sponsors: Michele Elmore

Field of Research: Nursing

Table 14

Suicide is the second leading cause of death in children worldwide. The purpose of this study is to analyze previous studies on social media's effects over suicide. In addition, suggestions for preventing, combating this issue are mentioned throughout this paper. There was no specific method used to aid in search for previous research within this paper. Eleven studies were gathered, but only ten were used for analysis and suggestions. Studies were selected from various countries to gain an international perspective on social media and suicide. Social media mainly had an effect on the mental health of children, specifically on their risk for depression and anxiety which increases their risk for suicidal ideations. There were several commonly found themes such as dependency, desensitization, addiction, etc. Additionally, increased time on social media was found to increase the chances of suicide in the pediatric population. A major contributor to suicide is cyberbullying including various challenges associated with cyberbullying such as peer pressure and constant exposure. With that being said, there are several benefits to limited social media use such as a sense of community and belonging. Some suggestions from previous research conclude that education over social media use in family and healthcare providers is beneficial. Another suggestion that is not recommended in this paper is to screen social media posts through artificial intelligence (AI). This paper's recommendations based on previous research includes education, implementation of stricter guidelines, and user control over social media content. Further research could be done to examine the cause and effect on the relationship of social media on suicide and early digital footprint. Longitudinal studies can be conducted on more frequent basis based on previous research.

## Male-Oriented Recruiting, Job Satisfaction, and Retention Practices in Nursing

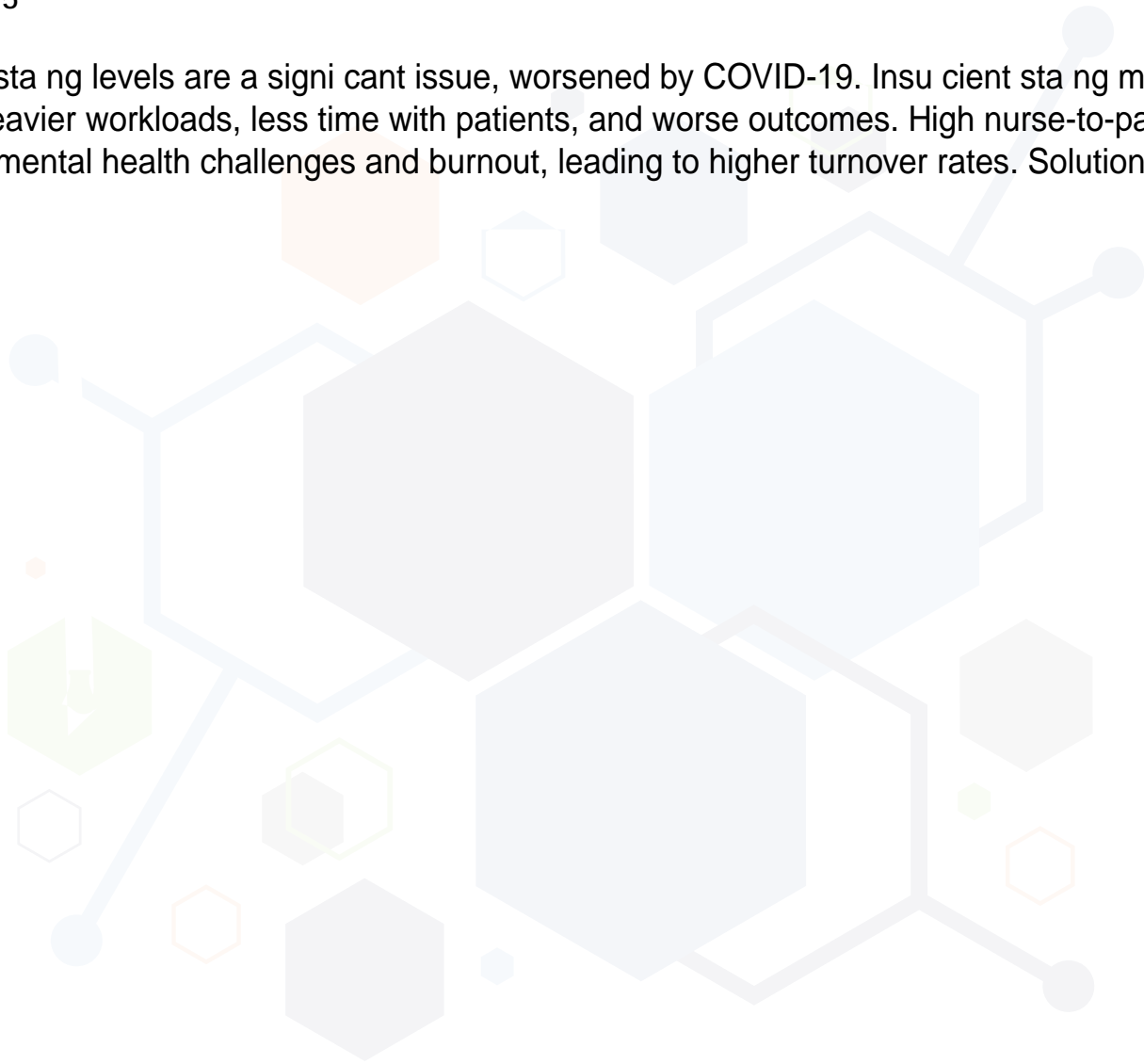
Presented by: Gerbert Floreschavez

Faculty Sponsors: Brooke Gray

Field of Research: Nursing

Table 15

Nurse staffing levels are a significant issue, worsened by COVID-19. Insufficient staffing means nurses face heavier workloads, less time with patients, and worse outcomes. High nurse-to-patient ratios can cause mental health challenges and burnout, leading to higher turnover rates. Solutions include revising





# Student Research Symposium

## The Evolution of Dental Radiology Safety

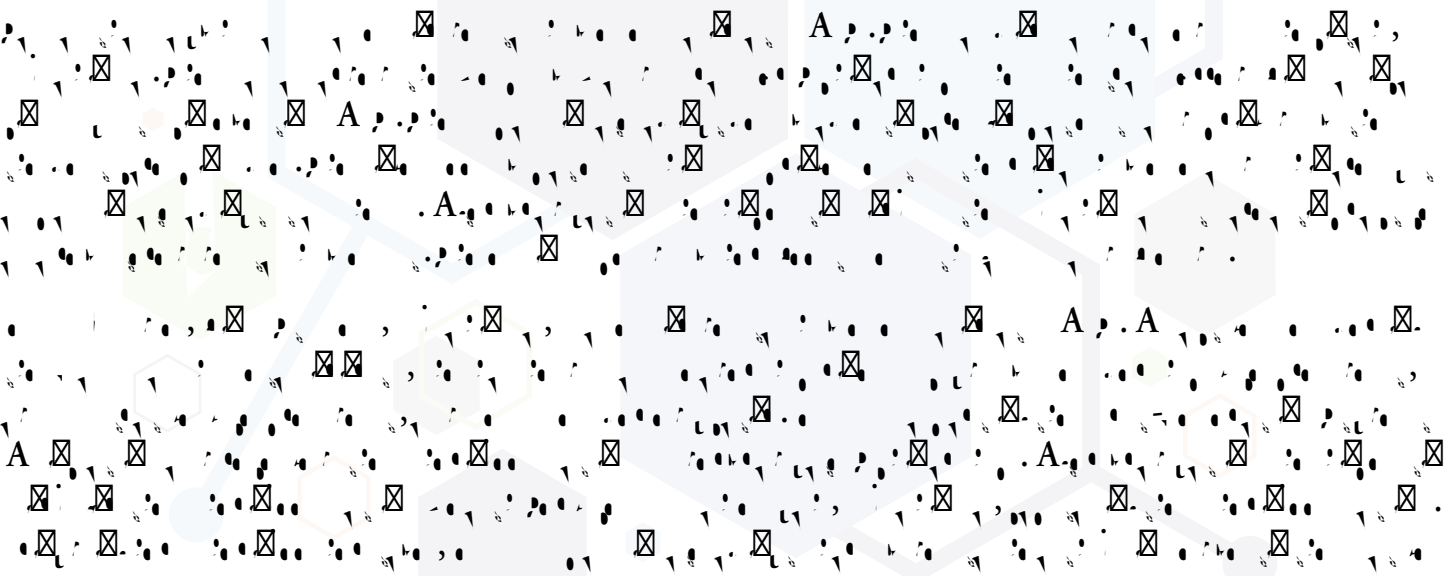
Presented by: Samantha Baughman, Jenny Kindle, and Parker Lemley

Faculty Sponsors: Roxy Reed

Field of Research: Dental Hygiene

Table 16

Since the discovery of the X-ray made by Wilhelm Roentgen in 1895 dental radiographs have undergone significant advancements. Dental radiographs are crucial in helping to diagnose and treat various dental conditions. Dental radiology safety has been a major topic of concern. The evolution of radiology safety is shown many different stages. During the beginning many did not understand the effects of radiation and did not use protection. With the help of updated technology, the amount of radiation a patient is exposed to can be reduced and safety measures have been placed to the patient as well as the clinician. Now the emission of radiation that is produced is said to be so low that certain protection such as a lead apron is no longer needed. This research paper will provide a comprehensive review of how dental radiographs have to be and their progression over time. As well as how safety measures have evolved with radiology practice.



# Student Research Symposium

## Look Out Flouride, There's a New Amino Acid in Town!

Presented by: Dulce Guterrez, Leslie Guerra, Amy Le, and Abigail Mussett

Faculty Sponsors: Roxy Reed

Field of Research: Dental Hygiene

Table 17

This paper aims to evaluate the efficacy of oral care products containing arginine, either alone or in combination with fluoride, in comparison to fluoride-only formulations with a focus on their ability to reduce the risk of dental caries. A comprehensive search was conducted across several databases for studies, trials, and reviews published in the last five years regarding the use of arginine. Studies investigating the impact of arginine-containing oral care products on caries prevention, either alone or in conjunction with fluoride, were included. This paper identified a range of studies assessing the effectiveness of arginine-containing products and fluoride-only formulations in reducing caries risk. While fluoride has long been established as a cornerstone in caries prevention, recent attention has turned to arginine and its potential role in fostering a neutral pH environment. The comparative effectiveness of products containing arginine and fluoride versus fluoride alone remains a subject of ongoing investigation. Preliminary findings suggest a potential synergy between arginine and fluoride in mitigating caries risk, with arginine contributing to an environment less conducive to acid-induced enamel demineralization. However, further well-designed clinical trials and long-term studies are needed to establish the comparative efficacy of these formulations. Dental professionals should consider individual variations, adherence to oral care practices, and the presence of other factors in providing personalized recommendations. This paper highlights the importance of ongoing research to inform evidence-based approaches in optimizing oral care regimens for caries prevention.



## Periodontal Tissue Regeneration

Presented by: Samantha Drain, Aracely Najera-Hernandez, Rudy Vasquez, and Gabriel Woody

Faculty Sponsors: Roxy Reed

Field of Research: Dental Hygiene

Table 18

Periodontal disease is a chronic condition that commonly affects the general population. It is a life-long condition and results in hard and soft tissue degradation over time if left uncontrolled. Among other things like oral jewelry, tissue trauma, and anatomical abnormalities, the loss of periodontal hard and soft tissues is a major dental concern that dental professionals moderate regarding oral health and aesthetic concerns for patients. This research analyzes and reviews different treatment options, concurrent and emerging, that aid the dental world in regenerating lost periodontal tissue.

# Student Research Symposium

Abstracts of student research presentations from the 2010 Student Research Symposium. The abstracts are organized by department and include the title of the presentation, the author's name, and a brief summary of the research. The abstracts cover a wide range of topics, including biology, chemistry, physics, and engineering.





# Student Research Symposium

## Instrumental Music and You

Presented by: James Estrada

Faculty Sponsor: Dr. Alexandra Zacharella

Field of Research: Music Education, Music Outreach, Community Music

Table 20

All too often, individuals that are not classically trained in music will view the world of instrumental music at an angle of what “should have” and “could have been” rather than at an angle of what could become. There are emphases that are placed on learning instruments at a young age; there are many terms in music that originate from several different languages; there are different systems of musical notation that each come with their own challenges for a new learner; there are high costs from owning and maintaining many of the single traditional classical instruments; there is a large amount of time and dedication required to acquire technical mastery in many traditional classical instruments; there is a misalignment in interests that appears between the genres of music associated with traditional classical instruments and the genres that appear in modern pop-culture. Many challenges come in the way of people that want to become classically trained musicians or want to engage with the world of instrumental music beginning in adult life. Unfortunately, these individuals sometimes never experience the pleasures of composing and performing with traditional classical instruments. This presentation will delve into the psychology and circumstances that cause the

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\* Denotes first-generation student