SYMPOSIUM SCHEDULE

April 2nd, 2025

Brad D. Smith Center for Business and Innovation, Encova Auditorium.....2:15pm - 2:30pm

Opening statement by **Dr. Philippe T. Georgel**, Director of the Office of Student Research

Welcome from **Marshall University President Brad Smith**

Brad D. Smith Center for Business and Innovation, Encova Auditorium.....2:30pm - 3:30pm

Keynote presentation: *"How Does the Social Environment Talk to Your Genes?"*

Dr. Moshe Szyf (recently retired from McGill University): Founding co-director of the Sackler Institute for Epigenetics and Psychobiology at McGill University, Fellow of the Canadian Institute for Advanced Research Experience-based Brain and Biological Development program Fellow of the Royal Society of Canada, and the Canadian Academy of Health Science, Founder of the first "Pharma" to develop epigenetic pharmacology "Methylgene Inc." and the first journal in epigenetics "Epigenetics", Founder and CEO of HKG epiTherapeutics and founder of HKG Epitherapeutics Ltd.).

Brad D. Smith Center for Business and Innovation, Encova Auditorium..... 3:30pm – 4:00pm

Questions and forum discussion

Brad D. Smith Center for Business and Innovation, Lobby and room 113 .....2:30pm - 3:30pm

Reception and social gathering

April 3rd, 2025

Welcome: Memorial Student Center, Don Morris Room.....8:30am – 8:45am

Welcome from **Marshall University Provost Avinandan Mukherjee**

Poster Sessions: Memorial Student Center .....8:45am - 4:20pm

Undergraduate Students Oral Presentations and Performances

Session 1-A: Drinko Library, Atrium (3rd Floor) ..... 8:45am - 9:30am

1. A Musical Miscellany: Performances of Rossini, Britten, Poulenc, and Donizetti
   College of Arts and Media .....Undergraduate UGO-04
   Presenter: Rachelle Snyder, snyder250@marshall.edu ..... Oral Presentation
2. Un Oiseau rebelle, François Borne's Fantaisie brillante on Bizet's opera Carmen for flute and piano
   College of Arts and Media, College of Engineering and Computer Sciences .....Undergraduate UGO-08
   Presenter: Mitchell Proper, proper3@marshall.edu ..... Oral Presentation

Session 1-B: Memorial Student Center, 2W-16B (2nd Floor)..... 8:45am - 9:30am

1. Depictions of U.S. Interventions in Panama's Foundation through Newspapers
   College of Liberal Arts..... Undergraduate UGO-11
   Presenter: Olivia Andrew-Vaughan, andrewvaugha@marshall.edu ..... Oral Presentation
2. Digital Bridge Trolls: Associations of narcissism, benign and malicious envy, and antisocial online behaviors
   College of Liberal Arts..... Undergraduate UGO-12
   Presenter: Mars Brown, brownbri@marshall.edu..... Oral Presentation

Session 1-C: Memorial Student Center, John Spotts Room (2nd Floor)..... 8:45am - 9:30am

1. Predictors of Recovery Treatment Effectiveness in Appalachia
   College of Liberal Arts.....Undergraduate UGO-20
   Presenter: Kara B. Marsingill, marsingill1@marshall.edu..... Virtual Oral Presentation
2. LLMs and Literature: Novel Approaches to Literary Engagement with Artificial Intelligence
   College of Liberal Arts.....Undergraduate UGO-21
   Presenter: Brandi Taylor, taylor1120@marshall.edu ..... Virtual Oral Presentation

Session 2-A: Drinko Library, Atrium (3rd Floor) ..... 9:45am - 10:30am

1. Sound Design for Sylvia
   College of Arts and Media .....Undergraduate UGO-02
   Presenter: Landon Mefford, mefford4@marshall.edu ..... Oral Presentation
2. Costuming Sylvia: The Art of Dressing a Dog in a 1960s Sitcom World
   College of Arts and Media .....Undergraduate UGO-03
   Presenter: Kristen Scites, scites25@marshall.edu..... Oral Presentation
3. Liminal Spaces
   College of Arts and Media .....Undergraduate UGO-07
   Presenter: Leah Teasdale, teasdale1@marshall.edu..... Oral Presentation

Session 2-B: Memorial Student Center, 2W-16B (2nd Floor)..... 9:45am - 10:30am

1. Pay Attention to Me: How Hitchcock's Rear Window Defies Classical History to Please His Audience
   College of Liberal Arts..... Undergraduate UGO-13
   Presenter: Amanda (Gracie) Bumgarner, bumgarner39@marshall.edu ..... Oral Presentation
2. How cats help with mental health
   College of Liberal Arts..... Undergraduate UGO-14
   Presenter: Dakota Dix, dix8@marshall.edu ..... Oral Presentation

Session 3-A: Drinko Library, Atrium (3rd Floor) ..... 10:45am - 11:30am

1. Fluid Impressions: Exploring Expression Through Multimedia Artwork
   College of Arts and Media .....Undergraduate UGO-01
   Presenter: Isa McMullen, mcmullen21@marshall.edu..... Oral Presentation
2. What do you like to eat?
   College of Arts and Media, College of Liberal Arts .....Undergraduate UGO-09
   Presenter: Ryann Province, province1@marshall.edu ..... Oral Presentation

3. Exploring Relationship Dynamics of Characters Through an Animated Short
   College of Arts and Media ..... Undergraduate UGO-19
   Presenter: Nickie Adkins, adkins1598@marshall.edu ..... Virtual Oral Presentation

Session 3-B: Memorial Student Center, 2W-16B (2nd Floor)..... 10:45am - 11:30am

1. Barriers to Mental Health Service Utilization in Appalachia
   College of Liberal Arts..... Undergraduate UGO-15
   Presenter: Skylar Elliott, elliott172@marshall.edu ..... Oral Presentation
2. What activities predict sense of belonging relating to mental health among college students?
   College of Liberal Arts..... Undergraduate UGO-16
   Presenter: Anna Lantz, lantz30@marshall.edu ..... Oral Presentation
3. Financial difficulties, student-faculty relationships, and their links to sense of belonging in college
   College of Liberal Arts..... Undergraduate UGO-17
   Presenter: Sydney Wiles, wiles22@marshall.edu ..... Oral Presentation

Session 4-A: Drinko Library, Atrium (3rd Floor) ..... 11:30am - 12:00pm

1. The Ethics of Integrating Artificial Intelligence in Journalism Part 1
   College of Arts and Media .....Undergraduate UGO-05
   Presenter: Sarah Davis, davis1355@marshall.edu ..... Oral Presentation
2. The Ethics of Integrating Artificial Intelligence in Journalism Part 2
   College of Arts and Media .....Undergraduate UGO-06
   Presenter: Baylee Parsons, parsons406@marshall.edu ..... Oral Presentation

Session 4-B: Memorial Student Center, 2W-16B (2nd Floor)..... 11:30am - 12:00pm

1. Examining Hate Crime in Media: The Murder of Ahmaud Arbery
   College of Science ..... Undergraduate UGO-18
   Presenter: Ben McElroy, mcelroy19@marshall.edu..... Oral Presentation

Lunch Discussion Panel: Memorial Student Center, Don Morris Room .....12:15pm – 1:30pm

Lunch will be served

Graduate Students Oral Presentations and Performances

Session 5-A: Drinko Library, Atrium (3rd Floor) .....1:45pm - 2:30pm

1. The 5th Ave Brass Quintet: A Performance of Newly Commissioned Works for Brass
   College of Arts and Media ..... Graduate GO-01
   Presenter: Evan Heuermann, heuermann@marshall.edu ..... Oral Presentation
2. Twentieth-Century Music for Solo Guitar: A Performance
   College of Arts and Media ..... Graduate GO-02
   Presenter: Tayro Louzeiro Mesquita, mesquita@marshall.edu..... Oral Presentation

Session 5-B: Memorial Student Center, 2W-16B (2nd Floor).....1:45pm - 2:30pm

1. Food as Language of Love and Unity in Ghanaian Storytelling and Communal Eating
   College of Arts and Media ..... Graduate GO-03
   Presenter: Habiba Mustapha, mustapha1@marshall.edu ..... Oral Presentation
2. Managing Online Identities: International Students' Use of Social Media for Identity Crafting and Integration
   College of Liberal Arts..... Graduate GO-09
   Presenter: Oluchi Francisca Ikwuakam, ikwuakam@marshall.edu ..... Oral Presentation

Session 5-C: Memorial Student Center, Shawkey Room (2nd Floor).....1:45pm - 2:30pm

1. It's OK Not To Be OK: A social Awareness Webquest
   College of Education and Professional Development..... Graduate GO-04
   Presenter: Jennifer Burns, burns6@marshall.edu ..... Oral Presentation
2. Subsistence and Ecological Variance: Faunal Insights and Climate Comparisons from the Ohio River Valley
   College of Science .....Graduate GO-10
   Presenter: Sara Slack, slack38@marshall.edu ..... Oral Presentation

Session 5-D: Memorial Student Center, John Spotts Room (2nd Floor).....1:45pm - 2:30pm

1. The Relationship Between Nurse Burnout, Organizational Engagement, and Quality Outcomes
   College of Business .....Graduate GO-13
   Presenter: Jamie Parsons, SHRM-SCP, CHHR, FACHE, parsons431@marshall.edu ..... Virtual Oral Presentation
2. Lessons Learned: Insights of Resilience from Juvenile Detention Center Teachers
   College of Education and Professional Development.....Graduate GO-14
   Presenter: Lisa Hoskins, hoskins6@marshall.edu ..... Virtual Oral Presentation
3. Principal Perspectives on the Most Important Elements of Alternative Certification Programs - Pilot Study
   College of Education and Professional Development.....Graduate GO-15
   Presenter: Jerry Jerabek, jerabek1@marshall.edu..... Virtual Oral Presentation

Session 6-B: Memorial Student Center, 2W-16B (2nd Floor).....2:45pm - 3:30pm

1. Dark Academia as Queer Manifestation: Readings in the Contemporary American Campus Novel
   College of Liberal Arts..... Graduate GO-07
   Presenter: Britney Cox, cox297@marshall.edu ..... Oral Presentation
2. I Might Be Nothing: A Study in Demisexuality and Asexuality through Film and Creative Nonfiction
   College of Liberal Arts..... Graduate GO-08
   Presenter: Britney Cox, cox297@marshall.edu ..... Oral Presentation

Session 6-C: Memorial Student Center, Shawkey Room (2nd Floor)..... 2:45pm – 4:00pm

1. Speedy Space Rocks: Searching for Surprising Solar System Objects in Rubin Simulation Data
   College of Science .....Graduate GO-11
   Presenter: Ellie White, white728@marshall.edu ..... Oral Presentation
2. The Arachidonic Acid Pathway Uniquely Regulates Sodium Dependent Glucose Co-Transporter (SGLT1) In SAMP1/YiTC Model Of IBD
   School of Medicine.....Graduate GO-12
   Presenter: Vivian Naa Amua Wellington, wellington3@marshall.edu ..... Oral Presentation

3. Optimization of Chitosan Nanoemulsions and Its Application in Delivering 5-Fluorouracil and Quercus infectoria for Wound Healing.
   School of Pharmacy ..... Graduate GO-16
   Presenter: Kalkedan Ameha, ameha@marshall.edu ..... Oral Presentation

Session 7-B: Memorial Student Center, 2W-16B (2nd Floor)..... 3:40pm - 4:20pm

1. SwarmCVT: Centroidal Voronoi Tessellation-Based Path Planning for Very-Large-Scale Robotics
   College of Engineering and Computer Sciences ..... Graduate GO-05
   Presenter: Gao, Xu (James), gao32@marshall.edu ..... Oral Presentation
2. Lightweight CNN-Based Recognition of Distracted Drivers
   College of Engineering and Computer Sciences ..... Graduate GO-06
   Presenter: Satya Sri Rajiteswari Nimmagadda, nimmagadda2@marshall.edu ..... Oral Presentation

Closing

Awards Ceremony: Memorial Student Center, Don Morris Room..... 4:30pm – 5:00pm

Tea and coffee will be served

Closing: Memorial Student Center, Don Morris Room..... 5:00pm – 5:15pm

UGO-01

Title: Fluid Impressions: Exploring Expression Through Multimedia Artwork

Authors/Presenters: Isa McMullen mcmullen21@marshall.edu
College/School: College of Arts and Media;
Mentor: Dr. Tacie Jones
Sponsoring Institution: Marshall University, School of Art and Design
Research Sponsor:

Abstract
Throughout my art, I am determined to confront the viewer with uncomfortability. Spending many of my formative years in the Deep South and Appalachia introduced curiosity about the way religion and censorship connect with modernity, specifically queer bodies. The topics of uncommon ways of life and self exploration are pertinent right now. Through my photography, film, and performances I explore expression, identity, and bodies.

Keywords: art, film, multimedia

UGO-02

Title: Sound Design for Sylvia

Authors/Presenters: Landon Mefford (mefford4@marshall.edu)
College/School: College of Arts and Media;
Mentor: Logan Reagan (reaganl@marshall.edu) Leah Turley (Turley45@marshall.edu)
Sponsoring Institution: School of Theater and Dance
Research Sponsor:

Abstract
This presentation would highlight the design process of sound designing a play. Starting with the research and preparation of the play. We would also be discussing the creative choices and design elements decided on by the production.

Keywords: Theater, Music, Sound Design

UGO-03

Title: Costuming Sylvia: The Art of Dressing a Dog in a 1960s Sitcom World

Authors/Presenters: Kristen Scites (scites25@marshall.edu)
College/School: College of Arts and Media;
Mentor: Olivia Trees (trees@marshall.edu)
Sponsoring Institution: School of Theatre and Dance, College of Arts and Media
Research Sponsor:

Abstract
In the fall of 2024, I was given the opportunity to be the costume designer for Marshall University's production of Sylvia by A.R. Gurney, directed by Leah Turley. The vision for this show was a throwback to sitcoms of the 1960s, such as I Dream of Jeannie or Bewitched. This show presented a unique host of challenges.The goal was to infuse the show with a nostalgic, lighthearted aesthetic that evoked the charm and style of this era. These sitcoms are usually presented as a normal world, with normal people, but with one unusual element thrown into the mix, such as a genie or a witch. The challenge of this show was dressing the titular character, Sylvia- a dog portrayed by a human actress. This provided many difficulties in costuming, as Sylvia's wardrobe had to strike a balance between human and dog, and allow for the movement of the actor. Through research, problem-solving, and collaboration with the director and cast, I was able to develop a design that enhanced the storytelling and paid homage to the golden age of television.

Keywords: Theatre, costuming, design, stage

UGO-04

Title: A Musical Miscellany: Performances of Rossini, Britten, Poulenc, and Donizetti

Authors/Presenters: snyder250@marshall.edu
College/School: College of Arts and Media;
Mentor: Alexander Lee, leeal@marshall.edu
Sponsoring Institution: School of Music, College of Arts & Media
Research Sponsor:

Abstract
A performance of arias and songs by Gioachino Rossini, Benjamin Britten, Francis Poulenc, and Gaetano Donizetti. Each work explores a different technique for singing advanced repertoire.

Keywords: Rossini, Britten, Poulenc, Donizetti, soprano

UGO-05

Title: The Ethics of Integrating Artificial Intelligence in Journalism Part 1

Authors/Presenters: Sarah Davis/davis1355@marshall.edu, Caden Adkins/adkins1659@marshall.edu, Kaitlyn Fleming/fleming115@marshall.edu
College/School: College of Arts and Media;
Mentor: Dan Hollis/hollis@marshall.edu
Sponsoring Institution: School of Journalism and Mass Communications
Research Sponsor: N/A

Abstract
Artificial Intelligence and its use in journalism has grown exponentially in recent years with the emergence of Large Language Models (LLMs, which will be referred to as AI) like ChatGPT and Deepseek. With this, there have been various questions regarding the ethics of the use of AI in the larger media landscape. AI has the potential for both a negative and/or positive impact in journalism. This part of our study shows the negative impact AI can have in the media landscape, particularly with how it works against human-generated content and breaks traditional rules of journalism. The School of Journalism and Mass Communications (SOJMC) at Marshall University states that the tasks of a journalist are to be a legal and ethical practitioner of compelling and engaging content that is theoretical and research based. Through research, we have developed ethical guidelines that work hand in hand with these tasks with the use of AI in the SOJMC. To develop these guidelines, we conducted a series of experiments exploring what AI can and cannot do in an ethical journalistic manner. Based on these experiments, we have developed ethical guidelines for the SOJMC to help student journalists uphold journalistic integrity while utilizing what AI has to offer.

Keywords: AI, Journalism, Ethics

UGO-06

Title: The Ethics of Integrating Artificial Intelligence in Journalism Part 2

Authors/Presenters: Baylee Parsons parsons406@marshall.edu, Wade Sullivan/sullivan150@marshall.edu, Jada Mills/mills299@marshall.edu
College/School: College of Arts and Media;
Mentor: Dan Hollis/hollis@marshall.edu
Sponsoring Institution: School of Journalism and Mass Communications
Research Sponsor: N/A

Abstract
The use of Artificial Intelligence in journalism has drawn much criticism in recent years, particularly pertaining to the ethics of the work it can generate. There is a widespread belief that Large Language Models (LLMs, which will be referred to as AI) like ChatGPT and DeepSeek use human-generated content in order for their algorithms to learn and evolve. This portion of our research looks into how these models can effectively be used to strengthen the work of human journalists to understand its capabilities and limitations. Using a series of experiments exploring what AI can and cannot do while following the Society of Professional Journalists (SPJ) Code of Ethics as taught in the SOJMC, we have established ethical guidelines that assist student journalists in the SOJMC to use AI in order to uphold journalistic integrity. As AI develops further and is able to generate content that aligns with the SPJ Code of Ethics better, the guidelines we developed can be refined to reflect the developments in these models.

Keywords: AI, Journalism, Ethics

UGO-07

Title: Liminal Spaces

Authors/Presenters: Leah Teasdale teasdale1@marshall.edu
College/School: College of Arts and Media;
Mentor: Sandra Reed, sandra.reed@marshall.edu
Sponsoring Institution: College Of Art And Design
Research Sponsor: N/A

Abstract
Liminal Spaces is a project aimed towards garnering interest in Marshall and it's Art Department. I have organized a competitive collegiate level exhibition stipulated to only be open to High School seniors, wherein they can apply to enter, and compete for first, second, and third prizes, of 300, 200, and 100 dollars respectively. I will be looking at all submissions, and doing a general scoring, to see what I deem a strong enough piece to compete. After that, I have selected four peers to review the work with me, and to help me 'grade' it, using a rubric comprised of four categories, that include actual artistic technique, and conceptual development, etc. After the work is scored, it will be gathered, and installed in Marshall Universities, Visual Art Center's, Pneumatic Gallery. The work will remain up for a week, and then at the end of the week, a reception will be held, where I will announce the winners of 1st , 2nd, and 3rd place.

Keywords: High-School, Art, Exhibition, Competition, Juror.

UGO-08

Title: Un Oiseau rebelle, François Borne's Fantaisie brillante on Bizet's opera Carmen for flute and piano

Authors/Presenters: Mitchell Proper, proper3@marshall.edu
College/School: College of Arts and Media;College of Engineering and Computer Sciences;
Mentor: Wendell Dobbs, dobbs@marshall.edu
Sponsoring Institution: College of Arts and Media, School of Music
Research Sponsor: N/A

Abstract
In 1880, flutist and professor at the Toulouse Conservatoire François Borne composed a fantasy for flute and piano featuring themes from Georges Bizet's opera Carmen. The opera had premiered in 1875, just several months before Bizet's untimely death at the age of thirty-six. Despite mixed reviews at the premiere, the opera and its melodies have continued to be some of the most enduring in French musical literature. This fantasy includes the famous "fate theme," the Habanera with a set of variations, the Chanson bohème, and concludes with the Toreador Song. Flutist Mitchell Proper, with the collaboration of pianist Sara Lee, will introduce and perform this beloved work from the flute repertoire.

Keywords: carmen borne flute Bizet opera

UGO-09

Title: What do you like to eat?

Authors/Presenters: Ryann Province // province1@marshall.edu
College/School: College of Arts and Media;College of Liberal Arts;
Mentor: Tacie Jones // jonestac@marshall.edu
Sponsoring Institution: Marshall University // College of Arts and Media // School of Art and Design // Filmmaking
Research Sponsor: N/A

Abstract
Ecofeminism is a political and intellectual movement that holds the perspective that the oppression of women and the degradation of the environment are interlinked by virtue of their common structural oppressor: the patriarchy. Although the core pillar of ecofeminism is the recognition of humanity's dependency on women and the natural world, the thought school's internal discourse defines two subcategories of ecofeminism: cultural and radical. While cultural ecofeminism equates women as a species to nature and the natural, arguing that feminists, thus, must defend nature, as it is the same as defending their own, radical ecofeminism (to which I am more inclined to subscribe) recognizes the common issue between women's and nature's subjugation, but contends that the dominant patriarchal society equates nature and women in order to degrade both, thus, rejects the conflation of women and nature.

The notion of "naturalism" as it relates to women, feminism, gender studies, and, in some ways, queer theory is of great intrigue to me, especially as a queer woman. In this video art project, I explore what "natural" means and what it has meant over time in American society. I examine naturalism as it relates to politics, culture, and my own embodied experiences, primarily using archival materials and supplementing the project with original material when necessary. My primary editing style includes layering and splicing clips, as well as some more advanced techniques such as masking and rotoscoping. The sound design features clicks as well as chewing noises and is primarily concerned with emphasizing the longevity of naturalism theory and its application to women and, in addition, evoking repugnance in listeners in response to the perpetual mastication.

Keywords: Eco-feminism, gender, video art, abstract, naturalism,

UGO-11

Title: Depictions of U.S. Interventions in Panama's Foundation through Newspapers

Authors/Presenters: Olivia Andrew-Vaughan, andrewvaugha@marshall.edu
College/School: College of Liberal Arts;
Mentor: Kevin Barksdale, Barksdale@marshall.edu
Sponsoring Institution: Marshall University, History Department
Research Sponsor:

Abstract
This project analyzes various depictions of U.S. involvement in Panama's secession from Colombia to build the Panama Canal. It specifically uses newspapers and political cartoons to show these depictions in U.S. media. In this project, I group a collection of several major newspapers into categories based on their depictions of players including the countries of Panama, Colombia, the United States, and prominent individuals including President Theodore Roosevelt, Frenchman Philippe-Jean Bunau-Varilla, Secretary of State John Hay, and other major players. The political leanings of the newspapers, company histories, and geopolitical background are also analyzed to better understand bias and perspectives from the various newspapers. Using the newspapers themselves as primary sources, and other books, journals, or articles that discuss depictions as secondary sources, I create a cohesive picture of the ways the U.S., Panama, Colombia, and prominent individuals were depicted in newspapers at the time. U.S.-Panama relations are particularly important to understand with recent events like President Trump's discussions around the Panama Canal. Additionally, analyzing the way media has historically portrayed foreign relations and major events helps contextualize the actions and rhetoric of modern media organizations.

Keywords: US-Panama relations, Panama Canal, Newspapers, Political Cartoons

UGO-12

Title: Digital Bridge Trolls: Associations of narcissism, benign and malicious envy, and antisocial online behaviors

Authors/Presenters: Mars Brown (brownbri@marshall.edu)
College/School: College of Liberal Arts;
Mentor: Dr. Masa Toyama (toyama@marshall.edu)
Sponsoring Institution: Office of the Vice President for Research (Undergraduate Research Fall 2024 Scholar Award)
Research Sponsor:

Abstract
In the online space, social media has become one of the world's most prioritized tools. Most of the actual literature shows that social media isn't inherently harmful; however, recent studies have begun to highlight negative implications of antisocial online behaviors, such as higher likelihood of depression, especially through trolling (online activity that borders on harassment by targeting other users with the intent to annoy or offend). Minimal research has been done to examine why these "trolls" provoke, but narcissism has been suggested as a predictor. This study considers the limitations of previous research and examined relationships between social media trolling, antisocial media content consumption, and narcissism, but also malicious envy (desire to see perceived superiors fail), and benign envy (desire to improve to superior trait level). Narcissism is associated with jealousy, and self-serving but not inherently antagonistic behavior, and these envy dimensions may explain behavior variations between things like admiration or rivalry. We developed an online questionnaire addressing these factors and collected and analyzed the data of 319 participants recruited using the online crowdsourcing platform Prolific. Our data analysis revealed that narcissism predicted greater social media trolling not only directly but also indirectly through higher malicious envy. Narcissism also predicted higher exposure to antisocial media content, but this association was fully explained by its indirect association through higher malicious envy. Results are informative for research approaching online activities, as reducing traits like narcissism and malicious envy may lower potential risk factors for social media trolling and other antisocial online behaviors.

Keywords: narcissism, trolling, envy, online behavior

UGO-13

Title: "Pay Attention to Me:" How Hitchcock's Rear Window Defies Classical History to Please His Audience

Authors/Presenters: Gracie Bumgarner; bumgarner39@marshall.edu
College/School: College of Liberal Arts;
Mentor: Nicole Lawrence; lawrence14@marshall.edu
Sponsoring Institution: College of Liberal Arts; Department of English
Research Sponsor: N/A

Abstract
In Alfred Hitchcock's 1954 film Rear Window, protagonist L. B. Jeffries (Jimmy Stewart) sits by his window and watches his neighbors. He constructs a theory that his neighbor Thorwald (Raymond Burr) has murdered his wife (Irene Winston). Jeff becomes obsessed with invading privacy, peering into all his neighbors' apartments constantly, much to the chagrin of Jeff's girlfriend Lisa (Grace Kelly). At the end of the movie, Jeff's theory is proven true, but it shouldn't have. Classical history says so, the culture of the time says so, and even the movie itself, through lighting and camera angles, says so, but Hitchcock was so determined to make a hit that he ignored all of these.

Ancient Roman rhetorician Quintilian discussed the orator-philosopher dynamic, of which Lisa is the former and Jeff is the latter, as evidenced by the lighting of the movie. This speaks to how Jeff should not have been validated by the film's ending and how Lisa was the true "good" character. Even ancient ideals that Jeff tries to employ, like the pater familias and ius vitae necisque, did not hold up against this argument, as there are exceptions to both rules, explained by Roman jurist Gaius.

These exceptions are because of the time in which the movie takes place and was released. In the post-war culture, women had become the forefront of the workforce, keeping the economy alive during the war. This proved they, and Lisa, were strong, capable career women. This made men uncomfortable, which is exactly why Hitchcock chose to make a film for them.

Hitchcock employed what Laura Mulvey calls the "male gaze," an extension of extreme scopophilia. This happens on two levels in the film. First, it occurs within the film: Jeff derives pleasure from watching his neighbors, to the point where he neglects his girlfriend, Lisa, and she has to beg him just to "pay attention" to her. Second, it occurs beyond the film: just as Jeff enjoys watching his neighbors, male audience members enjoy watching Jeff get validated and Lisa, a beautiful woman, submit to his theory and his instructions.

She becomes all the more pleasing to look at when she submits to this and enters Jeff's gaze.

Hitchcock created this to please his audience. Stefan Shariff explains the reason why it's so dangerous: with the way the film industry took over the world and became so competitive, it led to inevitable deterioration of art at the expense of making it big. In a time when art was lost to make a hit, Hitchcock did exactly that: he sacrificed Lisa and his story in favor of pleasing his audience. Rear Window is a manifestation of the dangerous reality of the male gaze.

Keywords: classics, film, Hitchcock, male-gaze, Quintilian

UGO-14

Title: How cats help with mental health

Authors/Presenters: Dakota Dix dix8@marshall.edu
College/School: College of Liberal Arts;
Mentor: Mentor: Caitlin Trombley trombley@marshall.edu, Teacher: Kristi Mcleod kristi.mcleod@marshall.edu
Sponsoring Institution: Marshall university
Research Sponsor:

Abstract
The study focuses on the mental health benefits cats provide college students. It explores how cats can help alleviate common mental health issues like anxiety, stress, and depression through companionship, stress reduction, and fostering a sense of responsibility.

The research employed a mixed-methods approach. Quantitative surveys alongside qualitative interviews were conducted to gather comprehensive data on how cat ownership affects college students' mental health. The data collection focused on emotional benefits, behavioral responses, and the potential for cats to be recognized as emotional support animals.

The primary aim of the study is to examine the unique bond formed between college students and their cats and evaluate how this relationship serves as a mental health intervention. The study also intends to assess how pet ownership inspires responsibility, promotes positive daily routines, and enhances emotional well-being among students.

The research revealed that cat ownership provides valuable mental health benefits for college students. Specifically, interactions with cats contribute to stress relief, emotional support, improved self-esteem, and the development of life skills through caring responsibilities. A significant portion of students reported experiencing stress relief after daily interactions with their cats.

The study underscores the potential of integrating cat-friendly policies and programs in universities, such as therapy cat visits or accommodations for students with cats. Embracing these initiatives can enhance traditional mental health resources by normalizing and leveraging the benefits of animal companionship. Future research could expand by comparing effects across various pets or examining socioeconomic impacts on pet ownership feasibility for students. Overall, fostering relationships between young adults and their cats may be instrumental in addressing the mental health crisis in higher education.

Keywords: mental health, cats, college students, staff

UGO-15

Title: Barriers to Mental Health Service Utilization in Appalachia

Authors/Presenters: Skylar Elliott (elliott172@marshall.edu)
College/School: College of Liberal Arts;
Mentor: Wendi Benson (bensonw@marshall.edu)
Sponsoring Institution: Marshall University (Creative Discovery and Research Award)
Research Sponsor:

Abstract
Mental health stigma and limited access to care are significant barriers to help-seeking in rural communities, particularly in Southern Appalachia, where cultural and social factors further complicate these challenges (Keller & Owens, 2023; Smith et al., 2020). This study examined how public stigma influences self-stigma, how stigma influences preferences for mental health care, and how these factors influence utilization of professional mental health care services. Identifying as Appalachian was expected to moderate these effects, by enhancing stigma's negative impact.

An anonymous online survey was administered to Appalachian and non-Appalachian individuals, utilizing validated measures of public stigma (Link, 1987), self-stigma (Vogel et al., 2006), help-seeking intentions (Fischer & Turner, 1970), and service utilization. Data was then statistically analyzed with correlations and t-tests.

Results reveal self-reliance and self-stigma as significant barriers to mental health service utilization, particularly for Appalachian-identifying participants. Appalachians who perceived more public stigma about seeking mental health care also tended to report significantly more self-stigma about mental health care. This relationship was not significant for people who do not identify as Appalachian. Higher self-reliance correlated with reduced telehealth and psychiatric medication use for Appalachian participants, while non-Appalachians with more self-reliance showed increased crisis line usage. Self-stigma was also related to reduced therapy and telehealth use for Appalachian participants but correlated with increased outpatient treatment and crisis line usage for non-Appalachians. Public stigma was uniquely linked to greater face-to-face therapy and telehealth use among Appalachian individuals. Cultural preferences for community and family, support over professional help was related to lower formal mental health service utilization for Appalachians, but more utilization for non-Appalachians. Cultural preference for religious support was related to less mental health service utilization for both groups. These findings highlight the need for culturally sensitive interventions tailored to Appalachian values and norms.

Keywords: Mental Health, Stigma, Culture, Appalachia

UGO-16

Title: What activities predict sense of belonging relating to mental health among college students?

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Sponsoring Institution:
Research Sponsor:

Abstract
This study seeks to understand the relationship between time allocation for different activities and students' academic performance, sense of belonging, and anxiety. Previous research has been limited in explaining how students' engagement in academic, social, and extracurricular activities is related to their overall well-being and academic success. The present study aimed to address this gap by examining whether the time spent on different activities, such as studying, co-curricular activities, work, and relaxing/socializing, predicted students' GPA, sense of belonging, and anxiety levels. To achieve this aim, we developed an online questionnaire measuring factors including hours spent on activities, sense of belonging (primarily focused on Marshall's community), and mental health. We recruited participants with the assistance of psychology professors by inviting their students to participate in the questionnaire, and 134 student participants completed it. The results indicate that more time spent on study significantly predicted higher GPA, while more time spent on co-curricular activities predicted a higher sense of belonging, particularly the sense of membership in the Marshall community. However, none of the time allocation variables were found to predict anxiety directly. Notably, a higher sense of membership was associated with lower anxiety, suggesting that time spent on co-curricular activities may be indirectly related to lower anxiety through higher sense of belonging. This study provides valuable insights for educators and administrators seeking to promote student success and development.

Keywords: Sense of beloning, mental health, gpa, co-curricular activities

UGO-17

Title: Financial difficulties, student-faculty relationships, and their links to sense of belonging in college

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Sponsoring Institution: N/A
Research Sponsor: N/A

Abstract
This study attempts to understand how sense of belonging and personal obstacles may jointly craft one's college experience. Previous research suggests that financial difficulties provide additional barriers for students, making it more difficult for them to feel like they belong. This study examines how financial difficulties and a sense of belonging in the Marshall community combine in an individual to predict mental health, while addressing two aspects of belonging: membership, which refers to being part of the university community, and acceptance, or feeling understood and welcomed by others. To study this relationship, an online questionnaire was used that measured anxiety, financial difficulties, sense of belonging, and student-faculty relationships. The study was completed by 134 participants recruited with the help of psychology professors at Marshall University, who distributed the survey to their students. My analysis revealed that acceptance was the factor that significantly predicted lower anxiety, but not membership. Greater financial difficulties predicted lower acceptance but higher anxiety. A high sense of membership was directly predicted by close student-faculty relationships; which were indirectly linked to acceptance, through the relation to membership. These findings suggest that one's sense of belonging in college is part of the connection between financial situations and mental health.

Keywords: sense of belonging, financial difficulties, anxiety, mental health, college

UGO-18

Title: Examining Hate Crime in Media: The Murder of Ahmaud Arbery

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Sponsoring Institution: Marshall University Department of Criminal Justice and Criminology
Research Sponsor: Creative Discovery

Abstract
Hate crimes are crimes that occur against people or groups with specific characteristics such as race, religion, national origin, sexual orientation, gender identity, and disability (US Department of Justice, 2023). Ahmaud Arbery, a black man, was murdered while he was jogging in Glynn County, GA on February 23, 2020. Arbery's murderers were not initially charged. After releasing a video of the murder, three men were charged, and later convicted and sentenced to life without the possibility of parole. This research is a content analysis that examined media reports following the murder of Ahmaud Arbery by pulling articles in the local newspaper, The Brunswick News. We analyzed 111 articles from February 23, 2020, until August 31, 2020.

Keywords: Media and Hate Crime within Arbery

UGO-19

Title: Exploring Relationship Dynamics of Characters Through an Animated Short

Authors/Presenters: Nickie Adkins, adkins1598@marshall.edu
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Sponsoring Institution: Marshall University, Visual Arts
Research Sponsor:

Abstract
The goal of my current animated project is to explore the relationship dynamic between two characters that has changed over time. The animated short follows characters August and Donovan from the start of their friendship to a point that was almost the end of it through a series of animated parts meant to resemble home video footage. The idea is that August has edited these videos together to say goodbye because Donovan is moving away. While they will have to say goodbye to each other, the two are going to try to remain friends despite the distance. The viewers will ideally walk away with an optimistic outlook on uncertain situations, as well as a feel for these characters and understanding of the subtle shifts in their relationship from beginning to end.

Keywords: Animated, relationship dynamic, friendship, optimism

UGO-20

Title: Predictors of Recovery Treatment Effectiveness in Appalachia

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Research Sponsor:

Abstract
Background: Substance use disorder is a critical issue that plagues communities throughout the country, especially in Appalachia. There has been an increase in residential treatment facilities to address the need and some research examining predictors of treatment success. Research suggests people with substance use disorder who have a strong social support system (Boisvert et al., 2008; Wallerstein, 2024) and receive support from recovery center staff (Dillon, Kedia, Isehunwa, & Sharma, 2020) tend to have better recovery outcomes (i.e., sobriety and a flourishing life). Research also suggests that people who are more satisfied with their recovery-focused treatment tend to have better recovery outcomes (Wallerstein, 2024; Wangsteen & Hyad, 2022) and higher self-esteem (Wangsteen & Hyad, 2022). Method: A cross-sectional self-report survey and correlation analysis of responses from n = 28 clients at an all-male residential treatment facility in southern Ohio (Appalachia) was used to examine the relationships between treatment-related experiences, recovery outcomes, and self-esteem. Results: Clients with more functional social support outside of treatment tend to feel more confident about their ability to resist drug urges or temptations and feel like the center is helping them recover and meet recovery-related goals. Clients who report that the center helping them meet life goals tend to have more confidence in their ability to resist drugs when they have pleasant experiences and tend to feel like the center is helping them recover and meet recovery-related goals. Clients who report more treatment diversity, individualized treatment, and a more inviting atmosphere tend to feel like the center is helping them recover and meet recovery-related goals. Clients who report more individualized treatment and an inviting atmosphere and space at the center tend to be more satisfied with the center overall and tend to have more self-esteem. Clients who reported more drug use in the past 6 months tend to be more satisfied with the center overall. Clients who are more satisfied with the center overall tend to feel more confident in their ability to resist drugs in a variety of situations and feel like the center is helping them recover and meet recovery-related goals.

Discussion: Results suggest recovery treatment centers in Appalachia should encourage social support networks within the treatment setting, prioritize recovery-related goals, incorporate diverse and individualized treatments for each client, and foster a welcoming environment to support recovery. This study is based on one treatment center but is useful for understanding client experiences in Appalachia. Past research (including this study) is largely focused on males, future research should compare males and females.

Keywords: recovery, social support, staff support, substance use disorder, self esteem

UGO-21

Title: LLMs and Literature: Novel Approaches to Literary Engagement with Artificial Intelligence

Authors/Presenters: Brandi Taylor taylor1120@marshall.edu Dr. Sarah Walton waltons@marshall.edu
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Sponsoring Institution: Marshall University, College of Liberal Arts
Research Sponsor: n/a

Abstract
Supported by an Undergraduate Creative Discovery and Research Award, AI AustenVerse is an innovative project that leverages artificial intelligence to enhance traditional literary engagement. This presentation will detail the development of an interactive web application allowing users to converse with characters from Jane Austen's Pride and Prejudice using finely tuned large language models. Initial prototypes showed that while basic chatbots could mimic character dialogue, they struggled with maintaining consistent tone, historical accuracy, and linguistic nuance. This project aims to refine the technology to accurately reflect the distinctive personalities, period-specific diction, and complex social dynamics of Austen's work.

"LLMs and Literature: Novel Approaches to Literary Engagement with Artificial Intelligence" tracks the process of learning to build a from-scratch LLM and refining that LLM to reflect a specific literary corpus. That process began with a literary and linguistic analysis of Pride and Prejudice, identifying specific language patterns and affective cues that define Austen's writing. Austen's use of free indirect discourse complicates the dialogue in her novels and posed a significant challenge for this work. This analysis then informed the creation of a targeted dataset, focusing on a select number of characters (including Mr. Collins and Jane Bennet), for training the language models. The next phase of this project, which will be in progress at the time of this conference, will involve developing the front end of the chatbot site and testing the efficacy of the LLMs by sharing this site with focus groups. My ultimate goal is to co-author an article with Dr. Sarah Walton detailing the methodology and broader implications of integrating AI with Austen scholarship; feedback from this presentation will inform our writing and next steps.

Keywords: AI, LLM, Literary Studies, Digital Humanities, Jane Austen

GO-01

Title: The 5th Ave Brass Quintet: A Performance of Newly Commissioned Works for Brass

Authors/Presenters: Evan Heuermann, heuermann@marshall.edu; Aden Facemire, facemirea@marshall.edu; Mason Parkes, parkes1@marshall.edu; Jayce Townsend, townsend66@marshall.edu; Isaac Mahurin, mahurin@marshall.edu
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Mentor: Martin Saunders, m.saunders@marshall.edu
Sponsoring Institution: School of Music, College of Arts & Media
Research Sponsor:

Abstract
A performance of newly commissioned works for brass, including an arrangement of Dizzy Gillespie's "Con Alma" by Gavin Ard, and new works by Tucker Johnson and Sam Friedman.

Keywords: brass quintet, Tucker Johnson, Sam Friedman, Dizzy Gillespie, Gavin Ard

GO-02

Title: Twentieth-Century Music for Solo Guitar: A Performance

Authors/Presenters: Tayro Louzeiro Mesquita, mesquita@marshall.edu
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Sponsoring Institution: School of Music, College of Arts & Media
Research Sponsor:

Abstract
A performance of music for solo guitar by Spanish composer Manuel de Falla, Brazilian composer Heitor Villa-Lobos, and Italian composer Maria Castelnuovo-Tedesco.

Keywords: de Falla, Villa-Lobos, Castelnuovo-Tedesco, guitar

GO-03

Title: Food as Language of Love and Unity in Ghanaian Storytelling and Communal Eating

Authors/Presenters: mustapha1@marshall.edu/Habiba Mustapha
College/School: College of Arts and Media;
Mentor: Dr. Clinton Brown
Sponsoring Institution: Department of Communication Studies
Research Sponsor: Marshall Universty

Abstract
Food is more than sustenance; it is a powerful medium of communication that conveys love, unity, and cultural identity. This research-in-progress explores the role of food as a language of love and unity in Ghanaian communal eating practices, emphasizing how storytelling and intergenerational knowledge transfer shape cultural traditions. Drawing on Symbolic Interactionism and Narrative Theory, this study examines how food preparation and consumption serve as a means of expressing care, strengthening relationships, and preserving cultural heritage.

Using a qualitative research approach, the study employs semi-structured interviews to gather insights from Ghanaian individuals who have experienced communal dining and storytelling traditions. Data collection strategies include autoethnography and online cultural forums. Preliminary findings suggest that food functions as a symbolic act of love, where shared meals reinforce social cohesion and facilitate the transmission of oral histories across generations.

This research contributes to cross-cultural discussions on food as a communicative tool, shedding light on how communal dining fosters emotional connections and a sense of belonging. The study also highlights the evolving dynamics of food traditions in an era of globalization. Further research will focus on data saturation, intergenerational differences, and the impact of modernization on traditional storytelling through food.

Keywords: Food as Communication, Food and Cultural Identity, Culinary Storytelling, Communal Dining Traditions, Ghanaian Food Culture.

GO-04

Title: It's OK Not To Be OK: A social Awareness Webquest

Authors/Presenters: Jennifer Burns bursn6@marshall.edu
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Mentor: Dr. Larison
Sponsoring Institution: Marshall University
Research Sponsor: NA

Abstract

Abstract:

Content Area: ELA Grade Level: High School 9-12. Learning environment: Self-contained Intellectual Disability

Understanding and managing emotions is essential, particularly for students with disabilities who often face challenges in identifying and expressing their feelings. These difficulties can lead to problematic and inappropriate behaviors. By learning critical social-emotional skills, students with disabilities can effectively regulate their emotions. Such skills are vital for their success at school, home, and work, and they also play a fundamental role in creating a harmonious learning environment. This WebQuest project is developed for special education students in grades 9-12 with mild to moderate cognitive disabilities.

WebQuests provide a dynamic and inclusive approach to teaching social skills to students with cognitive disabilities. By incorporating technology and interactive learning, WebQuests create a supportive environment that fosters essential social and mental skill development. A WebQuest is an engaging, inquiry-based learning activity in which learners primarily gather information from the Internet. These quests offer a structured framework for learning activities, enhancing critical thinking, collaborative learning, and problem-solving abilities.

This structured approach is particularly beneficial for students with cognitive disabilities, as it provides clear directions and support. Educators can implement various levels of assistance within WebQuests, such as guided notes, cooperative learning groups, and diverse content representations. Through exploring characters and scenarios, students learn to consider situations from multiple perspectives, which fosters empathy and a deeper understanding of others' emotions and viewpoints.

WebQuests can be tailored to meet a wide range of learning needs. Instructions are clear and concise, with tasks broken down into manageable, explicit steps. Activities are

scaffolded, and flexible pathways to learning allow students to choose from various tasks and activities that align with their interests and abilities. Visual supports, including images, icons, and diagrams, complement text-based directions, minimizing confusion and providing a predictable structure. Additionally, multimedia elements such as videos, audio clips, and interactive activities engage students of all abilities. Interactive activities like virtual tours and drag-and-drop exercises can be designed to cater to different learning styles.

This project design enables students to collaborate with classmates and connect deeply with characters in stories. Students collaborate to analyze these stories and individually relate to the characters' experiences. Following this, they share their findings with the class. Team pairings are based on academic abilities and classroom behavior to ensure an inclusive learning experience. Each team explores assigned topics and prepares presentations. Students collaboratively decide on the role of each team member. After the presentations, suggested activities and strategies are incorporated into daily class routines to create a socially and emotionally informed classroom structure.

Keywords: WebQuest, Intellectual Disabilities, Autism, Differentiated Learning

GO-05

Title: SwarmCVT: Centroidal Voronoi Tessellation-Based Path Planning for Very-Large-Scale Robotics

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Sponsoring Institution:
Research Sponsor:

Abstract
Swarm robotics, or very large-scale robotics (VLSR), has many meaningful applications for complicated tasks. However, the complexity of motion control and energy costs stack up quickly as the number of robots increases. In addressing this problem, we have formulated various methods employing macroscopic and microscopic approaches. These methods enable microscopic robots to adhere to a reference Gaussian mixture model (GMM) distribution observed at the macroscopic scale. As a result, optimizing the macroscopic level will result in an optimal overall result. However, all these methods require systematic and global generation of Gaussian components (GCs) within obstacle-free areas to construct the GMM trajectories. This work utilizes centroidal Voronoi tessellation to generate GCs methodically. Consequently, it demonstrates performance improvement while also ensuring consistency and reliability.

Keywords: intelligent control, robotics, multiagent system

GO-06

Title: Lightweight CNN-Based Recognition of Distracted Drivers

Authors/Presenters: Satya Nimmagadda (nimmagadda2@marshall.edu), Obi Ifeanyi (obi2@marshall.edu), Emily Mays (mays139@marshall.edu)
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Research Sponsor:

Abstract
Distracted driving is a growing hazard on the roads, causing significant damage to the infrastructure and, more importantly, leading to the loss of many lives. Every day, countless accidents occur due to drivers losing focus, whether from fatigue, distraction, intoxication, or reckless behavior. Human error is a significant contributor to road accidents. Reckless actions and intoxication are common hazardous driving behaviors in addition to less obvious actions such as inattentiveness, and driver fatigue, all of which frequently result in accidents. This paper discusses various methodologies proposed by different researchers, including their approaches such as sensor configurations, recognition techniques, and their respective performance metrics and shortcomings. This project focuses on creating an efficient, lightweight system that accurately detects distracted driving behaviors. Furthermore, this study examines the difficulties and constraints of the suggested model and identifies areas for future research. The methodology involves preprocessing driver images and extracting features using CNN. Comparisons are made between the proposed framework and the baseline model in terms of variable weight, processing time, and accuracy. Results indicate that, although the initial model achieves slightly higher accuracy (98%), the proposed model offers acceptable accuracy (96%) as well as a lightweight solution for image classification. Therefore, it is anticipated that this study will offer valuable insights for further enhancing accuracy without extending processing time.

Keywords: Driver distraction detection, Convolutional Neural Networks (CNNs), Deep learning, Epochs, Max pooling.

GO-07

Title: Dark Academia as Queer Manifestation: Readings in the Contemporary American Campus Novel

Authors/Presenters: Britney Cox - cox297@marshall.edu
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Sponsoring Institution: College of Liberal Arts - Department of English
Research Sponsor: N/A

Abstract
This project explores an emerging genre of literature as well as an internet aesthetic known as "Dark Academia." Within this genre, queerness presents itself as a topic of discussion, especially as it ties to wealth. The University serves as a place of educational freedom, allowing participants to explore parts of their identities. However, the university also hinders these explorations as an institution that upholds systematic barriers.

Keywords: literature, aesthetics, theory

GO-08

Title: I Might Be Nothing: A Study in Demisexuality and Asexuality through Film and Creative Nonfiction

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Sponsoring Institution: College of Liberal Arts / Department of English
Research Sponsor: N/A

Abstract
This project is a hybrid between research into the growing identification of asexuality and my personal reflection of this identity through film and television, specifically in the show Bojack Horseman and The Lobster (2015, dir. Yorgos Lanthimos).

Keywords: sexuality, film, television, theory, essay

GO-09

Title: Managing Online Identities: International Students' Use of Social Media for Identity Crafting and Integration

Authors/Presenters: Oluchi Ikwuakam/ ikwuakam@marshall.edu
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Research Sponsor:

Abstract
As international students navigate the complexities of living in a host country, social media plays a crucial role in their identity construction and cultural adaptation. Through digital platforms, they balance self-presentation, maintain ties to their home culture, and integrate into their new social and professional environments. However, challenges such as digital discrimination, cultural expectations, and audience-specific identity shifts influence how they craft and negotiate their online identities. This study examines how international students utilize social media to manage their digital presence, navigate cultural integration, and maintain professional and personal self-representation. Grounded in Identity Management Theory (IMT), the research aims to explore the trial, enmeshment, and renegotiation phases of identity negotiation, shedding light on the strategies students use to balance authenticity with social expectations. The study further considers how platforms like LinkedIn, Facebook, X (formerly Twitter), and Instagram, with possible consideration of a few dating sites facilitate or hinder identity negotiation and social belonging. This study will employ semi-structured in-depth interviews to capture students' lived experiences, with potential findings contributing to existing literature on intercultural communication, digital identity formation, and online discrimination, offering insights into the sociocultural and professional challenges faced by international students in digital spaces.

Keywords: acculturation, international students, identity, digital media

GO-10

Title: Subsistence and Ecological Variance: Faunal Insights and Climate Comparisons from the Ohio River Valley

Authors/Presenters: Sara Slack - slack38@marshall.edu
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Sponsoring Institution: Marshall University Biology Department
Research Sponsor: Creative Discovery Grant

Abstract
My thesis project has an interdisciplinary focus between the humanities and biology, uniting an analysis on subsistence and animal-human relations of Fort Ancient sites with a longitudinal stable isotope analysis of the Ohio River Valley to yield a deeper understanding of human driven climate change within the region.

This research aims to identify potential shifts in climate within the Ohio River Valley within the past ~500 years by a stable Isotope analysis of 96 third molars of mature squirrel and deer collected both from prehistoric fort ancient sites and historic collections from counties throughout West Virginia and Ohio with a focus on the Ohio River Valley. These specimens' dates range from the Buffalo site, a late protohistoric Fort Ancient site dated from the late 1500's to early 1600's, to specimens collected throughout the mid-1900s, and up to freshly collected teeth in November 2024, allowing for a wide range of comparison. The stable Isotope analysis will be conducted at Virginia Tech specifically focusing on d18O and d13C. The variation in these isotopes will be analyzed to predict general climate shifts as well as the abundance of C3 vs C4 plants which will allow for a discussion on human driven influences on ecology within the Ohio River Valley.

In addition to identifying temporal climate shifts, a comparative analysis will be conducted to compare isotopic composition of squirrel molars versus incisors, squirrel versus deer teeth, male versus female individuals, and the various altitudes and ecologies of West Virginia at large. This will allow for a robust study that examines the various affecting factors of isotopic variation and may lead to a discussion on the resulting shift of dietary behavior. Finally modern faunal data can be compared to that of the protohistoric period. This data would include comparisons of species abundance, dietary patterns, and percent forest cover to create a unique perspective of how European colonization affected the ecology of the Ohio River Valley at large.

Keywords: Faunal, Stable Isotopes, Climate Shift

GO-11

Title: Speedy Space Rocks: Searching for Surprising Solar System Objects in Rubin Simulation Data

Authors/Presenters: Ellie White (white728@marshall.edu) -- Marshall University Maria Hamilton (babiuc@marshall.edu) -- Marshall University Steve Croft (scroft@astro.berkeley.edu) -- UC Berkeley / Oxford University / SETI Institute James Davenport (jrad@uw.edu) -- University
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Research Sponsor: NA

Abstract
The Vera C. Rubin Observatory promises to be one of the most scientifically productive projects of this decade, capturing the dynamic night sky with unprecedented detail. One question that arises when dealing with large survey projects such as Rubin is: how do you ensure that you do not miss “weird” phenomena that may slip through standardized data processing pipelines? Simulated Rubin data has been released to allow researchers to prepare their data processing pipelines in advance of its inaugural observations in 2025. We are seeking to identify anomalous Solar System objects (of either natural or artificial origin) in this simulated dataset. To that end, we analyze the velocities of objects in the simulation to determine whether it is possible to isolate outliers by comparing the measured velocity components of a given object with the velocity components predicted in the absence of non-gravitational acceleration. If this approach does not clearly illuminate outliers, identifying anomalies on the basis of unusual velocity behavior may require additional work, such as implementing complex dynamics calculations. Developing an understanding of the velocity behaviors of simulated Solar System bodies will inform future efforts to search for anomalies once Rubin comes online and could enable the detection of objects that may test the limits of—or even break—Rubin’s current data processing pipelines.

Keywords: astrophysics, celestial mechanics, Solar System science, big data, search for extraterrestrial intelligence

GO-12

Title: The Arachidonic Acid Pathway Uniquely Regulates Sodium Dependent Glucose Co-Transporter (SGLT1) In SAMP1/YiTC Model Of IBD

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Research Sponsor:

Abstract
Malabsorption of nutrients including glucose, is a common complication of inflammatory bowel disease (IBD). In the mammalian small intestine, glucose is absorbed in the brush border membrane (BBM) of intestinal villus cells primarily by the Na-dependent glucose transporter, SGLT1. In SAMP1/YitFC, a mouse model of IBD, SGLT1 is inhibited secondary to a decrease in the number of co-transporters without a change in affinity. Immune inflammatory mediators such as the arachidonic acid metabolites (AAM); prostaglandins and leukotrienes, are known to be elevated in the chronically inflamed mucosa, which alters intestinal absorption of nutrients and electrolytes. However, the specific inflammatory pathway mediating SGLT1 inhibition in SAMP1 mice remains unknown. For this study, ten-week-old control AKR mice and SAMP1 mice were treated intraperitoneally with arachidonyl trifluoromethyl ketone (ATK), an inhibitor of AAM (3 mg/kg/2days). Mice ileal villus cells were then isolated and used in the preparation of BBM vesicles (BBMV). Phlorizin sensitive 3H-OMG uptakes were performed to determine SGLT1 activity in the villus whole cell and BBMV. Na-K-ATPase (NAK) was determined as Pi release in an equal amount of villus cell homogenate. Kinetic studies were performed using BBMV. We show that; SGLT1-mediated glucose uptake in villus cells was decreased in SAMP1 and then reversed by ATK. Similarly, SGLT1 uptake in the BBMV was inhibited, with ATK treatment reversing it. NAK activity was also reduced in SAMP1 and reversed by ATK. Further, kinetic studies showed that the mechanism of inhibition of SGLT1 is secondary to a reduction in the number of co-transporters in the BBM of the intestinal villus cells. This reduction was reversed by ATK treatment. In conclusion, in SAMP1 model of IBD, SGLT1 is inhibited in villus cells. This inhibition is at least partially due to a reduction in the Na extruding capacity of the villus cells. At the level of the co-transporter in the BBM, the mechanism of inhibition is secondary to a reduction in BBM co-transporter numbers. Inhibition of AAM pathway in chronically inflamed intestine reversed the inhibition of SGLT1 activity at the

level of the co-transporter in villus cells in SAMP1/YitFC. This data suggests that the Na-glucose co-transporter; SGLT1, is likely regulated by the arachidonic acid pathway during chronic enteritis.

Keywords: SGLT1, IBD, Chronic enteritis,Arachidonic Acid

GO-13

Title: The Relationship Between Nurse Burnout, Organizational Engagement, and Quality Outcomes

Authors/Presenters: Jamie Parsons, Parsons431@marshall.edu
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Mentor: Dr. Doohee Lee
Sponsoring Institution: Marshall University
Research Sponsor: Not Applicable

Abstract
This quantitative study explores the relationship between nurse burnout, organizational engagement, and quality outcomes in healthcare. Using the Theory of Reasoned Action (TRA) as a framework, the research investigates how emotional exhaustion, depersonalization, and reduced engagement affect patient care quality. By employing validated instruments such as the Maslach Burnout Inventory and the Utrecht Work Engagement Scale, this study aims to uncover actionable insights to mitigate burnout and enhance care standards, addressing critical challenges in healthcare.

The significance of this study lies in its focus on understanding the interplay between nurse burnout and organizational engagement in determining healthcare quality outcomes. Burnout, characterized by emotional exhaustion and diminished personal accomplishment, adversely impacts the well-being of nurses and the quality of patient care. Organizational engagement, which plays a pivotal role in buffering the effects of burnout, remains underexplored in its connection to care outcomes. This research addresses this gap to inform strategies for improving nurse retention and patient care excellence.

The study employs a correlational research design, targeting nurses across various healthcare settings. Data collection involves validated tools like the Maslach Burnout Inventory for assessing burnout and the Utrecht Work Engagement Scale for measuring engagement. Using Pearson's correlation coefficient, the research seeks to establish statistically significant relationships between these variables and patient care quality, offering a data-driven foundation for intervention strategies.

The findings of this study hold significant implications for healthcare organizations, policymakers, and administrators. By understanding how burnout and engagement influence quality outcomes, stakeholders can develop targeted interventions to enhance nurse well-being, improve patient care, and reduce organizational costs. This research

contributes to the ongoing discourse on healthcare quality and workforce sustainability, emphasizing the importance of addressing burnout to achieve excellence in patient care.

Keywords: Nurse Burnout, Organizational Engagement, Quality Outcomes, Theory of Reasoned Action

GO-14

Title: Lessons Learned: Insights of Resilience from Juvenile Detention Center Teachers

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Sponsoring Institution: College of Education and Professional Development/Curriculum and Instruction
Research Sponsor: NA

Abstract
Teachers in juvenile detention facilities face daily difficulties in their classes. Some choose to leave, but others show incredible determination by continuing to teach despite the challenges. This qualitative study investigates the resilience characteristics of teachers in two correctional programs. Data analysis reveals themes such as adaptation, perseverance, reflective practice, and cultivating positive relationships. The educators demonstrate the capacity to remain upbeat, build support networks, and manage classroom dynamics despite everyday obstacles.

The results support identifying and fostering teacher resilience to improve staff performance and retention in these high-stress settings. Key stakeholders can utilize these insights to provide focused support that enhances teacher well-being and maintains high-quality educational staff. This study emphasizes the importance of resilience in juvenile detention educators and the necessity of institutional support networks that foster student achievement and teacher retention.

Keywords: Teacher Resilience Framework, teacher resilience, juvenile detention

GO-15

Title: Principal Perspectives on the Most Important Elements of Alternative Certification Programs - Pilot Study

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Sponsoring Institution: Curriculum & Instruction Doctoral Program
Research Sponsor: NA

Abstract
This pilot study used a case study framework to explore principal perceptions of the most important elements of Alternative Certification (AC) teacher preparation in Texas Title One schools. Two rural Texas principal participants were observed doing walkthroughs of their beginning AC teachers with semi-structured follow-up interviews of both principals. Thematic analysis was conducted and descriptive coding techniques with frequency tallying were used to analyze the data. Results suggest four primary themes in the data. The first theme, Coaching, includes mentoring and shows the value of veteran educators working closely with beginning AC teachers to grow and reflect on their practices. The second theme, Engagement, acknowledges the critical importance of preparing AC educators in how to engage and motivate their students. The third theme, Classroom Management, broadly describes the value of effective behavior management and establishing effective routines, procedures, and practices. Finally, the fourth theme, Modeling, shares the importance of instructional leaders and mentors demonstrating how to handle student and parent situations and experiencing field-based experiences. Findings from this pilot study concur with a substantial body of research validating the critical importance of quality coaching, mentoring, modeling, field-based experiences, and reflection in preparing AC teachers to be successful in the contemporary classroom. The results of this pilot demonstrate the value of expanding the scale and breadth of this study to better inform AC preparation programs requiring future researchers to increase their scope by observing in multiple districts at all levels of EC-12 schools.

Keywords: alternative teacher certification principals preparation

GO-16

Title: Optimization of Chitosan Nanoemulsions and Its Application in Delivering 5-Fluorouracil and Quercus infectoria for Wound Healing.

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Research Sponsor: N/A

Abstract
Background: Chitosan-based nanoemulsions offer a promising approach for enhancing drug delivery in wound healing applications. Quercus infectoria extract provides antibacterial and anti-inflammatory effects that support tissue regeneration, while 5-Fluorouracil (5-FU), a chemotherapeutic agent, modulates abnormal cellular proliferation in non-healing wounds. Optimizing chitosan nanoemulsions for the efficient encapsulation of these therapeutic agents could enhance wound healing outcomes.

Objective: To optimize chitosan nanoemulsions to effectively encapsulate and deliver 5-FU and Quercus infectoria extract and evaluate their potential for wound healing applications.

Methods: Chitosan nanoemulsions were formulated and optimized by systematically varying key parameters, including concentration, droplet size, zeta potential, pH, Log P, pKa, and stability. Physicochemical characterization was performed to identify the most stable and effective formulation. The therapeutic efficacy of the optimized nanoemulsion was assessed using an in vitro wound scratch assay to evaluate its impact on wound closure and healing.

Results: Optimization studies resulted in a stable chitosan nanoemulsion with an appropriate droplet size, surface charge, and pH, ensuring effective encapsulation of 5-FU and Quercus infectoria. Preliminary in vitro studies indicate that the optimized formulation enhances wound closure rates, demonstrating potential for improved wound healing.

Conclusions: The optimized chitosan nanoemulsion formulation successfully encapsulated 5-FU and Quercus infectoria, showing promising physicochemical properties and therapeutic potential for wound healing. Future studies will focus on further in vitro and in vivo evaluations to confirm its efficacy and clinical applicability.

Keywords: Chitosan nanoemulsion, 5-Fluorouracil, Quercus infectoria, wound healing, drug delivery, optimization.

UGP-01

Title: African Americans & Labor

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Research Sponsor: Dr. Carter G. Woodson Lyceum

Abstract
My Black History Month poster celebrates the powerful legacy of Black labor union leaders and civil rights activists, drawing connections across decades of advocacy for justice and equity. In my research, I explored the pivotal roles played by A. Philip Randolph, Dorothy Bolden, Chris Smalls, and Alicia Garza in transforming the labor rights landscape and advancing civil rights. A. Philip Randolph's mid-20th-century activism, including his instrumental role in securing Executive Order 8802 and organizing the historic 1963 March on Washington, exemplifies strategic leadership that shaped national policies. Dorothy Bolden's grassroots efforts to empower domestic workers in the 1960s demonstrated resilience and the importance of local organizing. Chris Smalls' 2021 founding of the Amazon Labor Union continues this legacy of labor advocacy in the modern era. Similarly, Alicia Garza's work with the National Domestic Workers Alliance highlights the ongoing struggle for recognition and respect in undervalued professions. My poster's design incorporates layered imagery to connect past and present. Distorted photographs of coal miners and railroad workers symbolize the struggles of early labor movements, while the silhouettes that are on top of the torn newspapers are also coal miners as well as a teacher to help point the focus onto the figures in the middle of the poster design. The torn newspapers and photos at the front of the poster are supposed to symbolize coal piles and mountains, grounding the narrative in both a physical and metaphorical toil. The headlines of the newspapers emphasize the ongoing fight for justice, uniting historical and contemporary figures in a shared vision of equity. Through this design, I aim to honor the enduring impact of African Americans and Labor and inspire the reflection on the continued struggle for justice.

Keywords: Black History Month, Labor Rights, Labor History, Art, Poster Design

UGP-02

Title: African Americans & Labor

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Abstract
The poster that I have created serves as a tribute to the vital contributions of African Americans in shaping labor history and advancing civil rights. Drawing inspiration from the Underground Railroad quilts, the poster incorporates patterns that once guided enslaved people to freedom, symbolizing their courage and the enduring fight for liberation. These historic quilt designs provide a meaningful backdrop to the broader story of African American achievements and their influence on labor movements.

Central to the poster are key figures like Bayard Rustin, a chief architect of the civil rights movement and the March on Washington; Hattie Canty, a fearless union leader who advocated for workers' rights in Las Vegas; Chris Smalls, a modern labor organizer at Amazon; and Dorothy Bolden, who uplifted domestic workers through unionization. Their stories highlight the continued struggle for worker justice and equality. The poster also celebrates the Red Ball Express, a remarkable World War II supply operation led by African American soldiers, and the invention of the traffic light, showcasing significant technological contributions. Additionally, it honors the achievements of African Americans throughout history. This design weaves together themes of resistance, innovation, and the unyielding pursuit of equality.

Keywords: historic quilt designs, key figures

UGP-03

Title: Labor of Love

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Research Sponsor:

Abstract
African Americans and Labor - Labor of Love

My poster for African Americans and Labor, Labor of Love, began with an interest in knowing the history behind hair braiding and how it affects black individuals and communities. I learned that hair tells stories; Braiding has existed before history was being documented. Techniques and patterns evolved beyond a way to style your hair and became something more: self-expression, a form of communication, and an overall symbol of Black pride and legacy.

Braiding is a major contributor to Black history. Within African tribes, it was originally something to do as a community to create connection and closeness. As time continued to pass, braiding communicated escape routes and messages while preserving identity during slavery. Hair braiding continued to aid in the preservation of traditional practices and Black identity beyond the transatlantic slave trade. It continues to be a reclamation of culture beyond this specific time of oppression. Looking to the civil rights movement, a reclamation of rights and empowerment for Black pride also emerged. The 1960s and 70s proved a time for embracing natural hair. This was a political symbol in response to Eurocentric hairstyles being the “standard” during a time for rising up in support of equal rights for African Americans and representation in the government across the United States. Hair makes a statement, and the desire for hair braiding has reemerged in recent years and continues to be a form of self-expression rooted in Black culture and experiences.

I considered ways in which labor is performed that aren’t typically represented or acknowledged as labor. I considered the technique and skill required to braid in so many different ways, and for hours at a time, is an indication of labor. Depending on the pattern, the act of hair braiding takes hours to complete. The sense of community and connection that forms amongst each other, especially Black women, was something I admired when considering how rich this experience is. I wanted to harness this in the subject matter: two women laughing and talking amongst each other, a symbol of pride for identity and uplifting

Black culture and traditional practices. Bright colors highlight their figures and incorporate text, and this indication of a labor of love is a focal point in the composition. Labor of Love harnesses Black empowerment, preserves black history, and expresses African Americans and Labor and its impact in modern times.

Keywords: Black History Month, Celebrating Black History, Labor, Arts, Love

UGP-04

Title: The Appalachian Perspective

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Research Sponsor: Creative Research and Discovery Grant

Abstract
Within this project, I showcase Appalachia in a positive light by translating the natural landscapes into print mediums that inspire local audiences to interact with West Virginian culture. Throughout this project I created a series of posters that highlights West Virginia's ecosystems and communities so that viewers will see the importance and beauty of the region and protect it. In the end, I designed six large 20"x30" posters that each represent the regions of Thomas, Huntington, Charleston, Lewisburg, Fayetteville, and Parkersburg in West Virginia. To showcase the Appalachian artist community, I created a print magazine that shows their testimonials on what it's like to be an artist in West Virginia. This series distributes the idea of the beauty of West Virginia and the experiences of West Virginia artists who create in Appalachia.

Keywords: Appalachian, Magazine, Photography, Graphic Design, Artists

UGP-05

Title: Brotherhood of Sleeping Car Porters

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Abstract
The Brotherhood of Sleeping Car Porters was the first labor organization led by African Americans to receive a charter in the American Federation of Labor. They were founded in 1925, making 2025 the 100-year anniversary of the organization. This landmark union was a beacon of progress during a time of systemic racial discrimination, offering African American workers a collective voice and a platform to fight for better wages, improved working conditions, and dignity in the workplace. The porters, who primarily worked for the Pullman Company, endured long hours, low pay, and the constant indignity of racial prejudice. Despite these challenges, the Brotherhood, under the leadership of A. Philip Randolph, galvanized the labor movement and became a key player in the broader struggle for civil rights. Their efforts not only improved the lives of sleeping car porters but also paved the way for future labor rights victories for African Americans and other marginalized groups. Celebrating the centennial of the Brotherhood of Sleeping Car Porters is an opportunity to honor their legacy and reflect on their contributions to labor and civil rights movements. Their unwavering determination and remarkable achievements continue to inspire new generations in the ongoing fight for justice and equality.

Keywords: Poster

UGP-06

Title: African Americans & Labor: Roy Clay Senior

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Research Sponsor: Dr. Carter G. Woodson Lyceum

Abstract
My poster focuses on the life of Roy Clay Senior and his contribution to computer technology. As a graphic designer, I believe it is important to recognize those who had an influence regarding my career. I have been doing a lot of research regarding on advancements in technology and the internet. When I came across Roy Clay, his story fascinated me and I wanted to know more. Clay has been an unstoppable force in his career. I wanted to represent this by including the computers that he worked on in the background of this piece, while having him be apart of the foreground. My intention is for the audience to focus on the person, not just their work. With his legacy playing a role in my creative field, I thought I would incorporate a similar style to the pieces I made relating to technological advancements. I also added in a brief summary of Clay's life on the poster for anyone else who is interested in learning more about the "Godfather of Silicon Valley"

Keywords: Roy Clay, red, blue, pixel

UGP-07

Title: Revolutionizing Product Testing and Consumer Feedback with Augmented Reality (AR): A New Era of Immersive Innovation

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Research Sponsor:

Abstract
Augmented Reality (AR) continues to transform online shopping, making it essential to understand the factors driving purchase intention in AR-driven retail experiences. This study examines the long-term effects of trust, perceived risk, informativeness, personalization, and intention to co-create value on consumer decision-making. Using an experimental approach, we explore how AR features enhance trust and informativeness while mitigating perceived risk, ultimately shaping purchasing behavior over time and across different product categories (high-cost vs. low-cost). Informativeness plays a crucial role in reducing uncertainty and strengthening consumer trust, reinforcing AR's effectiveness as a decision-support tool. These findings emphasize the need for strategic AR design that balances personalization and risk reduction to maximize consumer engagement and long-term adoption. This study provides valuable insights for retailers seeking to enhance AR-driven shopping experiences, fostering deeper consumer involvement, trust, and loyalty.

Keywords: Augmented Reality (AR), Personalization, Purchase Intention, Trust, Perceived Risk

UGP-08

Title: The Effects of Mandated Healthcare on Mental Health

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Research Sponsor:

Abstract
Although mental health is an integral aspect of overall well-being, access to mental health services in the United States remains uneven despite policy advancements. This study examines the impact of mandated healthcare policies, including the Affordable Care Act and subsequent state-level mandates, on mental health outcomes among adults aged 18 to 64. Using a dataset spanning from 2010 to 2023 from 14 states and the District of Columbia, this study employs a regression panel, data regression, and difference-in-differences methods to evaluate the relationship between healthcare mandates and mental health.

The findings reveal that states with mandates report higher rates of mental illness, which can be attributed to improved access to care and better diagnosis rates. Additionally, variables such as healthcare costs per person, poverty rates, and average income significantly affect mental health outcomes. However, implementation challenges and disparities persist across regions.

Keywords: Mandated Healthcare, Mental Health, Affordable Care Act

UGP-09

Title: Balancing Personalization and Privacy: The Impact of AI-Driven Marketing on Consumer Trust and Loyalty

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Research Sponsor: N/A

Abstract
Artificial intelligence (AI) is reshaping marketing by enabling personalized customer experiences, yet its implementation raises concerns about privacy and algorithmic bias. This research examines the trade-offs between AI-driven personalization and its corresponding costs, such as privacy risks and biases, to understand their impact on customer satisfaction and brand loyalty. While AI strengthens consumer engagement through tailored recommendations and services, ethical concerns about data collection and transparency may influence trust and long-term loyalty. This study utilizes a mixed-method approach by combining surveys and case studies examining consumer perceptions of AI-driven personalization through various digital platforms. The expected findings imply that while personalization positively influences satisfaction and loyalty, privacy concerns and biases can diminish trust if not managed correctly. Transparency in AI applications and ethical data practices are crucial to consumer confidence. The implications of this research show the need to strike a balance between leveraging AI to enhance customer experiences and ensuring responsible data practices. Prioritizing ethical implementation, consumer consent, and bias mitigation strategies increases the chance for organizations to foster long-term customer relationships. This study contributes to the ongoing discussion on AI ethics in marketing and gives insights on optimizing AI-driven personalization while sustaining consumer trust and satisfaction.

Keywords: Artificial intelligence, Customer satisfaction, Personalization, Trust, Brand loyalty

UGP-10

Title: Design and Fabrication of Biodegradable Bone Tissue Scaffolds Based on the Nuclear Pasta Theory

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Research Sponsor: NSF Award # OIA-2327460

Abstract
Globally, around 2.2 million bone graft procedures are performed annually, with costs reaching approximately $664 million as of 2021. The number of surgeries to repair bone defects is projected to increase by about 13% each year. However, traditional bone grafts often carry risks such as donor site morbidity and limited availability, driving the need for innovative solutions. This study explores the fabrication of biodegradable bone tissue scaffolds inspired by the nuclear pasta theory using extrusion-based Fused Deposition Modeling (FDM). The nuclear pasta theory, which describes complex geometrical formations within neutron stars, serves as a novel source of inspiration for designing scaffolds with enhanced mechanical properties and optimized porosity. Two bio-based, biodegradable polymers, Luminy LX175 and ecoPLAS, were used to fabricate scaffolds via an in-house filament extrusion process utilizing the Filabot EX6 system. The extrusion parameters were optimized to achieve a consistent filament diameter of 1.75 mm suitable for 3D printing on a Creality K1C printer. Seven scaffold designs were developed, including five based on Triply Periodic Minimal Surfaces (TPMS) and two inspired by nuclear pasta configurations—namely "lasagna" and a hybrid "lasagna-spaghetti" structure. The scaffolds were evaluated for their mechanical properties using uniaxial compression testing. Results showed that TPMS-inspired designs generally achieved a favorable balance between porosity and mechanical strength, while the nuclear pasta-inspired designs exhibited unique anisotropic and isotropic compression characteristics. The study concluded that nuclear pasta-inspired scaffold architectures exhibit unique mechanical properties and porosity characteristics, emphasizing their potential for future optimization in bone tissue engineering applications. Additionally, these structures can be further reinforced through material modifications or hybrid scaffold designs to enhance their load-bearing capabilities. This work demonstrates the potential of using bio-inspired designs in conjunction with sustainable, biodegradable materials for bone tissue engineering. Future

research will focus on optimizing co-extrusion techniques and exploring composite materials to further enhance scaffold properties for clinical applications.

Keywords: Regenerative Medicine, Bone Tissue Engineering, 3D Biofabrication, Scaffold Design, Nuclear Pasta

UGP-11

Title: A Computational Investigation of a Non-Homogeneous Elastic Material Undergoing Wave Propagation

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Research Sponsor: ERDC

Abstract
When engineers design structures, accurately analyzing the transient response under dynamic loading conditions is a critical aspect. This primarily constitutes studying the wave propagation and the vibratory response of the structure. This is particularly important in inhomogeneous structures such as composite materials. Experimental methods can provide a method of detailed study of such phenomena. However, experimental testing is often both time-consuming and expensive. Computational methods provide an easy alternative in addressing this, since they can be quite efficient in estimating a first approximation numerical solution to great accuracy, which can be then followed by fewer experimental tests required to validate the numerical solution. Finite Element Modeling (FEM) is one such computational method of solving problems of structural mechanics. In this study, we utilize a commercial FEM software, ABAQUS, to investigate the wave propagation characteristics in a non-homogeneous domain comprising of two layers with dissimilar material properties, under forced response. Specifically, this study focuses on phenomena such as energy transfer and wave refraction at the interface between the two layers.

Several dynamic simulations will be employed, modeling different geometric characteristics, material definitions and loading properties. These numerical solutions will investigate the process of energy transfer between the layers due to wave refraction through the interface and correlate them to the geometric and material properties of the model. The study will enable a better understanding of the wave propagation phenomenon in such layered media and provide an accurate guideline for economic designs of composite and layered material under different dynamic loading scenarios.

Keywords: Propagation, Energy Transfer, FEA, Abaqus

UGP-12

Title: NfKB1 is elevated in the caudate nucleus with AD and PD.

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Research Sponsor: WV Space/NASA

Abstract
Alzheimer's Disease (AD) and Parkinson's Disease (PD) are neurodegenerative disorders marked by mitochondrial dysfunction and chronic inflammation. The transcription factor NF-κB1 exhibits dual roles in neuroprotection and neuroinflammation, depending on its activity within neurons or glial cells. While GLP-1 receptor (GLP-1R) agonists are recognized for their neuroprotective properties in AD and PD, the impact on gene expression in the aged human brain remains insufficiently understood. In this study, RNA-sequencing data from human postmortem caudate nucleus samples, comprising controls (n=5), AD (n=6), and PD (n=3) patients, were analyzed. Principal Component Analysis (PCA) identified FKBP and MT-ATP6P1 as genes with significant variability, underscoring mitochondrial dysfunction. Hierarchical clustering revealed that TNFα signaling via NF-κB was a major dysregulated pathway. Notably, elevated transcription factors NFE2L2 (NRF2) and NF-κB1 were correlated with reduced expression of GLP-1R and SLC25A6, suggesting a compensatory response to oxidative stress. Additionally, increased PLCG2 expression in microglia implicated a significant role in immune signaling and neuroinflammation. Importantly, a 10-fold reduction in HbA1 (hemoglobin) RNA levels was observed in both AD and PD brains, indicating impaired oxygen transport and heightened susceptibility to cellular stress. These findings propose potential biomarkers for neurodegeneration and therapeutic targets focused on modulating inflammation and mitochondrial function in AD and PD.

Keywords: NfKb1, neuroinflammation, the caudate nucleus, Alzheimer's disease, Parkinson's disease

UGP-13

Title: Hybrid 3D Printing and Electrospinning Platform for Multi-Layered Biomimetic Scaffolds

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Research Sponsor: N/A

Abstract
Tissue engineering aims to create biomimetic scaffolds that replicate the structural and functional properties of native tissues to support cell growth and regeneration. A critical challenge in this field is fabricating complex, hierarchical scaffolds that mimic the extracellular matrix (ECM). To combat how traditional methods often fall short in achieving the level of precision and structural complexity required for effective tissue engineering applications, electrospinning has emerged as a powerful technique for producing nanofibrous scaffolds with ECM-like characteristics. We have developed an innovative 3D bioprinter capable of integrating additive manufacturing and electrospinning techniques to fabricate complex, multi-layered biomaterial scaffolds. The system sequentially prints layers of biomaterial using a precision extrusion mechanism, followed by the electrospinning of nanofibers directly onto the printed layer. This alternating process of extrusion and electrospinning is repeated to create scaffolds with tunable structural and functional properties, mimicking the micro- and nanoscale features and hierarchical architecture of the ECM. The resulting constructs demonstrate enhanced mechanical strength, controlled porosity, and a biomimetic microenvironment conducive to cell adhesion, proliferation, and differentiation. This hybrid fabrication approach opens new avenues for creating advanced scaffolds for tissue engineering and regenerative medicine applications.

Keywords: Electrospinning, 3D Bioprinting, Biomimetic, Nanofibers, Cell Scaffolds

UGP-14

Title: Enhancing Railway Safety: A Machine Learning Approach for Automated Detection of Missing Track Bolts

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Research Sponsor: US Army Corps of Engineers - Engineer Research and Development Center

Abstract
Railways are a critical component of transportation infrastructure, enduring significant physical stress daily due to the massive weight of trains and their cargo. This constant use can lead to the wear and tear of railway components, posing safety risks. One essential part of the railway infrastructure is the track bolts, which secure the rails in place, ensuring safe train traversal and preventing derailments that could result in severe injuries to passengers.

This study investigates a machine learning algorithm approach to automatically detect missing track bolts from image and video data. The primary objective is to develop an algorithm capable of accurately identifying missing bolts on railways, thereby mitigating safety risks associated with poorly maintained tracks and streamlining maintenance processes. Various machine learning algorithms are evaluated using a specially curated dataset for detecting missing track bolts. These algorithms are optimized to achieve the highest levels of efficiency and confidence. This innovative approach enhances railway safety by providing a faster and more efficient tool for detecting missing track bolts, ultimately contributing to the overall reliability and safety of railway operations.

Keywords: Machine Learning, Artificial Intelligence, Object Detection, Railway Safety

UGP-15

Title: Automated Railway Crack Detection Using Machine Learning: Analysis of Deep Learning Approaches

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Research Sponsor: Engineer Research and Development Center

Abstract
Detecting defects in railway tracks, particularly small cracks or gaps, is traditionally a labor-intensive task. By leveraging machine learning, this process can be automated and accelerated, reducing both time and costs. This paper evaluates several prominent deep learning models for identifying railway cracks and examines the key factors influencing the training process. While our primary focus is on various versions of the You Only Look Once (YOLO) object detection model, we also explore the Residual Networks model. Our findings indicate that YOLOv5 and YOLOv9 achieve high crack detection accuracy, with F1-scores of 0.92 and 0.91, respectively. These results underscore the efficacy of deep learning models in detecting and classifying cracks, thereby potentially lowering labor costs. Additionally, we employ Explainable AI techniques to elucidate the models' decision-making processes in crack detection. By automating the detection of railway track defects, we can significantly enhance the efficiency and reliability of railway maintenance. The use of deep learning models, particularly the YOLO series, has shown promising results in accurately identifying even the smallest cracks. This not only speeds up the inspection process but also ensures a higher level of safety by detecting potential issues before they become critical. The integration of Explainable AI techniques further adds value by providing insights into how these models make decisions, which is crucial for gaining trust and improving the models. Overall, our research highlights the potential of advanced machine learning techniques to revolutionize railway maintenance, making it more cost-effective and reliable.

Keywords: Railway, Crack detection, Computer vision, Deep learning, Explainable AI (XAI)

UGP-16

Title: Post-Drainage Methane Capture in Coal Mining: A Techno-Economic Model for Sustainable Energy Solution in Appalachia

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Research Sponsor: EPA CPRG

Abstract
Coal mining is critical for energy supplies in the Appalachian region, however, it is a great contributor to greenhouse gas emissions such as methane. Ventilation systems (VAMs) and degasification are the biggest methane emission contributors. These methane emissions have the potential to be mitigated into an energy source to help power the mine itself or power the local community around it. Methane emissions caused by degasification drilling methods such as directional horizontal drilling or vertical boreholes can be captured and processed through a gas turbine to generate this electricity. A multi-variable code is being created to generate a techno-economic model (TEM) that illustrates the cost of implementation of these technologies as well as the energy generated and methane emission reduction.

Methane can be captured from coal mines and converted into energy including pre- and post-drainage options, however, pre-drainage methods are implemented before mining occurs, typically 2-7 years. Since these mines in West Virginia are already operating, we are looking into post-drainage options. Once the methane is captured through post-drainage, it is processed through a gas turbine. The three main parts of a gas turbine include the compressor, the combustion system, and the turbine. The compressor pressurizes the air it draws in at fast speeds, then the combustion system injects fuel that mixes with the air and is burned at very high temperatures. Once this expands through the turbine, it is composed of various blades driving the compressor to draw pressurized air into the combustion area and then spin the generator to produce electricity.

Economic and technical ranges have been found to develop the TEM. This data is then used to create a code that allows various scenarios that demonstrate the cost and production of this methane mitigation.

Keywords: Coal mining, techno-economic modeling, methane emissions, gas turbines, sustainability

UGP-17

Title: Selective Elevation of RelB, but Not NfκB1, in the Caudate Nucleus of Hydrocephalus Patients

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Research Sponsor: WV Space/NASA

Abstract
Hydrocephalus is a neurological condition characterized by abnormal cerebrospinal fluid accumulation, often leading to significant cognitive and motor impairments. However, the molecular mechanisms underlying hydrocephalus-associated neuropathology remain poorly understood. To investigate transcriptomic alterations associated with hydrocephalus, we performed bulk RNA sequencing (RNA-seq) on human postmortem caudate nucleus tissue. Our analysis revealed a selective elevation of RelB, a key component of the non-canonical NF-κB signaling pathway, in hydrocephalus, whereas NfKb1, a critical component of the canonical NF-κB pathway, remained unchanged. These findings suggest a potential role for RelB-mediated neuroinflammatory signaling in hydrocephalus pathogenesis. Given the involvement of non-canonical NF-κB signaling in immune regulation and neuronal survival, targeting RelB may offer novel therapeutic avenues for managing hydrocephalus-related neuroinflammation and cognitive decline. Further studies are warranted to elucidate the mechanistic implications of these findings and their relevance to neurodegenerative processes.

Keywords: RelB, neuroinflammation, the caudate nucleus, Hydrocephalus, Alzheimer's disease

UGP-19

Title: Optimization of Coil Handling and Sampling Processes to Enhance Efficiency in the Hot Mill

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Research Sponsor: Nucor Steel West Virginia

Abstract
This project aims to optimize the coil handling and sampling process within the Hot Mill to improve efficiency and minimize production delays. After a slab undergoes the Hot Mill process, it is coiled and secured at the down coiler before being transported to either the sampling station or the weighing station via transfer cars, shuttle cars, and walking beams. Since only select coils require sampling, some are directed to the sampling station, while others proceed directly to weighing.

For coils requiring sampling, the process involves de-banding, partial uncoiling, sampling, re-banding, and subsequent transfer to the weighing station. However, this procedure can create congestion due to the time-intensive nature of sampling, leading to a shortage of available transfer cars for incoming coils. This bottleneck is critical, as it can disrupt material flow upstream, affecting operations as far back as the Caster and ultimately impacting overall production efficiency.

The primary objective of this project is to develop a production calculator that determines the maximum number of coils that can be processed and sampled before bottlenecking occurs. Additionally, process improvements will be designed to enhance the safety and efficiency of coil sampling. Upon project completion, the revised sampling process will be more streamlined, and Nucor will have a tool capable of calculating production times for various steel gauges and widths.

Through this initiative, Nucor seeks to implement an innovative solution that enhances sampling efficiency, reduces congestion, and ensures the safe and effective handling of samples within the Hot Mill.

Keywords: Production Congestion, Improved Efficiency, Operator Safety, Manufacturing

UGP-20

Title: Solar Panels at Penn State Health

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Research Sponsor: N/A

Abstract
Penn State Health is looking for a solution to the overbearing electricity usage throughout its campus. They have over 28,000 hospital admissions with one million outpatient visits a year, a staff of 12,000, and 17,000 students and trainees; as well as, 44 university-owned buildings and 2 housing complexes on one main electrical substation, while the east side of campus has two separate services. Penn State Health has provided a few plots of land to become solar panel fields to lessen the cost of electricity.

Based on the land provided, half of the team is designing how many rows and columns will fit on the plot to be the most efficient for offsetting electricity consumption. The hospital consumes the most based on the data analytics given to the team from the previous year. This half of the team is also tasked with a power purchase agreement, solar lease, and potential purchase proposal for the campus. The largest section of land that Penn State Health provided has a walking path that cuts through it. The team plans to install raised solar panels where students, faculty members, and or other pedestrians to still utilize the grass or pavement underneath but have shade since there are barely any trees in that area.

The other half of the team is debating on proper storage for the energy the solar panels collect and convert. This half originally implemented capacitors into the solar panels to store the energy, but ran into an issue that they do not store long-term. The team found a new solution, the capacitors would help with the conversion of solar energy to renewable energy and then transfer energy into a battery. The battery would then run through transformers for the hospitals and other on-campus buildings at Penn State Health to consume.

Keywords: Renewable Energy, Capacitors, Electricity

UGP-21

Title: Realistic Simulation of Swarm Drone Control Using AirSim

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Research Sponsor: NASA West Virginia Space Grant Consortium

Abstract
This project explores AirSim, a high-fidelity drone and vehicle simulator based on Unreal Engine, for simulating swarm drone control in realistic environments. The project demonstrates the implementation and evaluation of swarm-control algorithms by combining MATLAB-based coordinate calculations with Airsim's simulation capabilities. A focus is placed on the Swarm Centroidal Voronoi Tessellation (SwarmCVT), a path-planning algorithm we designed to optimally guide multiple drones from initial to target locations within an obstacle-deployed environment. The simulation framework supports adjusting key parameters, such as drone speed, obstacle configuration, and environmental conditions, to enhance scenario realism. Moreover, the system generates demonstration videos, images, and predictive analytics, estimating real- world traversal times for drone paths in three-dimensional spaces. The simulated environment also allows the control of a physical drone simultaneous with a simulated counterpart drone for physical demonstrations. This approach provides a robust platform for evaluating the practical viability of swarm-control algorithms in dynamic and complex environments.

Keywords: drone, Airsim, simulation

UGP-22

Title: A YOLO-Based Semi-Automated Labeling Approach to Improve Fault Detection Efficiency in Railroad Videos

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Research Sponsor: U.S. Army Engineer Research and Development Center (ERDC), grant #W912HZ249C006

Abstract
Manual labeling for large-scale image and video datasets is often time-intensive, error-prone, and costly, posing a significant barrier to efficient machine-learning workflows in fault detection from railroad videos. This study introduces a semi-automated labeling method that utilizes a pre-trained YOLO model to streamline the labeling process and enhance fault detection accuracy in railroad videos. By initiating the process with a small set of manually labeled data, our approach iteratively trains the YOLO model, using each cycle's output to improve model accuracy and progressively reduce the need for human intervention.

To facilitate easy correction of model predictions, we developed a system to export YOLO's detection data as an editable text file, enabling rapid adjustments when detections require refinement. This approach decreases labeling time from an average of 2–4 minutes per image to 30 seconds–2 minutes, effectively minimizing labor costs and labeling errors. Unlike costly AI-based labeling solutions on paid platforms, our method provides a cost-effective alternative for researchers and practitioners handling large datasets in fault detection and other detection-based machine learning applications.

Keywords: YOLO, Labeling, AI

UGP-23

Title: Natural Cotton Electro-spinning

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Research Sponsor:

Abstract
Electrospinning of dissolved cotton provides a novel approach to creating extracellular matrix (ECM)-like nanofibrous scaffolds for tissue engineering applications. In this study, cotton fibers were chemically dissolved to produce a cellulose solution suitable for electrospinning. The process yielded uniform nanofibers with structural and mechanical properties mimicking the native ECM. These cotton-derived nanofibers exhibit excellent biocompatibility and support for cell adhesion and proliferation, making them promising candidates for applications such as wound healing, cartilage repair, and regenerative medicine. This research highlights the potential of utilizing natural cotton as a sustainable, cost-effective source for advanced biomaterials.

Introduction:

The extracellular matrix (ECM) is a critical component of the cellular microenvironment, providing structural support and biochemical cues essential for cell behavior, including adhesion, migration, proliferation, and differentiation (Hynes, 2009). Biomimetic scaffolds designed to replicate ECM characteristics have gained significant attention in tissue engineering and regenerative medicine due to their potential to promote cell growth and tissue repair. Among various fabrication techniques, electrospinning is a widely used method to create nanofibrous scaffolds with structural and functional similarities to the native ECM (Li et al., 2002).

Natural materials, such as cellulose derived from cotton, offer unique advantages in scaffold fabrication due to their biocompatibility, abundance, and mechanical strength (Klemm et al., 2005). Electrospinning of cellulose-based materials can generate nanofibers with tunable properties for diverse biomedical applications, including wound healing, cartilage repair, and vascular tissue engineering. In this study, cotton was processed into nanofibrous scaffolds through electrospinning, stabilized in acetic acid, and evaluated for its ability to support stem cell growth. The resulting scaffolds demonstrated ECM-mimicking properties, highlighting their potential for regenerative medicine applications.

Methods:

Cotton fibers were processed to form a solution suitable for electrospinning. The prepared solution was electrospun at a voltage of 20 kV to generate nanofibrous scaffolds. The resultant fibers were collected on a grounded collector and subsequently treated in acetic acid to stabilize their structure. The electrospun scaffolds were thoroughly washed to remove residual chemicals and sterilized prior to cell seeding. Human stem cells were cultured directly on the scaffolds in standard growth media under controlled conditions (37°C, 5% CO_2) to assess their biocompatibility and ability to support cell adhesion, proliferation, and differentiation. Cell behavior was monitored using microscopic imaging and viability assays.

Conclusions:

This approach produced nanofibrous scaffolds mimicking the extracellular matrix, providing an ideal environment for stem cell attachment and growth.

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Keywords: Biomaterials, Electro-spinning, Nanocotton, Novell

UGP-24

Title: Design, Optimization, and Enhancement of the Glass Manufacturing Process for BLENKO Company

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Research Sponsor: Marshall Advanced Manufacuring Center, BLENKO Glass Company

Abstract
In conjunction with Marshall University College of Engineering and the MAMC, we are planning to help Blenko glass transition to a more mechanized process of glassblowing mold production through utilization of CNC machines. Blenko has been outsourcing their mold supply from third party manufacturers due to their master mold maker retiring with no successor. Because the process takes a lot of skill and training, they are interested in changing their workflow to reflect a more modern approach. The goal of the project is to enhance the mold fabrication process by adding a CNC milling machine.

In terms of approach, we intend to help Blenko acquire the means of manufacturing all their molds in house, as well as engineering a safe and repeatable process that the necessary employees will be able to be trained in sufficiently. After meeting with Blenko we were able to get a good idea of the project scope, specifications, and problems with the production, and we intend to automate their decision making as well as design solutions to setbacks that will ease their transition into the modern side of glass blowing.

Through our initial research, this project will supply Blenko with valuable insight and experience so that the company can succeed in manufacturing their own glassblowing molds in the provided time frame. In terms of outcomes, we anticipate to gather the required information to design a safe and efficient process. With the new implement of the CNC machine, BLENKO will be creating an impact on the glass blowing industry.

Keywords: Glass Production Manufacturing, Process Optimization

UGP-25

Title: Iterative design process for obtaining a wire insulation sample.

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Research Sponsor: Service Wire Company

Abstract
This project is a senior design capstone spearheaded by a group of Marshall University engineering students in collaboration with Service Wire Company, a local wire manufacturer and distributor. During the manufacturing process at Service Wire, plastic insulation is extruded onto bare copper wire, which requires that the operators manually cut a sample of plastic insulation for quality control purposes. The goal of this project is to design a solution that eliminates hand injuries as a result of this manual cutting process, enhancing safety and delivering quality results. The design process involves generating and refining solutions, using the principles of iterative design to improve ideas, and prototyping any tools or items that are necessary for the solution. The project also involves collaborating with industry advisors at Service Wire, as well as other local industry experts. At the end of the two-part capstone project, the goal is to have a working prototype as a result of the iterative design process. This prototype should meet the needs of Service Wire as a company and provide a viable solution to the difficulties of the aforementioned situation. Potential for future work could take the form of further refining or automating the initial design, enhancing the value brought to Service Wire as a company, and providing additional experience for student learning.

Keywords: wire, plastic, prototyping, tool, engineering

UGP-26

Title: PCL/Graphene Nanocomposite Scaffolds as Tools for Delivering Electrical Cues to Neural Cells

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Research Sponsor:

Abstract
In recent years, low-voltage electrical stimulation (ES) has been shown to play a critical role in regulating cell proliferation, differentiation, adhesion, and migration. This provides ample opportunity for regenerative medicine and tissue engineering applications. Consequently, there is significant interest in developing materials capable of delivering ES effectively to cells both in vitro and in vivo. In this work, we have fabricated electrospun polycaprolactone (PCL)/graphene nanofibrous scaffolds and characterized their electrical conductivity and physical properties, demonstrating their suitability as conductive platforms for cell stimulation. Additionally, we have designed and calibrated an apparatus for conducting pulsating low-voltage ES throughout the percolating conductive network that is PCL/graphene. Scanning electron microscopy revealed consistent fiber morphology and effective dispersion of graphene within the scaffold. Epifluorescence microscopy confirmed neural cell adhesion, providing preliminary evidence of biological compatibility. These findings suggest that the developed conductive PCL/graphene scaffolds hold substantial promise for neural tissue engineering applications requiring precise electrical stimulation.

Keywords: biomaterials, tissue engineering, nanofabrication, neuroscience

UGP-27

Title: Investigated Novel TPMS Porous Bone Scaffolds Using Parametric Design for Tissue Engineering

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Research Sponsor: National Science Foundation (NSF)

Abstract
Bone tissue engineering (BTE) focuses on materials and devices that mimic natural bone for regenerative treatment. A key component to regenerative treatment for bone defects, fractures, and diseases is bone scaffolds. Despite significant research, challenges remain in improving mechanical strength and biological performance of bone scaffolds. This study developed and analyzed 10 novel bone scaffold designs created with Rhino 7 and the Grasshopper extension. The scaffold designs were generated by modifying well-known scaffold design equations, transformed into 3D models, and printed multiple times using Simubone, Polycarbonate, and EZPC+CF. Biological, fluidical, and compressional analyses were conducted to evaluate scaffold performance. The biological analysis focused on the cell viability of each scaffold, the fluid dynamics were simulated using ANSYS software, and the compression test required a compression machine to determine the best material-based scaffold design.

Furthermore, the design parameters were investigated to find the most optimal design with the best biological, fluidical, and compressional attributes, while taking printability into consideration. This was conducted through changing each design parameter with numbers varying around the original value. The designs were 3D printed using the same biomaterials. Some modified scaffold designs were not printable nor testable highlighting the interaction between design parameters and material properties. This study provides insights into scaffold optimization for improved mechanical and biological outcomes in bone regeneration.

Keywords: Bone Tissue Engineering, Advanced Manufacturing, Regenerative Medicine

UGP-28

Title: Automated Detection of Track Gauge Deviations Using Video and Depth Cameras with Machine Learning

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Research Sponsor: U.S. Army Engineer Research and Development Center

Abstract
Ensuring the safety and reliability of railway infrastructure is crucial for transportation systems worldwide. This research introduces a novel approach to detecting horizontal and vertical track height deviations in railways using video and depth cameras combined with machine learning. Track gauge deviation refers to the change in track gauge values from the expected to the current value. The primary objective is to reduce the time, human labor, and costs associated with inspecting large sections of railway for track gauge deviation by automating the process with machine learning. A dataset of relevant track images is selected and augmented using techniques such as grey scaling, blurring, brightness changes, and the addition of noise. This dataset is used to train several machine learning models. Various detection strategies were developed and considered, and a combination of converting pixels to real-world measurements and utilizing depth camera data was chosen. Preliminary results from our depth camera demonstrate promising levels of accuracy for estimating track gauge deviation. This machine learning approach offers a cost-effective and efficient solution for detecting track gauge deviation, thereby maintaining the safety of our railroad infrastructure.

Keywords: Computer Vision, Machine Learning

UGP-29

Title: Multi-Camera Gesture Recognition

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Research Sponsor: Marshall University Undergraduate Creative Discovery and Research Scholar Award Program

Abstract
Gesture recognition enables more intuitive human-machine interaction by allowing systems to interpret hand signs. However, many existing methods assume that the hand is facing directly toward the camera, which can significantly reduce recognition accuracy when the hand is viewed from the side. To overcome this limitation, we propose a dual-camera gesture recognition system that reconstructs 3D hand landmarks to improve classification performance. Our approach utilizes Mediapipe Hands to extract 2D landmark positions from two different camera perspectives. These 2D landmarks are then triangulated using OpenCV to generate 3D hand landmarks, which provide a more accurate representation of hand position and orientation. The 3D landmarks are subsequently processed using a Support Vector Machine (SVM) to classify different hand gestures. By leveraging multiple viewpoints and 3D reconstruction, this method aims to enhance gesture recognition robustness across a wider range of hand positions and orientations, making gesture-based interactions more reliable in real-world applications.

Keywords: Gesture Recognition, MediaPipe, Computer Vision

UGP-30

Title: Enhancing Drone Navigation and Control: Obstacle Avoidance, Gesture-Based Piloting, and 3D Mapping

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Research Sponsor: NASA West Virginia Space Grant Consortium, NASA Agreement #80NSCC20M0055

Abstract
Drones have emerged as versatile tools across numerous industries, from power to emergency response, yet their operation often requires significant manual input and is hindered by challenges such as collision risks and limited control methods. To address these challenges, our research focuses on the development of a multi-functional drone control system incorporating advanced obstacle avoidance, gesture-based controls, and 3D mapping capabilities.

The obstacle avoidance algorithm uses real-time ToF (Time of Flight) sensor data to detect and navigate around physical barriers, significantly reducing the risk of crashes. Gesture control introduces an intuitive method for piloting drones, enabling users to command the drone using simple hand movements, which is particularly advantageous in scenarios where traditional control interfaces are impractical. Additionally, the integration of 3D mapping enhances situational awareness by providing a visual representation of the drone's flight path and its surrounding environment, making it a useful tool for tasks requiring precise navigation or spatial analysis.

Potential applications of this system are vast, including search-and-rescue missions in disaster-stricken areas, inspections of hazardous industrial sites, and delivery operations in urban environments. By combining cutting-edge algorithms with user-centric control methods, our research aims to contribute to safer, more efficient, and more accessible drone operations, ultimately expanding both the public and private sectors interest in drones. This work highlights the transformative potential of drones when equipped with intelligent systems tailored to real-world challenges.

Keywords: Drone, Autonomous, Obstacle-Avoidance, Gesture-Control, 3D-Mapping

UGP-31

Title: Implementation of Procedural Content Generation Within a 2D Arcade Style Video Game

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Research Sponsor:

Abstract
Procedural Content Generation (PCG) is the use of an algorithm to generate game content that would otherwise be created manually. The use of PCG in video game development traces its origins to early PC games of the late 1970s and early 1980s. Notable titles utilizing PCG from this period include Beneath Apple Manor (1978) and Rogue (1980) with the latter spawning a new video game genre referred to as “roguelike”. Throughout the years, the use of PCG in video game development has expanded beyond just the roguelike genre as developers began to use PCG as a general tool for creating expansive and unique virtual environments. This Senior Capstone project demonstrates the use of PCG within the Unity game engine to create a 2D arcade style video game with unique and randomized map layouts. To generate these maps, an algorithm was created in C# that randomizes a set of tiles on a 64x64 grid using the Perlin noise. In the context of the Unity game engine, Perlin noise is a pattern of values that gradually increase and decrease across a two-dimensional plane where the location of the values is randomized based on a given seed. When given a 2D vector, the algorithm returns a result between 0 and 1, which can then be used to determine whether or not to place a particular tile at the given vector location on the grid. When the result is less than 0.65, then a grass tile is placed, otherwise a water tile is placed. Hill tiles are placed over grass tiles whenever the result is less than 0.3, and decorative foliage tiles are placed when the result is less than 0.2. This results in a map that changes with each play-through and level, resulting in the player being exposed to novel environments with the goal of increasing replayability and player experience. Once the development is completed, the game will be tested with users to observe how it affects player experience.

Keywords: Game Development, Procedural Content Generation, Programming

UGP-32

Title: Design and Manufacturing of WV Native Hardwood Glasses Frames - Timber Optical

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Research Sponsor: Marshall Advanced Manufacturing Center and WV Eye Associates

Abstract
Timber Optical is an endeavor to scale production of wooden eyeglasses made from WV hardwoods (frames, earpieces). These products would be included for sale in several WV Eye Associates office locations, at which an array of eyeglasses are currently offered. In past attempts to produce these wooden frame glasses MAMC has encountered challenges with their manufacturing methods compromising the structural integrity of the frames. The soft nature of the resin infused wood makes CNC Machining of the product difficult without the frames breaking or slipping from the vice grip mid-process.

The challenge is to modify the frame design as needed to increase structural integrity and through iterative manufacturing develop a time and cost-effective way to rapidly produce the glasses frames. Once a successful frame is produced create and write up a standardized method of manufacturing the product so that it can be replicated.

The initial design approach is to manufacture the frames in a three step process: material processing, CNC Machining of the frames, and CNC Machining of the earpieces. The internal core of the frames will be a type of metal or 3D printed to provide strength to the frames, while the outside will be a type of veneer from a WV native supplier.

The expected outcome is to produce one style of glasses using CNC machining, and then up scale the production for mass manufacturing. The entire process will need to be documented so that the glasses can be reproduced by a hired machinist in the future.

The broader impacts of this project are to resell the glasses as a novelty item in eye doctor offices across West Virginia, made mostly from WV materials.

Moving forward more research will be done on types of woods that will be best to manufacture from, and begin iterative prototyping.

Keywords: Manufacturing, Iterative Design, Prototyping, Machining

UGP-33

Title: Repeated Toe Rise Exercise Decreases Achilles Tendon Stiffness.

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Research Sponsor: n/a

Abstract
Introduction:

Dancers face a higher risk of Achilles tendon (AT) injury than nondancers. Higher tendon stiffness has been associated with an increased risk of tendon injury and has been shown to decrease with exercise. The effect of an acute bout of exercise on AT stiffness in dancers has not been studied. We aim to measure AT stiffness using shear wave elastography to determine the effects of exercise on AT stiffness in dancers.

Methods:

Twenty people (17 female, 3 male, 21±2.2 years, 168±7.6cm, 79±21Kg) without AT or ankle injury participated in this repeated-measure study. Informed consent was obtained before testing; the Marshall IRB (IRB net#2200915) approved the study. B-mode and shear wave elastography ultrasound images of the participant's AT were taken before and after a bout of toe raise exercises. Paired T-tests were performed to test differences in relative strain, and plantar flexion strength.

Results:

Plantar flexion strength did not differ (P>0.05) following the toe rise exercises. Dorsi flexion strength did not change on the right side (P>0.05) but did decrease on the left (mean difference = 0.45Kg, P = 0.03) following the toe rise exercises. Right side dorsiflexion and plantar flexion range of motion was not affected (p > 0.05) by the toe rise exercise. Both planter flexion (mean difference = 3.35°, P = 0.04) and dorsiflexion (mean difference = 2.6°, P = 0.02) decreased following the toe rise exercise. The ankle resting position did not change (P > 0.05) on either the right or left sides following the toe rise exercise. No differences (P > 0.05) in Achilles tendon thickness or width between the neutral of dorsiflexed position before or after the toe rise exercise. The strain ratio decreased between the neutral and dorsiflexed positions on both the right (mean difference=0.18 ± 0.40Kg, P=0.05) and left side (difference= mean 0.25 ± 0.40, P=0.02) before the exercise. After the exercise bout the strain ratio on the left side decreased (difference=0.18 ± 0.37, P=0.01) in

the dorsiflexed position but did not change on the right-side (difference=0.04±0.31, P=0.54).

Conclusion:

The decreased strain ratio indicates an increase in tendon stiffness. The exercise bout decreased the tissue stiffness. Future work needs to determine the effect of repeated bouts of exercise on the AT.

Keywords: Maybe, Tendon injury, Exercise, Ultrasound elastography, Plantarflexion, Ankle

UGP-34

Title: The Effect of Head Rotation on Scapular Kinematics

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Research Sponsor: NA

Abstract
Head Rotation Has Negative Effects on Scapular Position during Arm Elevation.

Background: Scapular kinematics are affected by arm elevation, the scapula experiences upward rotation, external rotation, and posterior tilt arm elevation. Reduced upward rotation, posterior tilt and external rotation have been associated with increased risk of should injury. Previous studies have described scapular kinematics with no cervical rotation. The current study tested the hypothesis that head rotation will produce scapular kinematics associated with the development of rotator cuff injury.

Methods: Sixteen participants without shoulder injury took part in the investigation, all provided written informed consent. Motion tracking sensors were attached to the participant. Participants then performed 2 bouts of 5 unilateral right arm elevations with their head rotated to the right or left. Repeated measures ANOVA was used to tested difference in scapular position by arm elevation angle and head position.

Results: When the head was rotated away from the elevating arm the scapula was in greater internal rotation, anterior tilt, and less upward rotation than when the head was rotated towards the elevating arm ($P<0.05$) for both the right and left arm. Scapula posterior tilt and upward rotation was not affected by head position.

Conclusion: Head rotation away from the elevating arm increased internal scapular rotation and anterior tilt while decreasing scapular upward rotation. This scapular position is associated with the development of shoulder pain. Many occupation and sport actives require look away from an elevating arm. Future work needs to be completed to test the relationship between head position and shoulder injury.

Keywords: Shoulder, Motion Tracking, Impingement,

UGP-35

Title: Mid-Forearm Circumference Change in Novice Rock Climbers

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Sponsoring Institution: Exercise science
Research Sponsor: Marshall university

Abstract
Rock climbing is one of the most rigorous and intense sports in the athletic realm. These athletes must exhibit extreme levels of core and grip strength along with overall mental and physical resilience. This research study monitors 18 novice rock climbers over the course of six weeks. Researchers monitored the change of their mid-forearm circumference prior to intervention, compared it to post intervention data, and evaluated the change. The subjects were tasked with climbing two-times a week for a minimum of 30 minutes over the six-week period. The experimental data was collected by measuring the circumference of the largest part of the forearm, or mid-forearm in centimeters. The average pre-intervention mid-forearm circumference for the left arm was ~24.22 cm, and the average for the right arm was around ~24.27 cm. Posthumous to the climbing the subjects' data exhibited some changes in the circumference of the mid forearm. The average change prior to intervention in the right mid-forearm was an increase of ~0.18 cm with the range showing some increasing much as 1.2 cm and some decreasing -1.6 cm. The left mid-forearm exhibited a decrease on average of -0.11 cm, however the circumference decreased on average the left forearm presented large amounts of variability with some having an increase of 2.2 cm and some decreasing as much as -8.8 cm. The increase in variability in the left mid-forearm over the six-week period could imply specific factors acting on the left arm such as possible asymmetries in usage during the active climbing.

Keywords: Circumference change

UGP-36

Title: Pinch Grip Adaptations in Novice Rock Climbers

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Research Sponsor: NA

Abstract
This study follows a group of 18 subjects at Marshall University during a rock-climbing study. Data was gathered from the subjects before and after the rock-climbing intervention. When the rock-climbing intervention concluded, the pinch grip test numbers should increase. Data from the participants was gathered using a tape measurer, hand dynamometer, pinch grip test, goniometer, and hang board test. This article focuses on the pinch grip strength numbers from the participants. These testing methods were used to get a baseline test of the participant, and data was compared post-intervention. The population tested, was 18 college students (11 Female/8 Male, 19.8 ± 1.0 yrs, 171 ± 9.6 cm, 67.7 ± 14.2 kg). Participants did their climbing on the rock wall at the university's gym. During the intervention participants were to climb twice a week for 30 minutes during those sessions. There was not enough significance in the data for the hypothesis to be completely true. The 4th and 5th pad (ring and pinky) on the right hand had shown statistical significance (R4th, p= 0.040 and R5th, p= 0.010). The 4th pad on the left hand was very close to being statistically significant (L4th, p= 0.059). There was a positive change in the output of force by each finger after the intervention. The hypothesis, A rock-climbing intervention will increase pinch grip strength, was proven to be true for two fingers.

Keywords: Rock-climbing. Pinch. Grip. Adaptations

UGP-37

Title: Optimizing PCR Conditions for Accurate Genotyping of Genetically Modified Mice:

A Touchdown PCR Approach

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Research Sponsor: NIH R15HL145573

Abstract
Genotyping is essential for a laboratory working with genetically modified mice. Genetic modifications, such as gene knockout or insertion, require confirmation that newborn mice carry the correct edited gene. This is typically achieved using polymerase chain reaction (PCR) to amplify a small segment of genomic DNA containing the edited gene. To do this, we design primers that specifically recognize wild-type or mutated alleles. However, primers sometimes exhibit non-specific binding, leading to unwanted PCR products that complicate accurate genotyping. This issue may also arise when switching to a new PCR reagent kit. Here, using Atp1a1$^{+/-}$ mouse genotyping as an example, I investigated how to address this challenge. We previously used a PCR reaction composed of individually transferred components, including PCR buffer, polymerase, dNTPs, $MgCl_2$, primers, water, and mouse tail DNA. This process was time-consuming and labor-intensive. To streamline this work, we purchased the DreamTaq PCR Master Mix, a ready-to-use solution containing DreamTaq DNA Polymerase, optimized buffer, $MgCl_2$, and dNTPs, requiring only the addition of primers, DNA template, and water. However, under standard PCR conditions, we were unable to obtain a sharp band of the correct size. To resolve this, we employed touchdown PCR, a technique that begins with 10 cycles at an annealing temperature 5 °C higher than the standard reaction. In each cycle, the annealing temperature was reduced by 0.5 °C while maintaining constant denaturation and extension temperatures. This “touchdown” approach enhances primer specificity at higher temperatures. Following this, the PCR was run at a standard annealing temperature, typically 3–5 °C below the primers' Tm. Using this strategy, we successfully amplified the target DNA segment, producing a sharp, correctly sized band on an agarose gel. Our results demonstrate that an understanding of PCR principles enables successful optimization without the need for additional reagents.

Keywords: Genotyping, PCR, touchdown PCR

UGP-38

Title: Thymidine phosphorylase plays a mechanistic role in the development of obesity

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Research Sponsor: NASA Undergraduate West Virginia Space Grant Consortium

Abstract
Obesity is an independent risk factor for developing various metabolic disorders, including obesity, and West Virginia has the highest prevalence of obesity in the U.S. Our lab has found that thymidine phosphorylase (TYMP) levels are elevated in obese individuals, but its role in obesity remains unknown. We investigated this by feeding wild-type (WT) and Tymp–/– mice a Western diet (WD), beginning at 8 weeks of age for 8 weeks. TYMP deficiency dramatically reduced gains in body weight, liver weight, and visceral fat in male, but not female, mice. Additionally, the small intestine length was significantly greater in male Tymp–/– mice compared to WT, with no such difference observed in females. Male Tymp–/– mice also showed increased insulin sensitivity. Among tissues, TYMP expression was highest in the liver, followed by the lungs and small intestine. Fecal density was lower in male Tymp–/– mice on a WD, with no difference seen in those on a normal laboratory diet, suggesting that the feces of WD-fed male Tymp–/– mice may contain more fat. WD feeding increased TYMP and CD36 expression in the small intestine, while CD36 expression was markedly reduced in Tymp–/– mice. TYMP deficiency also attenuated CD36 expression in the liver of WD-fed mice. In conclusion, our data suggest that TYMP may play an important role in lipid metabolism, likely through upregulating intestinal CD36 expression, leading to increased lipid absorption and obesity development. Targeted TYMP inhibition may represent a novel anti-obesity therapy.

Keywords: Obesity, Thymidine Phosphorylase, CD36, small intestine

UGP-39

Title: Perceived Stress Levels and Course Load Busyness: Do Credit Hours Accurately Represent a Course Load?

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Research Sponsor:

Abstract
This study explores the correlation between stress levels, course load busyness, and enrolled credit hours among undergraduate students to assess if credit hours accurately represent busyness and guide academic advising. Building on prior research linking rigorous academics to increased stress (Ribeiro et al., 2020), it was hypothesized that both credit hours and perceived course load would be positively associated with higher stress. Participants were recruited at the Marshall University Student Center and completed an anonymous survey. The survey included questions on demographic data, enrolled credit hours, and ratings of stress and course load busyness on a scale of 1-10. Data analysis revealed a moderate, significant correlation between perceived course load busyness and perceived stress, but no significant correlation between credit hours and perceived busyness or perceived stress. Only 35% of students agreed that credit hours accurately represented course load busyness. Findings suggest factors beyond credit hours, such as individual course characteristics, time management skills, and external responsibilities, contribute to stress perceptions, challenging the assumption that more credit hours directly lead to higher stress. There is also application for advisors to consider factors beyond number of credit hours while advising students in their courses.

Keywords: Stress, undergraduate students, credit hours

UGP-40

Title: SARS-CoV-2 Spike Protein Increases the Incidence of Lung and Liver Cancer

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Research Sponsor:

Abstract
The COVID-19 pandemic has left millions of people in need of long-term care. It is crucial to consider and predict the long-term consequences that COVID-19 survivors may face, particularly 5 – 10 years after infection. For instance, the lungs of COVID-19 patients may develop fibrosis, a wound-healing process that leaves scarring. These fibrotic changes can increase the risk of lung cancer development. Recent studies have also highlighted the harmful effects of the SARS-CoV-2 Spike Protein (SP), which enhances platelet activity and thrombosis, among other effects. This poses a potential threat not only to COVID-19 survivors but also to individuals who have received COVID-19 vaccines. Thymidine phosphorylase (TYMP), known for its pro-angiogenic role in cancer, is highly expressed in the liver and lungs. TYMP is significantly elevated in COVID-19 patients and is linked to fibrosis in various diseases. We hypothesized that elevated TYMP levels following COVID-19 may contribute to post-recovery lung fibrosis, thereby increasing the risk of lung cancer. Using a mouse lung cancer model, we found that SP treatment not only elevated the incidence of lung cancer but also increased liver cancer occurrence. Deletion of TYMP in mice dramatically reduced these cancer incidences. Our study suggests that SARS-CoV-2 SP is pro-carcinogenic. COVID-19 survivors, particularly those with post-COVID-19 syndrome, should be closely monitored for the development of lung and liver cancers.

Keywords: COVID-19, SARS-CoV-2 Spike Protein, TYMP, Lung Cancer, Liver Cancer

UGP-41

Title: Faculty Support and Understanding Moderate Neurodivergence's Impact on Belonging and Transition Difficulty in Online Programs.

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Research Sponsor: N/A

Abstract
Neurodivergent students face challenges when transitioning to higher education, especially in online learning environments where academic support and understanding might be more limited. Research suggests that neurodivergent students report greater difficulty transitioning to new academic settings and have lower anticipated belonging compared to their neurotypical peers (Gillespie-Lynch et al., 2017). Faculty support and understanding can serve as protective factors, improving engagement and retention among neurodivergent students (Dwyer, 2020).

A self-report, cross-sectional survey with empirically validated scales was administered via Qualtrics to incoming Marshall University Online students in Fall 2023 and 2024, resulting in a final sample of n = 166 (79%) neurotypical, n = 40 (19%) neurodivergent, and n = 4 (2%) students who did not report their neurodivergent status.

Moderated regression analyses indicated that neurodivergent students had significantly higher anticipated transition difficulty and lower anticipated belonging. Faculty support significantly predicted greater belonging and lower transition difficulty. Further, neurodivergent students who anticipate being comfortable seeking support from faculty tend to report significantly higher levels of anticipated belonging than students who identify as Neurotypical. Neurodivergent students who do not anticipate being comfortable seeking support from faculty tend to report significantly lower levels of anticipated belonging than Neurotypical students. Neurodivergent students who anticipate having less understanding faculty tend to report higher levels of anticipated belonging than Neurodivergent students who anticipate more faculty understanding and Neurotypical students who anticipate less faculty understanding. Neurotypical students who anticipate more faculty understanding tend to report the highest levels of anticipated belonging.

Neurodivergent students tend to have less anticipated belonging when entering an online degree program. Student orientation should normalize and encourage seeking support from faculty and self-advocacy more than emphasizing faculty understanding of unique challenges to help bridge this gap in belonging.

This is the first study to examine the impact of anticipated faculty support on the transition to online degree programs for neurodivergent students. In the future, it could prove useful to expand the study to include a larger and more diverse sample from several universities to help improve generalizability, or additional studies to help expand this research. Longitudinal research on the effects of experienced support and understanding are also warranted.

Keywords: Online learning, Neurodivergent, belongingness, facutly support and understanding, difficulty of transition

UGP-42

Title: Loaded Discourse: Analyzing Attitudes Towards Campus-Carry Laws in WV Through Social Media

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Research Sponsor: Marshall University Undergraduate Creative Discovery and Research Scholar Award Program

Abstract
Social media has become one of the primary areas for political discourses to be disseminated and produced. We conducted a critical discourse analysis (CDA) of social media posts regarding the recent passage of campus-carry legislation in West Virginia to understand how account holders use this mode of communication to engage in political discourse. We use a linguistics-based approach through CDA to examine how ideological and emotional stances are constructed through semiotic means (e.g., words, images, hashtags) presented on platforms such as X (formerly Twitter), Instagram, Facebook, and Reddit. This method reveals how political arguments are framed and constructed and how they effectively amplify politically polarized perspectives and feedback loops that consequently mobilize support to shape public opinion and policy. The analysis revealed that political discourse on social media surrounding the “campus carry” bill was often emotionally laden and filled with characterizations of violence and criminality, creating polarized stances that aligned the poster’s position with moral rightness and constructing an oppositional moral other Additionally, through a public survey of university students, staff, and faculty, we shed light on diverse viewpoints that were not necessarily captured in mainstream legislative campus-carry conversations during the passage of the bill. Our research reveals the linguistic and ideological mechanisms that shape and perpetuate attitudes towards campus-carry legislation that are central to these political debates and addresses critical questions about the implications of these discourse strategies that potentially hinder constructive dialogue.

Keywords: campus carry, critical discourse analysis

UGP-43

Title: Student Proximity as a Predictor of Belonging, Transition Difficulty, and Excitement About Joining Marshall Online

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Research Sponsor: N/A

Abstract
A sense of belonging for students is an emerging area of research for psychologists. However, less is known about how proximity to campus influences belonging and excitement, particularly for fully online students. Prior research suggests that students living further from campus reported lower levels of belonging and acceptance than those situated closer (Dumford et al, 2019) and greater feelings of isolation (Rientes & Ramanau, 2024). We hypothesized that Marshall Online students within a 57-mile radius of campus would experience higher anticipated belonging and excitement, and lower anticipated difficulty of transition. Our study involved a self-report cross-sectional survey on Qualtrics with incoming Marshall Online students in Fall 2023 and 2024. Independent t-tests showed no significant differences in excitement, belonging uncertainty, or anticipated belonging between students living near (0-57 miles from campus) and far from campus (58+ miles). However, students closer to campus anticipated less transition difficulty (p=.072) and a correlation analysis supported this finding that greater distance from campus predicted higher anticipated transition difficulty. Our results suggest that while proximity may influence anticipated difficulty transition, it does not strongly impact belonging or excitement for online students. It is important to note that prior research focuses more on in-person students, thus our findings could suggest that proximity does not influence online students in the same manner. Future research should treat distance as a continuous variable rather than a binary split and continue the study to examine how anticipated belonging develops into experienced belonging once students begin college.

Keywords: excitement, belonging, transition difficulty, student success, proximity to campus

UGP-44

Title: Minerva Sulis and the Sacred Bath

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Research Sponsor:

Abstract
his poster will explore Minerva Sulis, a hybridized Roman-British deity exemplifying Rome's efforts to create a shared cultural and religious identity in Britannia. At Aquae Sulis, modern-day Bath, England, the Romans syncretized Minerva, their goddess of wisdom, with Sulis, a local Celtic deity associated with the healing powers of the hot springs. While Sulis had an existing worship site present at Bath, the Romans constructed a grand bathing complex that embodied their broader strategy of cultural and religious integration. This poster will analyze curse tablets from the site as key figures, as they illustrate the blending of Roman and native religious traditions while reflecting varying levels of Latin literacy among Britons. By establishing Minerva Sulis as a shared deity, Rome provided continuity for native worshippers while embedding its own religious and administrative systems into British society. Additionally, the poster will include artistic and architectural figures that highlight aesthetic hybridization, demonstrating how the temple incorporated Roman architectural principles while retaining distinct organic Celtic motifs.

Keywords: Classics, Roman, History, Religion, Hybridization

UGP-45

Title: AlphaFold3 Predictions Reveal the Transition Between Conformations of the Metamorphic Protein

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Research Sponsor:

Abstract
The circadian clock is a 24-hour rhythm that regulates nearly every aspect of an organism's biology. Disruption of the circadian clock has been linked to sleep disorders and related conditions, such as heart attacks, in humans. However, studying the human circadian clock is challenging due to its complexity. Cyanobacteria, with their simpler systems, serve as an excellent model for circadian clock studies. Additionally, the central oscillator can be reconstituted in a test tube using its protein components. KaiB is a circadian clock protein in cyanobacteria that is essential for maintaining the 24-hour rhythm. Its concentration in the cytosol exhibits circadian oscillation, which seems to be driven by the rhythmic localization of KaiB between the membrane and cytosol. We propose that this localization is regulated by two distinct conformations of KaiB, which drive the circadian rhythm in cyanobacteria. Our research has identified a potential regulatory site for conformational exchange on the C-terminus by analyzing predicted quaternary structures from AlphaFold3. We found that the conformational equilibrium can be altered by changing the salt concentration. Therefore, we suggest that KaiB undergoes conformational changes that affect its cellular localization, a process critical for maintaining the 24-hour circadian rhythm in cyanobacteria.

Keywords: oscillator, KaiB, localization, conformation

UGP-46

Title: From Synapses, to Neurons, to Behavior in a Nudibranch Sea Slug

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Research Sponsor: NSF award #OIA-2242771

Abstract
To understand the neural mechanisms of behavior, we must investigate across different levels: synaptic, neuronal, and the whole organism. The nudibranch sea slug Berghia stephanieae is a great model species as it is transparent, breeds quickly, produces many offspring, and has a moderate number of neurons.

We began looking at the synaptic level of organization using immunohistochemistry. DLG4 is the invertebrate version of PSD95, labeling the post-synaptic region of neurons. We used an antibody for DLG4 to see where it is located in the adult nudibranch brain and the juveniles' whole bodies. Juveniles showed immunoreactivity in the skin as well as the brain, while the adult had labeling only in specific regions of its brain.

To understand the organization of thousands of neurons in the nudibranch brain, we used in-situ hybridization to view gene expression. Berghia stephanieae expresses many neuropeptides, including neuropeptide F (NPF), which is similar to NPY in humans. NPY affects feeding, and different receptors allow different responses across the brain and body. The first sets of neurons we will label in both adult and juveniles are those that express NPF, and those that express its receptors, to understand which neurons are communicating.

Finally, we look at the nudibranch's behavior. One of the wonderful things about Bergia stephanieae is the sensory appendages located on their head, specifically the rhinophores, oral tentacles, and palps. We observed them under different conditions using high resolution video. Future experiments include the use of a 3D printed maze; here we will monitor how long it takes for individuals to find food with a series of obstacles that increase in difficulty. We also plan to remove part of the slug's brain, or its appendages, to observe its compensatory capabilities after injury in the maze. After these injured slugs are studied behaviorally, we will analyze them at the two previous stages to compare them to normal slugs.

Keywords: Nudibranch, Immunohistochemistry, In-situ hybridization, Appendages, Neurons

UGP-47

Title: Effects of oral silver nanoparticle exposure on synapse morphology in the rat brain.

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Research Sponsor: NSF Cooperative Agreement No. OIA-2242771 (NS, co-PI); Marshall Undergraduate Creative Discovery and Research Scholar Award, Spring 2025 (AB); NASA WVSGC Undergraduate Research Scholarship (RS)

Abstract
Silver nanoparticles (AgNPs) possess antimicrobial properties and are incorporated into various medical and consumer products. These particles are released from products during use and bioaccumulate in the brain. Previously, we found that AgNPs disrupt cytoskeletal mechanisms in cultured neural cells. Because synapse morphology is highly dependent on the actin cytoskeleton, we hypothesized that synapse structure is disrupted through oral AgNP exposure in rats. We treated rats orally with AgNP solutions in 10% sucrose with either 0 mg/kg (control), 25 mg/kg (low), or 100 mg/kg of AgNPs (high). These amounts were chosen because the AgNP concentrations accumulated in the rat brain after treatment with these doses mirror the concentrations estimated to accumulate in the human brain from environmental exposure. Brains were collected after nine weekdays of consecutive treatment or following a month of no AgNP treatment to examine if the bioaccumulation of AgNPs impacts synapse morphology. Immunohistochemistry (IHC) was used to identify changes in presynaptic terminal markers and postsynaptic terminal markers. When the terminals maintain the apposition necessary for function, the green presynaptic signal and the red postsynaptic signal colocalize yellow when imaged using confocal microscopy. The colocalizations were quantified using the SynBot plugin for Fiji. Our data suggest that oral AgNP exposure decreases pre- and post-synaptic colocalization in the hippocampus. Because synapses in the hippocampus are essential for learning and memory, these processes could be disrupted by AgNP bioaccumulation.

Keywords: biology, neuroscience, synapses, synaptic plasticity

UGP-48

Title: The Impact of Heavy Metals on Growth and Development of African ecotypes of Arabidopsis with distinct telomere lengths

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Research Sponsor: Undergraduate Creative Discovery and Research Scholar Awards Program

Abstract
Telomeres are short, repetitive DNA sequences found on the ends of chromosomes that protect them during and after cell division. Significant natural variation in telomere length has been observed both between different plant species, and between different genotypes of the same species. This variation has been proposed to play a role in stress responses in the model plant Arabidopsis thaliana. The aim of this study was to investigate how telomere length variation influences plant growth and development under heavy metal stress. Heavy metal contamination of air, water, and soil has become a major environmental and agricultural concern in recent years due to an increase in anthropogenic activity like mining, chemical plants, improper land use, etc. The high level of contaminating heavy metals is especially a concern in West Virginia because of its significant mining activity over the past century. In this study, we utilized the model plant Arabidopsis thaliana and investigated the effects of the heavy metal cadmium (Cd) exposure on A. thaliana varieties (ecotypes) of the African origin. These ecotypes, which were originally collected in Morocco, belong to an evolutionarily unique and ancient clade of A. thaliana that is genetically distinct from more recently evolved ecotypes of the Eurasian origin. We first measured telomere length, via Southern blotting, for over a dozen Moroccan ecotypes. Subsequently, two ecotypes with long telomeres and two ecotypes with short telomeres from Morocco were chosen to be grown on plates with different concentrations of Cd. Columbia-0, an ecotype with intermediate telomere length and a reference laboratory line, as well as the same African ecotypes grown in the absence of Cd, were included as controls. Two experiments were then conducted with the selected five ecotypes. The first experiment was conducted to measure plant growth and development at three lower concentrations of cadmium (0.05, 0.10, and 0.15 mM $CdCl_2$). Root lengths of all plants were imaged and quantified at 7-, 12-, and 14-days post-germination using the

software ImageJ (Java 8 version). All genotypes responded in a dose-dependent manner to varying levels of Cd exposure, with chlorosis detected in leaves at 0.10 mM and 0.15 mM Cd treatments. The second experiment is ongoing and aims to observe germination efficiency at three higher concentrations of cadmium (5, 10, and 15 mM CdCl2). Preliminary data indicate that at least some ecotypes are able to maintain good germination efficiency at high Cd concentrations, providing encouraging insights into plant growth in contaminated soils. This study may identify key physiological parameters of plant stress response that could be useful for improving land use and management of contaminated soils.

Keywords: arabidopsis, telomeres, heavy metals, cadmium, stress

UGP-49

Title: Filtration of Direct Red 2 and Direct Yellow 12: A Research Experience for Undergraduates

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Research Sponsor: National Science Foundation, Research Experience for Undergraduates Program (Award # 2349289)

Abstract
One of the largest polluters of freshwater on Earth is the textile industry. Nearly 280,000 tons of synthetic textile dyes are discharged every year into the environment. Recent research shows that polycarbonate filters functionalized with anionic azo dyes have the potential to enhance dye rejection, leaving nearly completely decolorized water after filtration in specific instances. This functionalization process occurs when ramping up and down in concentration from 50 micromolar to 1000 micromolar and then back to 50 micromolar. This research is part of a larger project that focuses on what variables dominate in the rejection process, either intrinsic charge or functional end groups of the dye molecules. The collected data was a part of a National Science Foundation Research Experience for Undergraduates (REU) program. Functionalization data, also called hysteresis run data, with accompanying flowrate data, for 2 different azo-dyes, Direct Red 2 and Direct Yellow 12 were collected during the REU. Direct Red 2 results will be focused on for this presentation

Keywords: Azo Dye Functionalization Water Purification

UGP-50

Title: Protocols for using Fluorescence to Image the Subcellular Arrangements of Hypsibius exemplaris

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Sponsoring Institution: Marshall University, Department of Chemistry
Research Sponsor: NSF, 2149173

Abstract
Tardigrades, semi-microscopic invertebrate, have become an organism of increasing interest in recent years due to their remarkable capability to survive transiently in extreme environments. In addition, they have potential applications in pharmaceuticals, biomedicine, and as a model organism. The mechanism they use to survive many environmental stressors is called cryptobiosis, in which some modes are denoted by an entrance into a shriveled anatomical state called a tun and a nearly undetectable metabolic rate. Osmobiosis is a kind of cryptobiosis that is induced by high osmotic pressure. Several different stressors can be used to induce osmobiosis and the rate at which tuns form in this state can vary depending on factors such as the type of stressor and the concentration of it. Prior work from our lab indicates that mitochondrial reactive oxygen species are necessary for tardigrades to enter a tun. Based on these finding it has been postulated that mitochondrial activity increases when tardigrades are undergoing cryptobiosis. This work establishes a protocol for imaging the subcellular organelles of Hypsibius exemplaris, a species of tardigrade, using fluorescence imaging. The morphology is imaged in tardigrade cells that have not been induced with osmobiosis and one's that have. This work progresses the morphological understanding of cryptobiosis using new fluorescence imaging protocols for tardigrades.

Keywords: Tardigrade, Fluorescence, Subcellular Arrangements, Cryptobiosis

UGP-51

Title: Benchmark FTIR Spectra of Substituted Ketenes in Argon Matrices

Authors/Presenters: Presenter: David Kapp- kapp8@marshall.edu Coauthors: Andrew Fields, Alexis Bowles, Mia Jarrel, Benjamin Campbell
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Sponsoring Institution: Marshall University College of Science, Department of Chemistry
Research Sponsor: Donors of the American Chemical Society Petroleum Research Fund

Abstract
The establishment of benchmark spectra can be a strong tool for any chemistry requiring the analysis of any IR spectra. Methylketene and chloroketene are common products of the pyrolysis of oxygenated hydrocarbons and chlorinated hydrocarbons, respectively. The goal of this work is to establish reliable benchmarks of these substituted ketenes using argon matrix-isolation FTIR spectroscopy, a tool used for pyrolysis studies of biofuels and PVC recycling. Propanoic anhydride is a known pyrolytic precursor to methyl ketene. Likewise, chloroketene can be made pyrolytically through chloroacetic anhydride. In separate experiments, propanoic anhydride and chloroacetic anhydride were each mixed with argon at a dilute ratio of 1:1000 and then pyrolytically decomposed into products. The pyrolytic temperatures for these experiments ranged from 900K-1300K. Methylketene was observed at several peaks with the most prominent being in the 2125 cm-1 and 2129 cm-1 region. Chloroketene was likewise observed.

Keywords: Pyrolysis, Physical Chemistry, Ketenes

UGP-52

Title: Ion size is a major determinant of the circadian rhythm

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Research Sponsor:

Abstract
The circadian clock orchestrates a 24-hour rhythm that synchronizes with the natural light/dark cycle. The cyanobacterial circadian clock serves as a simple model system, which can be reconstituted in vitro by mixing KaiA, KaiB, and KaiC proteins with ATP and magnesium ions. Minerals are essential elements for life and influence circadian rhythms in various ways. Previously, we proposed that magnesium regulates the circadian rhythm in the cyanobacterial circadian oscillator. We also found that the concentration of magnesium ions is closely related to the period of the circadian rhythm. Here, we discovered that certain minerals and heavy metal ions directly affect the regulation of the circadian rhythm and modulate its period. Among these, ineffective minerals and heavy metals compete with magnesium ions, influencing the circadian period. Our findings indicate that ion size is the major determinant of its effect on the circadian rhythm, whereas differences in ion charge do not significantly impact circadian regulation. Structural predictions using AlphaFold3 suggest that the ion's size must fit into the ion pocket at the active site for it to function as a regulatory cofactor. These findings provide new insights into the relationship between mineral deficiency and circadian rhythm disruption, particularly in elderly Alzheimer's patients.

Keywords: cyanobacteria, magnesium, circadian clock, KaiC

UGP-53

Title: Computational Study of the Thermal Decomposition of 2-Chlorophenol

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Research Sponsor:

Abstract
With the rising production levels of plastics, it is becoming urgent to find an efficient chemical means of recycling. One promising approach is the process of pyrolysis for chemical recycling. However, for pyrolysis to be used as a means of recycling, it is important to know the decomposition products and mechanisms for the components of plastics involved. Past studies have discovered that 2-chlorophenol commonly appears as a byproduct in the decomposition of plastic, specifically PVC. This study will model pyrolysis via computational chemistry to investigate the thermal decomposition of 2-chlorophenol. Geometry optimizations and frequency calculations were performed with Gaussian 09 on 2-chlorophenol, transition states, and products for multiple unimolecular dissociation pathways. Transition states were confirmed with intrinsic reaction coordinate calculations. One such calculation involved the reaction pathway of 2-chlorophenol decomposing into 2-chlorocyclohexa-2,4-dien-1-one. The results from computational chemistry will be compared to experimental results to produce a deeper and more accurate analysis of the thermal decomposition mechanism, which can be applied to the development of more efficient recycling.

Keywords: computational chemistry, physical chemistry

UGP-54

Title: Neural Activation in Rhagoletis Flies: Using Immunohistochemistry to Identify Glomerular Responses to Odor Stimuli

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Abstract
Understanding how the brain processes sensory information is fundamental to the study of neurophysiology and behavior. Over evolutionary time, Rhagoletis fruit flies have diverged in their preferences for host fruits and odors. For these experiments, Rhagoletis pomonella flies were employed to examine the differences in the way insects respond to attractive versus aversive odor stimuli within the antennal lobe of their brain.

Previous studies have identified which regions are activated in the presence of butyl hexanoate and 3-methyl-1-butanol, the preferred odors of the apple and hawthorn variants, respectively. Trials with these odors are replicated in this study, along with linalool, a neutral odor, and 1-octen-3-ol. It is hypothesized that the latter odor should be unpleasant to apple and hawthorn races but appealing to the dogwood flies which are the next most closely related variant.

Using immunohistochemistry, we applied an antibody for phosphorylated extracellular signal-regulated kinase (pERK), aiming to stain the activated brain regions corresponding to each of the four odors. Preliminary trials performed with nC82, DLG4 and Synorf antibodies determined that Synorf produced the highest resolution image of all the fruit fly's brain, allowing for sharp visualization of the glomeruli within the antennal lobe. Thus, we decided that it will be used along with the pERK to stain the brains after odor stimulation.

By using Synorf labeling along with pERK, we will be able to identify the individual glomeruli that are activated across different variants of flies responding to different odors. We can then connect what is going in in the brain with the preference behaviors that they show in nature.

Keywords: Immunohistochemistry, Olfactory, Odor Discrimination, Sensory Processing, Glomeruli

UGP-55

Title: Trunk Rotation During Arm Elevation Increases When the Head is Rotated Away from the Elevating Arm

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Research Sponsor: N/A

Abstract
Context: Movement of the arm is associated with trunk motion during arm elevation. When an arm elevates the truck rotates towards the elevating arm. The effect of head rotation on trunk rotation during arm elevation has not been sufficiently studied. The current study tested the hypothesis that during arm elevation the trunk rotates towards the elevating arm.

Methods: Sixteen (16) participants without shoulder injury were recruited. The participants' trunk rotation was measured using electromagnetic tracking. Participants performed 2 bouts of 5 right arm elevation with their head turned towards their right or left. Repeated measures ANOVA was used to test the effect of head position on trunk position during arm elevation.

Results: When looking towards the right the trunk started in 3.5° right rotation and while looking left 8.2° left rotation. During elevation of the right arm the trunk rotated towards the right. Greater right rotation($P=0.004$) was found when looking towards the left (6.1°±2.8°) than right (1.7°±3.1°). Trunk lateral flexion did not change during arm elevation ($P>0.05$). Trunk extension increased during arm elevation (2.2°±0.61°, $P=0.008$), head rotation did not affect trunk flexion.

Conclusion: The data shows that trunk rotation is seen in arm elevation with opposing head rotation but not with head rotation towards the same side as arm elevation is occurring. Further exploration of this topic can lead to greater understanding of the mechanisms leading to shoulder injury.

Keywords: Shoulder, Motion capture, Shoulder Injury

UGP-56

Title: Agriculture and Natural Resources Microcredentials Data Analysis and Future Research into Private ANR to Support Workforce Development in Southwestern West Virginia

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Research Sponsor:

Abstract
Hannah Blake's thesis, Agriculture and Natural Resources Microcredentials to Support Workforce Development in Southwestern West Virginia, presents a needs assessment to identify the skills and competencies required in the region's agriculture and natural resources (ANR) industries. A survey was distributed via email to 10,462 individuals across 549 organizations spanning academia, consulting, private business, and government agencies. A total of 365 employees responded, resulting in a response rate of approximately 3.3%.

The survey included 44 close-ended and 9 open-ended questions, designed to gather insights into the essential skills and competencies across various levels of ANR employment. To build on this research, the data is being transitioned from Excel to Access to better categorize organizations. Moving forward, the focus will shift toward private ANR organizations, as the initial survey responses were predominantly from government agencies.

The ultimate goal of this research is to identify the skills and qualifications ANR businesses in the region surrounding Marshall University seek in employees. By using these insights, Marshall University can develop microcredential programs that align with industry needs, support workforce development, promote ANR career growth, and contribute to the economic and social well-being of southwestern West Virginia.

Keywords: Microcredintials

UGP-57

Title: A Benchtop Bioreactor Modeling Native Biofilm Communities on Gravity Fed Sewer Pipes

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Research Sponsor: National Science Foundation, Centers for Disease Control, West Virginia Department of Health

Abstract
WBE (wastewater based epidemiology) is the practice whereby concentrations of human pathogens shed into community wastewater are assessed in order to infer disease prevalence. Environmental and engineering factors can have notable effects on measured signal, confounding analysis. In sewer pipes, biofilms have been shown to both destroy human pathogen signal and to serve as reservoirs for those pathogens; a better understanding of this interaction and the application of this knowledge to our WBE data analysis motivates our work.

Most wild microbial communities form multispecies biofilms in which organisms produce extracellular matrix to aid in surface adhesion, genetic exchange, and protection from the environment, among other advantages. To grow biofilms of interest, we constructed a bioreactor modelling gravity-fed sewer pipes in March 2024 and have been sampling from then through present. A bioreactor is a controlled environment allowing selective culture of organisms of interest.

We have been monitoring and identifying these organisms through use of imaging via light microscopy and scanning electron microscopy (S.E.M.). While interpreting community make-up in environmental samples has largely shifted to metagenomic analysis, environmental factors can influence this, and morphology must be considered to answer questions regarding biofilm formation. Parameters such as pH, total suspended solids (TSS), and dissolved oxygen (DO) were recorded; these measurements indicate that our bioreactor is usually food poor and oxygen rich.

Early tentative identifications included H. Hydrossis, a filamentous bacterium in sewage biofilms, testate and non-testate amoeba, tardigrades, filamentous morphotype 0041, and golden algae.

Keywords: wastewater, infectious disease, biofilm, public health, pathogen

UGP-59

Title: Unveiling Cosmic Cataclysms: Polarized Gamma-Ray Detection with GEANT4

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Research Sponsor:

Abstract
Energetic gamma rays from space are messengers of cataclysmic events like stellar explosions like supernovae, and kilonovae. These extreme events forge heavy elements, which are initially born in excited states as nuclear isomers. Their gamma-ray emissions carry unique energy and polarization signatures, making polarization measurements a powerful tool for distinguishing between nuclear and non-nuclear sources and probing the physical conditions of these astrophysical environments.

In this project, we use the GEANT4 simulation toolkit to develop a method for detecting and analyzing polarized gamma rays. Our simulated gamma-ray telescope features trackers, a calorimeter, and an anticoincidence system, designed to replicate real observational instruments. Detection relies on Compton scattering, where high-energy gamma rays interact with atomic electron clouds, emitting X-rays. By measuring the energy and angular distribution of these X-rays, we can reconstruct the original gamma-ray's energy and polarization.

Additionally, this method can be applied to estimate the abundance of nuclear isotopes in gamma-ray bursts associated with kilonovae. Our work enhances the study of gamma-ray emissions and provides deeper insights into the nuclear processes occurring in extreme astrophysical environments.

Keywords: Gamma rays, Compton Scattering, Polarization, Isomers, GEANT4

UGP-60

Title: The Negative Effects of Adolescent Binge Drinking on the Structural Integrity & Composition of the Tripartite Synapse

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Research Sponsor: NNX15AI01H (NASA West Virginia Space Grant Consortium to CDW), R21AA030086 (NIAAA-R21 to MLR), BX005403 (VA Merit Award to MLR)

Abstract
Adolescent binge drinking impairs cognitive function in both human and animal models and increases the risk of developing an alcohol use disorder. Recent research indicates that adolescent intermittent ethanol (AIE) exposure, a rat model of binge drinking, disrupts the tripartite synapse. This is composed of a pre- and post-synaptic terminal and an ensheathing peripheral astrocyte process (PAP) that is critical in regulating synaptic function. Tripartite synapses are stabilized by several bridging proteins, e.g., neuroligin and neurexin, that are essential for maintaining synaptic health. Previously, our laboratory has shown that AIE results in a progressive loss of PAP-synaptic coupling at excitatory synapses in the hippocampus. We hypothesize that AIE disrupts the interaction between neurexin-neuroligin, driving a loss of tripartite synapse structural integrity, and subsequent PAP-synaptic decoupling. To conduct this research, Sprague Dawley rats were subjected to AIE or water intermittently over 16 days. After various washout/abstinence periods, brain samples were collected for analysis using techniques such as adeno-associated virus (AAV) to assess astrocyte morphology and immunohistochemistry, western blotting, and co-immunoprecipitation to assess changes in bridge protein expression and interactions. The primary focus was on samples collected at 26 days of washout, as previous studies have shown the most significant uncoupling at this stage. We will show how AIE disrupts PAP-synaptic coupling and how alterations in neurexin and neuroligin interactions contribute to this decoupling. Whether changes in astrocyte morphology contribute to the loss of physical interactions at the synapse remains to be determined and will be the focus of our future investigations.

Keywords: astrocyte/ alcohol/ synapse/ hippocampus/ neuroscience

UGP-61

Title: How Retention Rates in the Ohio River Impact Zooplankton Population

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Research Sponsor: : U.S. Army Engineer Research and Development Center (ERDC) Federal Award Identification Number W912HZ-22-2-0027

Abstract
Zooplankton are heterotrophic microscopic to macroscopic organisms that feed on phytoplankton and typically exist in non-flowing bodies of water. We have observed zooplankton in the Greenup pool of the Ohio River, a managed river ecosystem with flow controlled by locks and dams maintaining a navigational pool. We conducted research on how retention rates in the Greenup pool impact zooplankton communities, to understand community dynamics in this lotic habitat. With zooplankton being the main predator for algae, this research provides insight into the algal community dynamics and may provide insight into the development of harmful algal blooms as well. Seasonal samples were collected at 4 locations in the Greenup Pool of the Ohio River spanning the 60-mile-long pool. Zooplankton were concentrated by filtering and stored in formaldehyde until processing. Zooplankters were identified to the lowest practical taxon and counted. Retention rates for the Greenup pool were estimated using discharge data from the USGS gaging station in Ironton, Ohio using pool dimensions from transect sampling. Higher zooplankton and algal counts have been observed during periods of higher retention. Trends in rotifer, copepod and daphnid density are presented in relation to pool retention. Our research provides a better understanding of the factors influencing the plankton community dynamics in the managed river ecosystem.

Keywords: Zooplankton, Freshwater, Discharge

UGP-62

Title: Do Silver Nanoparticles Induce p-Tau Aggregate Formation in Rat Brain?

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Research Sponsor: This material is based on work supported by the National Science Foundation under Cooperative Agreement No. OIA-2242771 and Marshall University Creative Discovery

Abstract
Silver nanoparticles (AgNPs) are incorporated in products such as toys, cosmetics, and surgical tools due to their antimicrobial properties. AgNPs bioaccumulate within the brain and persist for months with no clearance when mammals are exposed. Because of their remarkable physical properties, AgNPs pass through the blood-brain barrier, which is the brain's first line of defense against pathogens. Once inside, AgNPs disrupt crucial structural proteins such as f-actin. Tau, a critical scaffolding protein in microtubules, functions to organize tubulin and maintain cytoskeletal structure. Through mechanisms such as oxidative stress (OS), tau becomes hyperphosphorylated and forms aggregates, causing cells to lose signaling capabilities and undergo apoptosis. Because it has been demonstrated that AgNPs increase OS and we showed that AgNPs bioaccumulate and persist with no clearance as well as disrupt the dynamic organization of cytoskeletal proteins, the aim of this project was to determine if AgNPs induce p-tau aggregates in rat brain. By using immunohistochemistry to co-label p-tau with Superoxide Dismutase 1 (SOD1), an enzyme responsible for breaking down toxic reactive oxygen species, we quantify formation of p-tau aggregates. Preliminary data show that whereas low doses of AgNPs increase p-tau accumulation, there is no change in rats exposed to high doses of AgNPs although SOD1 expression appears to increase. These findings suggests that exposure to AgNPs could induce cellular mechanisms associated with neurogenerative diseases and activate SOD1-mediated repair mechanisms. By further comparing SOD1 and p-tau, insight into the interactions that AgNPs have on antioxidant-mediated pathways leading to the autophagy of p-tau aggregates can be obtained.

Keywords: neurodegeneration, environmental contaminants, oxidative stress

UGP-63

Title: A Test Of Semi-Automated Varve-Counting Software Using Drill Core Photographs, Pleistocene Lake Tight

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Research Sponsor: NASA fellowship

Abstract
Count-My-Varves is open-source, image recognition software for semi-automated counting of lacustrine varves. The program was developed and first used with digital line scans of drill cores of Holocene lake deposits and was suggested to be equally suitable for use with outcrop photos, and by extension, drill core photos. We assessed the potential of this program for speeding the varve counting process and providing accurate count results using photos of drill core.

Our evaluation used digital photos of archival drill core from deposits of Early Pleistocene (Calabrian) Lake Tight, an ice-dammed lake that occupied the Teays River Valley in West Virginia. Two series of photos were utilized, one from 20 years ago, taken shortly after initial collection and processing of the drill core, and the other from 2024 of the archived core. Samples of the archival core selected for study were sprayed with matte finish polyurethane and photographed using a polarizing filter to enhance contrast and reduce glare. Software counts were performed and compared to two separate manual counts of easily discerned varves conducted by different operators. One manual count was completed Sanderson & Robertson (2005) shortly after the drill core was collected and the other completed in 2024 for the archived core.

Reliable software counts were only achievable following strict procedures. The accuracy of the software counts was heavily influenced by the average varve thickness value that must be input at the start of the semi-automated counting process. This limitation was accommodated using short interval samples of similar varve thickness. Designed for processing of large line scan data sets, the software has toggles for splitting or combining varves that do not fall within 50% of the average thickness. Acceptable results were achieved only by disabling this feature. Additionally, the user-selected area where the count will be performed is critical to obtaining accurate counts and must be a very clean

(undisturbed) and generally a very narrow section of the sample. Following this approach and using short interval samples of similar varve thickness, the software can routinely yield counts that match manual counts. Although, due to these constraints it provides little advantage over manually counting varves in outcrop or drill core photographs.

Keywords: Quaternary Geology, Varves, Lake Tight

UGP-64

Title: KaiB detects the phosphorylation state of KaiC to generate oscillatory post-translational modifications

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Research Sponsor: NASA Grant # 80NSSC22M0027

Abstract
The circadian clock, which operates on a roughly 24-hour cycle, acts as an intrinsic timekeeping system that offers numerous advantages for life in a world of rhythmic environmental changes. The cyanobacterial circadian clock can be reconstituted in vitro by mixing the KaiA, KaiB, and KaiC proteins with magnesium ions and ATP. Two residues in KaiC (Ser431 and Thr432) exhibit oscillatory phosphorylation and dephosphorylation both in vivo and in vitro. We previously reported that a single-residue mutation alters the oscillatory phosphorylation pattern, with a damped oscillation observed when the Thr432 residue is replaced by Ser. In this study, we examined another mutation, S314T, which does not undergo dephosphorylation and remains in a hyper-phosphorylated state. Even with the addition of a fold-switch KaiB mutant, which typically maintains KaiC in a hypo-phosphorylated state, the S314T mutant does not undergo dephosphorylation. Fluorescence anisotropy-based binding analysis revealed that this is due to the lack of KaiB binding to KaiC. Additionally, a double mutation in KaiC, S431T/T432S, exhibits a similar behavior to the single S314 mutation. These KaiC mutants can be used to further investigate the mechanisms of oscillatory phosphorylation.

Keywords: Metamorphic, KaiB, Circadian Clock, Oscillations

UGP-65

Title: Production of Carbon Nanotubes from Appalachian Coals Via Electrolysis and Pyrolysis

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Abstract
This research aims to create carbon nanotubes from various coals sourced in the Appalachian region. Coal-assisted water electrolysis was performed to create organometallic precursor solutions from coal. Various types of coal were electrolyzed using sulfuric acid containing ferric and ferrous ions, resulting in the deposition of an organometallic layer on the coal's surface. This layer was extracted using organic solvents, such as ethanol and isopropanol, and later filtered to produce the organometallic precursor solution. When processed through spray pyrolysis, this precursor yields carbon nanomaterials. This innovative method offers a cost-effective way to synthesize carbon nanomaterials using locally sourced West Virginia coal while further emphasizing sustainability. The stripped coal can be recycled through the electrolyzing stage until fully degraded, and the sulfuric acid cathode solution can be reused indefinitely. This research provides an innovative approach to repurposing West Virginia's abundant coal, offering a sustainable and economical method for locally producing carbon nanomaterials.

Keywords: Carbon Nanomaterials, Electrolysis and Pyrolysis

UGP-66

Title: Synaptic Tripartite Proximity: Combining Spatial Transcriptomics and Immunohistochemistry to understand changes across development

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Research Sponsor: National Science Foundation, RII Track 1: West Virginia Network for Functional Neuroscience and Transcriptomics (WV-NFNT), Grant# NSF-2242771 to MLR Risher (Research Lead).

Abstract
During development, synaptic maturation within the brain is critically important for establishing the appropriate neuronal circuitry necessary for the development of higher cognitive function. The tripartite synapse consists of a pre- and post-synaptic terminal that is ensheathed by a peripheral astrocyte process (PAP), and these structures allow for communication between neuronal synapses and astrocytes, which are critical for the regulation of neuronal and circuit function. Communication occurs through contact mediated events and the release of secreted factors, therefore establishing appropriate PAP-synaptic proximity is an important developmental event that ensures appropriate astrocyte-neuronal crosstalk. Our previous work has shown that during this adolescent period, the brain is highly vulnerable to the acute and long-term effects of binge alcohol, resulting in structural and functional disruption of the tripartite synapse that persists into adulthood. As of now, it is unknown when PAP ensheathment of synapses occurs during this late developmental period, when maturation is complete, and if the maturation process varies depending on the brain region. Here our goal is to identify the structural characteristics of tripartite synapse maturation within the subregions of the orbital frontal cortex (OFC), a region of the brain that is essential for higher order cognitive function and a brain region that is significantly impacted by adolescent binge alcohol use. Since the ventral and lateral OFC have very different functions, we hypothesize that tripartite synapse development within the OFC will vary depending on the subregion.

Mice were sacrificed at three developmental stages: postnatal day (PND) 31 (early adolescent development), PND 46 (late adolescent development), and PND 72 (young

adulthood). The brains were collected and formalin-fixed paraffin-embedded (FFPE). Adjacent 5µm brain sections were used for immunohistochemistry (IHC) and spatial transcriptomics (ST) allowing the overlay of the imaged tripartite synapse and changes in gene expression. Imaging of the tripartite synapse was conducted using antibodies targeted to know proteins located within the pre- (bassoon), post-synaptic (PSD95) terminal, and the PAP (ezrin). A SPY700 nuclear stain was added to allow alignment with the ST slice. Stimulated Emission Depletion (STED) microscopy was used to measure the distance between pre-post-synaptic terminals and PAP-synapses at multiple timepoints across late development. ST was conducted using Visium-HD (10X genomics).

Data from the IHC portion of this experiment will be presented. We expect that PAP-synaptic proximity will increase across maturity and that changes in gene expression, indicative of maturation, will correlate with the proximity changes observed. We further expect to see differences in maturation temporally depending on the subregion of the OFC.

These data will elucidate how the tripartite synapse matures across development and could reveal why the adolescent, maturing brain is more sensitive to the acute and long-term negative effects of binge alcohol use when compared to adults.

Keywords: development, STED, tripartite synapse, spatial transcriptomics, astrocytes

UGP-67

Title: Self-Assembled Dendritic Catalysts – New Biphasic Approach for Homogeneous Catalyst Recycling

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Research Sponsor: National Science Foundation

Abstract
Catalysts are essential components of industrial processes, ranging from producing new pharmaceuticals to manufacturing various materials. Worldwide sales of catalysts amount to tens of billions of dollars annually, with about a 5% growth rate per year. Catalyst recycling significantly benefits the environment and economy through resource conservation and cost reductions. To this end, heterogeneous catalysts have more significant advantages due to ease of separation from the reaction mixture for recycling. Unfortunately, limited catalytic activity and selectivity are critical issues for heterogeneous catalysts.

In contrast, homogeneous catalysts often provide superior catalytic efficiency and selectivities. However, recovery and recycling of homogeneous catalysts remain underdeveloped due to a lack of proper tools to capture and isolate them in the reaction mixture. In this regard, biphasic approaches provide a solution to recover homogeneous catalysts as they allow for the separation of the catalyst from the product phase.

The current approach to biphasic separation is built upon the strategy to keep catalysts in the aqueous phase by functionalizing them with water-soluble subunits. This often leads to negatively altering catalytic efficiency and selectivities due to the low solubility of reactants in the aqueous phase. Our approach provides an innovative solution by incorporating a hydrophilic functional group through highly selective self-assembly. The approach significantly reduces the reactant solubility issue by recovering the catalyst in the aqueous phase upon completion of reactions. Moreover, the reversible nature of our ligand-metal self-assembly enables us to reuse catalysts by dissociating hydrophilic subunits under mild conditions using EDTA.

Keywords: Self-Assembled Dendritic Catalyst Recycling

UGP-68

Title: Effects of Lonicera maackii Invasion on Native Plant Biodiversity in Mixed-Oak Forests of West Virginia

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Research Sponsor: Marshall University

Abstract
Lonicera maackii (Amur honeysuckle) is a shrub native to East Asia that was introduced to the Eastern U.S. and quickly invaded deciduous forests across the region. This plant has multiple life history traits that give it a competitive advantage over native species. The objective of our study is to quantify the long-term effects of this invasion on native plant biodiversity in mixed-oak forests in Huntington, WV. We hypothesized that plots with higher abundance of Lonicera maackii would have lower plant species richness and diversity, and less tree regeneration than uninvaded plots. From April to October 2024, we established 5 invaded (>20% L. maackii cover) and 5 uninvaded (<20% L. maackii cover) 100 m2 permanent vegetation plots in the forest behind the Huntington Museum of Art. We recorded and estimated cover for all vascular plant species, measured and identified all trees, tallied tree seedlings and saplings, and counted L. maackii stems. Soil was collected in each plot and analyzed for texture and nutrients. We calculated several biodiversity metrics and evaluated whether invaded plots had lower diversity with linear models. We also evaluated whether soil properties differed between invaded and uninvaded plots using paired t-tests. Shannon Diversity, Shannon Diversity of herbaceous species, and species richness did not differ significantly between invaded and control plots ($p > 0.05$). Clay % was significantly higher in invaded than in uninvaded plots ($p = 0.02$), suggesting L. maackii invasion may have occurred preferentially in areas with higher water- and nutrient-holding capacity. In Fall 2025, all L. maackii stems will be removed using herbicide and thus these results will provide baseline, pre-treatment data for this removal experiment. In the future, Marshall University students will monitor these permanent plots, and compare pre-treatment and post-treatment data to better understand the effects of L. maackii invasion on native biodiversity.

Keywords: Ecology, Plant Communities, Invasive Species, Biodiversity

UGP-69

Title: Mapping Thymidine Phosphorylase Expression in Mice: A Foundation for Organ-Specific Studies

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Abstract
The primary function of thymidine phosphorylase (TYMP) is to drive the salvage pathway of pyrimidine nucleosides, a metabolic process that recycles pyrimidine bases and nucleosides. In addition to this traditional role, Dr. Li's laboratory at the Marshall University School of Medicine discovered that TYMP has signaling functions, enhancing platelet activation and thrombosis. Furthermore, the Li lab found that TYMP plays a role in metabolism and is crucial for maintaining glucose and lipid homeostasis. However, its role in individual organs remains unclear. To address this gap, we first examined TYMP expression in 22 organs harvested from male C57BL/6J mice using qPCR. We collected samples from each organ with triplicated mice. I extracted total RNA from these tissues using the GeneJET RNA Purification Kit. RNA concentrations were measured with NanoDrop, and 1 µg of total RNA was converted to cDNA. TYMP expression was quantified using PowerUp™ SYBR™ Green Master Mix-based qPCR, with 18S as the housekeeping gene control. Our results indicated that the spleen had the highest TYMP expression, followed by the liver, lungs, and intestines. The heart had the lowest TYMP expression among the organs examined. These findings support TYMP's roles in circulation as well as metabolism. This study provides the foundation and rationale for exploring the organ-specific effects of TYMP. In the future, we will continue to measure TYMP expression in female mice and investigate its expression in a more cell-specific manner.

Keywords: Thymidine phosphorylase, qPCR, organ-specific expression

UGP-70

Title: The role of Arabidopsis yRAD10 gene in Telomere Length Regulation

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Research Sponsor: This research was made possible by NASA West Virginia Space Grant Consortium, NASA Agreement # 80NSSC20M0055.

Abstract
Telomeres, which are the most terminal parts of chromosomes, work to protect the cellular genome from damage. Every time a cell divides, telomeres progressively shorten; once they become too short, aging accelerates, and people are much more susceptible to disease. Understanding telomere length maintenance has paramount implications for human health and disease. The Shakirov Lab did a screening of many different genes in the model plant Arabidopsis thaliana to look for associations with telomere length maintenance. Among identified genes was yRAD10, a gene that has known roles in DNA damage response and repair (DDR) mechanisms. The yRAD10 gene encodes a DNA repair endonuclease, which prevents possible mutations in preparation for DNA synthesis. Since a similar yRAD10 gene is found in the human genome, discoveries may directly relate to biology and regulation of aging in humans. Telomere length measurements in the second generation of yrad10 homozygous mutants showed one plant with shorter telomeres, relative to its siblings and the parental plant. These findings suggest that there may be a sporadic reduction of telomere length in yrad10 mutants. In future work, we plan to take the short telomere generation two (G2*) plant and a G2* plant with normal telomeres to produce separate lines of generation three (G3*) homozygous mutants. The ultimate goal of my project is to understand if the sporadic shortening is consistent across multiple yrad10 mutant lines, and if this shortening is reversed or continues to accelerate through subsequent mutant plant generations.

Keywords: Arabidopsis; Telomeres; yRAD10; Genetics

UGP-71

Title: Examining Gut Microbiota Composition Following Adolescent Binge Ethanol Exposure in Male

Sprague Dawley Rats

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Research Sponsor: West Virginia Clinical and Translational Science Institute (Pilot Grant) 14207

Abstract
Alcohol consumption, particularly in the form of binge drinking, peaks during adolescence and continues at moderate levels throughout the lifespan, contributing to cognitive decline during aging. The effect of adolescent binge ethanol exposure and the long-term impact of moderate ethanol use on the adult gut microbiome is lesser characterized. To understand changes in microbial communities during adolescent ethanol exposure, the gut microbiome composition of male Sprague Dawley rats was examined over three consecutive timepoints, with fecal samples collected from postnatal day (PND) 44-72. During this period, animals were subjected to binge ethanol exposure. Next, to understand the long-term consequences of continued moderate ethanol exposure, the gut microbiota composition of adult rats provided with a bottle choice of pure water, sucrose+water, or sucrose+ethanol was examined over an additional six timepoints with fecal samples collected from PND 86-366, or to the equivalent age of a 30-year-old human. Bacterial DNA was extracted from fecal samples with an Omega Bio-tek E.Z.N.A. Stool DNA Kit. Subsequent analyses of fecal microbiota were done by 16S rRNA amplicon sequencing. The 16S rRNA V3-V4 primers were used to construct Illumina compatible sequencing libraries. The libraries were sequenced in a 150 bp paired-end run using NextSeq 2000. The raw reads were processed using Nephele platform for microbiome data analysis to assess taxonomy. Analyses to assess alpha and beta diversity across multiple samples are underway. Our study will improve understanding of the long-term consequences of alcohol exposure on the gut microbiome and contribute insight into the gut-brain axis.

Keywords: microbiome, gut, brain, ethanol, aging

UGP-72

Title: Characterizing the Effects of Early Life Opioid Exposure on Neuronal and Astrocytic Structural Synaptic Development

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Research Sponsor: National Science Foundation and National Institutes of Health

Abstract
The opioid crisis has led to a dramatic increase in neonatal abstinence syndrome, a constellation of withdrawal symptoms experienced by opioid-exposed infants after birth. Though opioid exposure has been shown to impact cells in the central nervous system (CNS), such as neurons and astrocytes, little is known regarding the impact of prenatal opioid exposure (POE) on long-term neural development. We have modeled POE in mice by orally dosing pregnant dams with the opioid buprenorphine (or vehicle control) from gestational day 7 to 11 days after the birth of their litters. Astrocytes in the cerebral cortex of the pups were then labeled via either an astrocyte-specific adeno-associated virus (AAV) or postnatal astrocyte labeling by electroporation (PALE), while neurons were labeled via a neuron-specific AAV. The pups were then killed around postnatal day 35 (equivalent to adolescence), and the brains were extracted, frozen, sectioned, and stained for immunohistochemistry (IHC) with the postsynaptic marker PSD95, followed by confocal and super-resolution (STED) microscopy. Volumetric analysis of opioid-induced structural changes at the “tripartite synapse” (i.e. astrocytes and neurons) is currently ongoing to better understand how POE impacts the relationship between critical cell types during development and beyond. Identification of these altered cellular targets is an important first step for the generation of future therapies to address this issue. This research is funded under the National Science Foundation EPSCoR Track 1 Award OIA-2242771 (West Virginia Network for Functional Neuroscience and Transcriptomics WV-NFNT) and the NIH/NIMH Grant 1R15MH126345-01.

Keywords: opioids, synapses, astrocytes, brain, prenatal

UGP-73

Title: Reprogramming of Branched-Chain Amino Acid Metabolism in Breast Cancer

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Sponsoring Institution: School of Pharmacy, School of Medicine
Research Sponsor: NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence (WV-INBRE)

Abstract
Cancer, despite its genetic origin, has recently been considered as a metabolic disease in the scientific community. Reprogramming of energy metabolism to favor cancer growth, metastasis, and resistance to chemotherapy has been studied extensively and well-documented. A major focus of the research in our laboratory has been the changes in mitochondrial biogenesis and energy metabolism in cancer. metabolic alterations around mitochondrial energy metabolism in cancer. The branched chain amino acids (BCAAs) valine, leucine, and isoleucine are all essential amino acids and critical building blocks in the biogenesis of oxidative phosphorylation (OXPHOS) complexes and consequently mitochondrial energy production. Therefore, the BCAAs imported into mitochondria naturally becomes an important part of the energy metabolism in mitochondria. They have already been implicated in diseases including cancer, aging, and other metabolic disorders. In this study, we performed secondary analysis of the mass spectrometry - based proteomics studies of breast cancer tumor tissues and cell lines along with the immunoblotting analyses of triple-negative and ER/PR(+) cell lines, MDA-MB-231 and MCF7, respectively. The impaired expression of BCAA catabolic enzymes, BCAT1 and BCKDH complex subunits, were clearly shown in both tumor tissues and cell lines and helped explain the remodeling of OXPHOS in specific subtypes of breast cancer. Therefore, we propose that the changes in expression of BCAA catabolic enzymes could be developed into diagnostic and prognostic markers to determine aggressive subtypes in breast cancer.

Keywords: breast cancer, proteomics, secondary data analysis, branched chain amino acids, oxidative phosphorylation

GP-01

Title: Optimizing Sponsorship Strategies in Professional Soccer: A Systematic Review

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Research Sponsor: n/a

Abstract
Sponsorship in professional soccer is a multibillion-dollar industry, serving as a primary revenue source for clubs and a key branding strategy for corporate sponsors. Despite its importance, existing research on sponsorship effectiveness and long-term partnerships remains fragmented. Studies have examined various aspects of sponsorship, but there is no unified understanding of what drives successful sponsorship agreements and sustainable partnerships across different leagues and markets. This study aims to address this gap by systematically reviewing the academic literature on soccer sponsorship from 1998 to 2024, identifying key success factors, methodological gaps, and future research directions.

This research employs a Systematic Quantitative Literature Review (SQLR) of 16 peer-reviewed journal articles, using Professional Soccer, Football, and Sponsorship as key search terms. The review synthesizes findings across sponsorship effectiveness, financial impact, brand exposure, fan engagement, regulatory considerations, and emerging sponsorship trends. It examines what factors contribute to successful sponsorships (RQ2), consolidates key insights on sponsorship effectiveness and long-term agreements (RQ3), and highlights conceptual and methodological gaps (RQ4). Additionally, it outlines theoretical, methodological, policy, and practical implications for future research (RQ5).

Findings indicate that successful soccer sponsorships are influenced by brand alignment, audience engagement, contractual stability, and digital activation strategies. However, existing studies reveal gaps in methodological diversity, a lack of cross-market sponsorship evaluations, and an increasing need for advanced sponsorship valuation models. As clubs and governing bodies navigate changing sponsorship landscapes, the study underscores the need for adaptive, data-driven sponsorship strategies.

By consolidating existing scholarship, this research provides a comprehensive assessment of sponsorship strategies in professional soccer, offering valuable insights for sports governing bodies (e.g., FIFA, UEFA), corporate sponsors, and soccer clubs. The findings

contribute to both academic knowledge and industry best practices, supporting evidence-based sponsorship decision-making in an increasingly competitive sports market.

Keywords: Professional Soccer, Football, Sponsorship

GP-02

Title: Systematic Review of Fan Engagement as a Strategic Driver of Organizational and Competitive Success

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Abstract
This study investigates the evolving role of fan engagement in sports organizations, with a focus on how it influences both financial performance and team success. The central research question explores the extent to which fan engagement impacts organizational income and competitive outcomes. Despite the growing recognition of fan engagement's importance, significant gaps remain in the literature regarding its direct correlation with financial and competitive results. These gaps highlight the need for this study to provide a comprehensive review of the existing body of research on the topic. The research utilizes a Systematic Quantitative Literature Review (SQLR) methodology, analyzing peer-reviewed English-language articles published from 1990 to the present. The study addresses five core research questions that aim to understand the scope, key findings, and methodological gaps in the current literature. These questions examine the range of studies, identify dominant themes, assess conceptual and methodological shortcomings, and explore the relationship between fan engagement and organizational outcomes. This study will benefit sports organizations, marketers, executives, and researchers by offering actionable insights into how fan engagement strategies can enhance financial and competitive success. It also contributes to the field of sports management by identifying areas where further research is needed, particularly in terms of methodological innovation and the socio-economic impacts of fan engagement on sports organizations. By synthesizing the findings from the literature, this research provides a holistic view of fan engagement's role in sports and its potential to drive both financial performance and on-field success. The study's conclusions offer important implications for future research and practical applications in sports marketing and management.

Keywords: Fan Engagement, Sports Marketing, Social Media, Strategies.

GP-03

Title: The Role of Brand Image in Professional Sports: A Systematic Review of Characteristics, Strategies, and Impact

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Abstract
Brand image plays a critical role in the success of professional and elite athletes, influencing opportunities for growth, sponsorship, and fan loyalty at both the individual and organizational levels. While previous research has explored aspects of brand image in sports, there remains a gap in understanding how specific brand image characteristics and actions impact the long-term success of athletes and sports organizations. This study addresses this gap by investigating the role of brand image within the sports industry through a Systematic Quantitative Literature Review (SQLR) of peer-reviewed research from the last 30 years. The study examines the evolution of brand image in sports, identifying key characteristics that contribute to the success of athletes and organizations. It also explores the behaviors and strategies that effectively promote a positive brand image, resonating with fans and stakeholders in an increasingly digital and competitive sports landscape. This research is particularly timely due to the growing reliance on brand image in the sports industry, where social media, influencer culture, and global marketing reshape how brands engage with audiences. A thorough SQLR methodology synthesizes findings from diverse studies to identify common themes, trends, and gaps in the research. The analysis focuses on the characteristics of brand image, such as trust, relatability, and emotional connection, and how these factors influence both athlete performance and organizational success. Furthermore, the study explores actionable strategies for sports entities to cultivate a strong brand image. This research provides valuable insights for sports marketers, brand managers, and organizational leaders who are tasked with shaping and maintaining effective brand identities. Additionally, it contributes to academic research on brand management in the sports sector, offering a framework for future studies on the intersection of branding, fan engagement, and sponsorship.

Keywords: brand image, professional, elite, sports industry

GP-04

Title: Game-Changing Endorsements: A Systematic Review of Celebrity Athletes' Impact on Consumer Behavior

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Abstract
Celebrity athlete endorsements represent a critical yet evolving component of sports marketing, particularly in areas with rapidly growing sporting industries. This study examines the relationship between celebrity athlete endorsements and consumer behavior through a Systemic Quantitative Literature Review (SQLR) of research published between 1996 to 2025. While previous studies have established the importance of athlete-brand alignment and consumer trust, there are still significant questions that remain about the effectiveness of these endorsements when it comes to shaping consumer behavior across different market segments. To conduct this analysis, the research initially found 2,315 scholarly articles related to celebrity endorsements. To dive deeper into the research, we refined the search to only peer-reviewed articles written in English, focused on sports endorsements, and investigated how factors such as social media presence, consumer trust, and athlete-brand alignment influence endorsement effectiveness. Our methodology combines SQRL with quantitative survey analysis, guided by specific research questions that address endorsement quality, consumer behavior impacts, and market dynamics. The systemic review process follows the Preferred Reporting Items for Systematic and Meta-Analysis (PRISMA) protocol, ensuring structured research procedures, identification phases, screening, eligibility assessment, and inclusion criteria. The research emphasizes how consumer identification with athletes directly influences brand attitudes and purchase decisions and how social media platforms have transformed the athlete-consumer relationship. This study will contribute to the existing literature by comprehensively analyzing athlete endorsement effectiveness in the modern digital timeframe. Brand managers across all industries will be able to use our research to understand the key factors that drive consumer engagement and prioritize how they utilize athletic celebrity endorsements to entice consumers to choose their products over competitors. Beyond brand managers, our research also offers valuable insights for athletes considering partnerships that align with their brand. This study shows how

strategic collaborations can elevate an athlete's image by amplifying their influence and ensuring that their endorsements contribute to long-term career growth rather than short-term financial gain.

Keywords: Celebrity endorsements, sports, social media, athlete branding

GP-05

Title: Going Viral: Social Media Use for Learning in WV High School Classrooms

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Research Sponsor:

Abstract
As social media remains an integral part of students' daily lives, understanding its educational potential and challenges is essential for engagement in twenty-first century learning. Using Demir (2024) Post-Bloom Social Media Taxonomy as a guide, this study used a researcher-developed cross-sectional survey to examine the extent West Virginia high school teachers used social media in their classrooms, their perceptions of its effectiveness, and the challenges teachers experienced incorporating social media in the classroom for learning. Quantitative data were analyzed using descriptive statistics and chi-square tests to identify the relationships between variables, while qualitative data were thematically coded to discover patterns in teacher experience. Findings provide perspective into the role social media has as an educational tool as well as barriers to its implementation.

Keywords: Social Media, Mixed Methods, West Virginia, Secondary Education, Survey

GP-06

Title: Readers Theatre

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Research Sponsor:

Abstract
Readers Theatre is a literary strategy that uses dramatic presentation of read aloud that does not involve prior memorization or practice. A group of students will read from scripts with minor costumes and props. Readers Theatre works on fluency and comprehension of literary texts. In my PreK classroom, we achieve this through puppets, puppet shows, and nursery rhymes.

Keywords: Readers Theatre PreK Reading and Literacy Strategy

GP-07

Title: Maximizing Model Performance by Identifying Weaknesses

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Abstract
Classification of medical images is essential for both disease diagnosis and treatment planning. However, systematic misclassification patterns are frequently seen in deep learning models used for this task, which may restrict their dependability in practical applications. Conventional methods for enhancing model performance, such as ensembling, combine several models to increase accuracy. Even though ensembling works well, it ignores the unique flaws in each model, treating them as black boxes without addressing their flaws.

The research provides a new approach that will track and analyze the most common reasons for misclassification in a model. This is done by determining the top labels or signs that if exist in an image the model will mostly classify it incorrectly. Following this approach leads us to creating a misclassification analysis for each model. When a new image is entered for prediction, the system will look at the misclassification analysis and compare it to the new input to decide which model/s has better chances in giving a correct prediction. By employing this technique that targets the knowledge of each model a more effective alternative to the common ensembling will be introduced.

Keywords: Classification, medical images, ensembling, model performance.

GP-08

Title: Analysis of Significant Statistical Categories that Lead to Victory in Close Basketball Games

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Research Sponsor:

Abstract
Basketball is a worldwide sport that has captivated the interest of millions globally. From the professional level down to local recreational leagues, there is a desire to quantify the game in a way that is helpful to coaches and players in order to aid their physical approach in game planning and practice. In games where the opponents are equally matched and the outcome of the game is decided by a small point differential, it is imperative to find what determines the outcome of the game. This study will aim to find if there are other statistical categories, besides points, that are influential in leading to a win or loss in these types of close game scenarios and what thresholds are found within those categories. With the rise of the popularity of women's basketball in recent years, this study will analyze NCAA Division I women's basketball statistics from recently completed seasons. Statistical categories recorded include points scored, field goals made, field goals attempted, offensive rebounds, defensive rebounds, assists, turnovers, steals, fouls, etc. This data is found in box scores that are released following a game, detailing team and individual statistics recorded during the game. Statistics that can be derived from the box score data that will also be used in analysis are field goal percentage, shot distribution (one, two, or three point attempts), defensive and offensive rebounding percentages, points per possession, etc. By examining these statistics across multiple seasons, the study aims to identify consistent trends that separate winning teams from losing teams in closely contested matchups. Advanced analytical techniques such as regression and correlation methods will be used to determine the significant statistical categories and optimal thresholds that consistently differentiate success in close games. These thresholds may include specified rebounding margins, turnover limits, minimum shooting efficiency, etc. This study will assess games decided by five points or less. This marginal difference will allow for the analysis of games decided by one to two possessions. The findings could be instrumental in shaping coaching strategies, player development programs, and scouting

approaches, ensuring that teams are better equipped to handle the pressures of late-game situations and coaches will be educated on what in-game adjustments need to be made. This use of statistics to influence the decision making process in sports provides mathematical support in the justification for coaching decisions, shifting from instinctive reasoning to factual. This approach will not only provide historical insights but also create a foundation for future applications in predictive analytics and game strategy optimization

Keywords: Data Analytics, Close-game Analysis, Game Strategy Optimization, Performance Metrics

GP-09

Title: Lightweight CNN-Based Recognition of Distracted Drivers

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Research Sponsor: NA

Abstract
Abstract—Distracted driving is a growing hazard on the roads, causing significant damage to the infrastructure and, more importantly, leading to the loss of many lives. Every day, countless accidents occur due to drivers losing focus, whether from fatigue, distraction, intoxication, or reckless behavior. Human error is a significant contributor to road accidents. Reckless actions and intoxication are common hazardous driving behaviors in addition to less obvious actions such as inattentiveness, and driver fatigue all of which frequently result in accidents. This paper discusses various methodologies proposed by different researchers, including their approaches such as sensor configurations, recognition techniques, and their respective performance metrics and shortcomings. This project focuses on creating an efficient, lightweight system that accurately detects distracted driving behaviors. Furthermore, this study examines the difficulties and constraints of the suggested model and identifies areas for future research. The methodology involves preprocessing driver images and extracting features using CNN. Comparisons are made between the proposed framework and the baseline model in terms of variable weight, processing time, and accuracy. Results indicate that, although the initial model achieves slightly higher accuracy (98%), the proposed model offers acceptable accuracy (96%) as well as a lightweight solution for image classification. Therefore, it is anticipated that this study will offer valuable insights for further enhancing accuracy without extending processing time.

Keywords: Driver distraction detection, Convolution Neural Networks (CNNs), Deep Learning, Epochs, Loss function, Max pooling

GP-10

Title: A Convolutional Neural Network Model for Characterization of Material Deposition Quality in Additive Fabrication of Bone Scaffolds

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Research Sponsor: National Science Foundation (NSF)

Abstract
This research aims to address the challenge of ensuring consistent extrusion quality in porous bone scaffolds, which is crucial for their structural integrity and biomedical functionality. The primary issue is the lack of automated, reliable methods for real-time extrusion quality assessment during manufacturing. The long-term goal is to establish a smart, scalable quality control framework for additive fabrication of bone tissue scaffolds. The objective is to develop a Convolutional Neural Network (CNN) model to predict extrusion quality by learning complex visual patterns of bone tissues. By integrating the CNN into the manufacturing workflow, near real-time monitoring and prediction of extrusion quality can be achieved. This research contributes to tissue engineering by improving scaffold quality, which directly affects their structural and biological performance. The dataset consists of scaffolds fabricated by Pneumatic Micro-Extrusion (PME) with varying extrusion regimes (over, under, and normal extrusion) and biocompatible composite materials. The CNN model, optimized for hyperparameters, achieves accuracy ≥ 90% in predicting extrusion quality. It offers a reliable, non-destructive method for identifying extrusion issues and provides a foundation for an automated quality control system in scaffold fabrication. This approach supports the development of standardized, efficient manufacturing processes for high-quality, patient-specific bone scaffolds in regenerative medicine.

Keywords: Advanced Manufacturing; Bone Tissue Engineering

GP-11

Title: Enhancing Breast Cancer Detection in Ultrasound Imaging Using Focused Masked Autoencoders

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Research Sponsor: NSF ACCESS

Abstract
Our project focuses on improving breast cancer detection using deep learning techniques on ultrasound images. While reviewing current methods, we identified areas where analysis could be enhanced for greater accuracy. To address this, we propose adapting FocusMAE, a technique originally developed for detecting gallbladder cancer in videos, and modifying it for breast ultrasound images.

What makes FocusMAE particularly valuable is its ability to emphasize the most critical regions of an image while minimizing distractions from non-relevant details. As a team, we will tailor this approach specifically for breast tissue by modifying the region proposal network. Since the original method leverages temporal information from videos, our adaptation will focus on enhancing spatial attention capabilities for still ultrasound images. We will train and test our model using publicly available breast ultrasound datasets to ensure robust performance and validation.

Our goal is to develop a system that improves the accuracy of breast cancer detection while reducing false positives, thereby enhancing the reliability of computer-aided diagnosis tools. To our knowledge, this approach has not yet been applied to breast ultrasound images, making our work a potential breakthrough in the field of medical imaging and deep learning

Keywords: Breast cancer detection,FocusMAE,Deep learning, computer-aided diagnosis,Ultra-sound image

GP-12

Title: Investigation of Virtual Impactor Design Parameters in Aerosol Jet Printing Using Computational Modeling

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Abstract
Aerosol jet printing (AJP) is an additive manufacturing technique used to fabricate electronics like sensors and capacitors by depositing conductive inks onto substrates. The AJP system consists of three main components: the pneumatic atomizer, virtual impactor, and deposition head. The virtual impactor (VI), located between the atomizer and deposition head, separates aerosol particles based on size. It plays a crucial role in aerosol flow behavior, printing efficiency, and print quality, as it can contribute to inefficiencies, poor repeatability, and inconsistent output. This study uses computational fluid dynamics (CFD) to analyze the fluid transportation and deposition within the virtual impactor. The VI geometry is modeled in ANSYS-Fluent, based on Optomec's design, to observe single-phase, compressible, turbulent flow. The flow domain is discretized with a mesh, and boundary conditions are applied. The study examines mass flow rates and aerosol particle interactions with the VI walls, providing insights into particle behavior and flow transitions. The analysis also explores fluid flow separation, which is key to the VI’s function. These findings aim to address challenges such as inaccurate print quality, flow blockages, and process instability, ultimately contributing to the improvement of AJP for high-quality, efficient printed electronics.

Keywords: Advanced Manufacturing; Aerosol Jet Printing.

GP-13

Title: Smartphone-Based Road Quality Assessment Using IoT and Machine Learning: A Data-Driven Approach for Infrastructure Maintenance

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Research Sponsor:

Abstract
The combination of the Internet of Things (IoT) with machine learning is creating a game-changing method for assessing road quality in real time, addressing the drawbacks of traditional inspection methods. In this study, we introduce a smartphone-based system designed for data collection, which uses tri-axial accelerometer data, GPS tracking, and cloud-based analytics to evaluate road surface conditions. We collected over 100,000 data points from 100 miles of urban and rural roads, processing acceleration data at 100 Hz and GPS information at 1 Hz. By employing unsupervised learning with k-means clustering (k=5), we effectively divided road segments into five distinct quality categories. We confirmed the accuracy of this classification through visual inspections and photography, achieving a 92% correlation with ground truth data. The analysis revealed that 27% of the roads were in poor condition, 34% were moderately good, and only 12% were rated excellent. The study also points out some challenges, including sensor reliability, differences in vehicle suspension systems, and limitations in GPS accuracy. Even with these hurdles, our results indicate that IoT-powered road monitoring can greatly improve data-driven decision-making for infrastructure upkeep. Future work will aim to incorporate combination of physics based and deep learning models, broaden our datasets and enable near real-time processing for predictive maintenance. These advancements will make the system more scalable, and cost-effective, and enhance road safety, ultimately contributing to smarter and more sustainable transportation infrastructure.

Keywords: IoT / Transportation / Roads / Machine Learning

GP-14

Title: Railroad Defect Detection using Emerging Machine Learning Technology

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Research Sponsor: U.S. Army Engineer Research and Development Center (ERDC)

Abstract
Railroad inspection is an important element in railroad maintenance. The inspection process is mainly performed in a visual manner by humans. The major disadvantages of this usual method are cost, worker safety, and accuracy. Advances in machine learning offer promising approaches to solving the challenges. This study explores the use of machine learning technology in railroad defect detection. The main objectives of this research are to analyze the general railroad defects and to investigate how to detect defects for railroad maintenance using machine learning techniques. Four general railroad defects were selected as target issues: Joint Bar Cracks, Missing Bolts, Insufficient Ballast, and Track Gauge Deviation. Based on a comprehensive literature review, the results demonstrate that YOLO, a probabilistic model, and CNN, a deterministic model, are widely used to detect these defects. This research provides insight into the opportunities for machine learning in railroad defect detection. The implications of this study are that continuous research on the architecture of each model and algorithm development is required to fully utilize the potential of machine learning in railroad inspection. Future research can be conducted to develop new feasible railroad defect detection algorithms by modifying the architecture of the major models of both approaches.

Keywords: railroad defect detection, railroad inspection, machine learning, probabilistic models, deterministic models

GP-15

Title: Comparative Analysis of OpenAI GPT-4o and DeepSeek R1 for Scientific Text Categorization Using Prompt Engineering.

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Abstract
This study examines how large language models categorize sentences from scientific papers using prompt engineering. We use two advanced web-based models, OpenAI's GPT-4o and DeepSeek R1, to classify sentences into predefined relationship categories. DeepSeek R1 has been tested on benchmark datasets in its technical report. However, its performance in scientific text categorization remains unexplored. To address this gap, we introduce a new evaluation method designed specifically for this task. We also compile a dataset of cleaned sci- entific papers from diverse domains. This dataset provides a platform for comparing the two models. Using this dataset, we analyze their effectiveness and consistency in categorization.

Keywords: Large language models, GPT 4o, DeepSeek R1, prompt engineering

GP-16

Title: Evaluating the Suitability of Different Intraoral Scan Resolutions for Deep Learning-Based Tooth Segmentation.

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Abstract
Intraoral scans are widely used in digital dentistry for tasks such as dental restoration, treatment planning, and orthodontic procedures. These scans contain detailed topological information, but manual annotation of these scans remains a time-consuming task. Deep learning-based methods have been developed to automate tasks such as tooth segmentation. A typical intraoral scan contains over 200,000 mesh cells, making direct processing computationally expensive. Models are often trained on downsampled versions, typically with 10,000 or 16,000 cells. Previous studies suggest that downsampling may degrade segmentation accuracy, but the extent of this degradation remains unclear. Understanding the extent of degradation is crucial for deploying ML models on edge devices. This study evaluates the extent of performance degradation with decreasing resolution. We train a deep learning model (PointMLP) on intraoral scans decimated to 16K, 10K, 8K, 6K, 4K, and 2K mesh cells. Models trained at lower resolutions are tested on high-resolution scans to assess performance. Our goal is to identify a resolution that balances computational efficiency and segmentation accuracy.

Keywords: Tooth segmentation, intraoral scan, mesh processing, point cloud, mesh decimation

GP-17

Title: Evaluating Lightweight and Standard Encryption Algorithms for IoT Security and Efficiency

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Abstract
The Internet of Things (IoT) presents unique security challenges due to its reliance on resource-constrained devices. This study evaluates the performance of standard ciphers (AES, DES, 3DES, Blowfish) and lightweight ciphers (SIMON, PRESENT, PICCOLO) under IoT-specific constraints. Simulations were conducted using practical parameters such as transport delay, noise levels, and power limits. Lightweight ciphers demonstrated stronger resistance to noise injection attacks but remained vulnerable to brute force and differential cryptanalysis attacks. SIMON emerged as the most efficient lightweight cipher, achieving 99.53% lower latency and 99.98% reduced energy consumption compared to AES. However, lightweight ciphers exhibited increased error rates under higher loads, highlighting the tradeoffs between scalability and security in IoT environments. Future directions include hybrid encryption approaches and adaptive cryptographic frameworks for enhanced resilience.

Keywords: IoT, lightweight encryption, standard encryption, cybersecurity, resource constraints

GP-18

Title: Applying DIFFUSEMIX for liver tumor segmentation using the LiTS dataset

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Abstract
Data augmentation is a method used to combat data scarcity, a problem with training deep learning models, in which new data is created by altering existing data. While data scarcity is an issue across all machine and deep learning problems, it is of particular concern in medicine. This is due to laws surrounding the release of medical data, disease rarity, and more. DIFFUSEMIX: Label-Preserving Data Augmentation with Diffusion Models outlines a new model for data augmentation that utilizes diffusion, generation prompts, image concatenation, and fractal images to create hybrid augmented images. DIFFUSEMIX was tested on seven natural image datasets. The researchers used DIFFUSEMIX to perform five tasks: general classification, fine-grained classification, adversarial robustness, data scarcity, and transfer learning. Because DIFFUSEMIX has only been tested on natural images and used for classification tasks, our group proposed a study in which DIFFUSEMIX would be applied to a medical image dataset, specifically the Liver Tumor Segmentation (LiTS) dataset. LiTS is a widely used dataset that contains images of patients with liver tumors. In this study, we are using DIFFUSEMIX for segmentation tasks, rather than the classification tasks it was originally used for. Our primary goal is to successfully apply DIFFUSEMIX for liver tumor segmentation to see if the use of DIFFUSEMIX can improve segmentation accuracy. Our results will be compared with those of existing models to determine if using DIFFUSEMIX yields better accuracy for liver tumor segmentation.

Keywords: Machine Learning, Image Segmentation, Medical Images, Data Augmentation

GP-19

Title: The Sand Battery:

An Exploration of Thermal Energy Storage in 2D

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Abstract
This study focused on the design, modeling, and optimization of a Thermal Energy Storage (TES) system utilizing sensible heat storage in sand as the storage medium. Through a series of 2D numerical simulations, various design configurations, material properties, and operational parameters were tested to determine the most efficient and practical TES system. The primary objectives were to maximize thermal energy retention, optimize heat transfer efficiency, and ensure the practicality of system construction while balancing computational constraints and material feasibility. The conclusions drawn from this work are based on systematic variations of key parameters, including porosity, heating element configurations, power input variations, and material blending strategies. One of the fundamental aspects studied was porosity, as it directly impacts the effective thermal conductivity of the sand-based TES system. Three porosity levels—31.5%, 35%, and 40%—were analyzed to evaluate their effect on thermal storage efficiency. The results confirmed that a lower porosity of 31.5% resulted in higher thermal retention and improved heat transfer, validating findings from the 2D simulations. At the final recorded time step, the temperature in the 31.5% porosity system was 24.15 K higher than that of the 40% porosity system. The number of resistive heating elements was systematically increased to improve heat distribution within the TES system. The initial 9-rod setup exhibited significant localized heating, leading to inefficient heat spread throughout the system. Expanding the system to 12 rods improved heat distribution, as demonstrated by a higher overall temperature rise and a more uniform temperature gradient. Three power levels—500 W/m^2, 1000 W/m^2, and 2000 W/m^2—were tested in 2D simulations to evaluate how different energy inputs affect thermal distribution within the TES system. The results indicated that increasing power input substantially accelerated heat accumulation, with the highest power setting of 2000 W/m^2 producing a temperature increase of 217.64 K higher than the 500 W/m^2 case over the same duration. This confirms that higher power inputs contribute to faster charging of the system, allowing it to reach optimal temperatures more quickly.

The study also explored the influence of metal additives, including stainless steel, copper, and aluminum, to improve the effective thermal properties of the sand. Copper and aluminum blends, at concentrations of 1% and 3% by mass, were introduced to enhance thermal conductivity. The results showed that these metals facilitated higher initial heat absorption but provided only marginal long-term temperature retention gains. Specifically, the 1% copper blend initially retained more heat than the 3% blend, but as time progressed, the 3% blend exhibited higher heat loss, suggesting a diminishing return on increasing metal concentrations.

Keywords: Thermal Energy Storage Sand Battery

GP-20

Title: Using Artificial Intelligence Method for Realistic Biomedical Image Synthesis

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Abstract
Biomedical image synthesis has emerged as a crucial area in artificial intelligence, particularly in deep learning, where data availability is often restricted due to privacy regulations like HIPAA. This research explores the application of diffusion models for generating realistic biomedical images, specifically for skin lesion classification. The study aims to address the persistent issue of limited labeled datasets by employing generative approaches to enhance existing collections and elevate classification outcomes. The project follows a structured methodology, starting with the selection of a publicly available skin lesion dataset like HAM10000 which is a large collection of multi-source dermatoscopic images of common pigmented skin lesions. We explore and develop various diffusion models to generate diverse and realistic skin lesion images. We leverage cloud computing infrastructure through AWS for efficient model testing and evaluation. The completed research will offer significant contributions regarding generative AI applications in biomedical contexts. The results will deepen the understanding of deep learning for medical image synthesis, helping bridge the gap between artificial intelligence and biomedical engineering.

Keywords: Skin lesion classification, deep learning, data augmentation, diffusion models, generative AI, medical image processing, PyTorch, biomedical image synthesis.

GP-21

Title: Lower Force Production, Postural Sway, And Lower Extremity Injury Prevention

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Abstract
Context: Lower extremity force production is critical in athletic performance and injury risk.

Understanding its relationship with postural sway, lower extremity force production, and lower extremity injury risk may improve screening and prevention strategies for collegiate athletes. Despite extensive research on lower extremity injury mechanisms, there remains a need to explore predictive markers for injury occurrence. This study examined whether postural sway and force production metrics can be reliable predictors of future lower extremity injuries and whether previous injury history leads to measurable deficits in these variables.

Methods: A prospective cohort study was conducted with 43 collegiate male baseball athletes (1.85 ± 0.06 m; 91.0 ± 8.8 kg). Data collection occurred in the university biomechanics laboratory, utilizing force plates (AMTI, Watertown, MA). Athletes underwent testing for force production and postural sway metrics using CMVJ. Variables used included: normalized landing force (NormLandingForce), mean overall power (MeanOverallPower), peak overall power (MaxOverallPower), anterior-posterior (APCOP) and medial-lateral (MLCOP)center of pressure range, and root mean square sway (RMSAP, RMSML) in anterior-posterior and medial-lateral directions. Injury surveillance was conducted throughout the competitive season, and past injury history of lower extremity injuries was documented. Lower extremity injuries were categorized as pre-testing or post-testing. Independent t-tests compared previously injured vs. non-injured athletes. A logistic regression model assessed whether force and sway variables predicted future injuries. Significance was set at 0.05.

Results: No significant differences were found in postural sway and force production metrics between previously injured and non-injured athletes. However, injured athletes had lower Max Overall Power (2490.58 ± 104.67 W vs. 2047.21 ± 361.01 W, p = 0.027), indicating reduced peak force production, indicating lingering deficit in force production. Single leg Landing Rate of Force Development also differed significantly (35.876 ± 0.807 kN/s vs.

33.090 ± 4.360 kN/s, p = 0.025), suggesting that previously injured athletes generate force at a different rate. Single leg mean Landing Force varied between legs (1.097 ± 0.038 kN vs 1.110 ± 0.085 kN, p = 0.021), suggesting that one leg consistently absorbs more impact force than the other, indicating possible asymmetries. Logistic regression failed to accurately predict future injuries, with a 100% classification accuracy for non-injured athletes but 0% accuracy for injured athletes, indicating a highly imbalanced dataset. Dynamic postural stability index and anterior-posterior stability index were slightly elevated in future injured athletes but were not statistically significant predictors.

Conclusions: This study suggests that force production, particularly peak power and rate of force development, may be altered in previously injured athletes, whereas postural sway is not significantly affected. However, force and sway metrics alone do not reliably predict future injuries, emphasizing the need for a multifaceted approach incorporating training load, biomechanics, and neuromuscular control assessments.

Keywords: Lower extremity, force production, injury

GP-22

Title: Nutrition Education Impact on First Responder Nutrition Habits and Knowledge

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Abstract
This study aimed to evaluate the effectiveness of a nutrition education program on first responders' nutrition knowledge and habits. First responders often work long hours, thus proper nutrition is crucial for their strength, focus, and overall health, helping them handle tough situations, recover quickly, and stay mentally sharp. Previous studies show that first responders, especially firefighters, often do not meet recommended daily intake values, leading to negative health outcomes (Johnson & Mayer, 2020; Sotos-Prieto, et al., 2019). This study aimed to improve their nutrition status and attitudes through tailored education. The seven-week program included weekly lessons on various nutrition topics. Twenty-three participants completed pre-surveys after being recruited via email or social media invitation. All participants were male, average age = 37.04, average years of experience = 12.89. Pre-survey results indicated that on a scale of 1-10 (1 = not at all important, 10 = very important), participants felt that nutrition was important (M = 8.65 , SD = +/- 2.14) and ranked themselves poorly (M = 5.07 , SD = +/- 2.09) on the extent to which they consume a balanced diet and satisfaction with their own diet (M = 5.96 , SD = +/- 2.58). A post-survey will also be administered following completion of the seven-week nutrition education program. The results will assist in tailoring future nutrition education programs and interventions specifically to the needs of first responders.

Keywords: Nutrition, first responder nutrition, nutrition education

GP-23

Title: BCMJ Variables Mean Power and Concentric Impulse Correlate to Fastball Velocity

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Abstract
Introduction: Baseball pitchers at the professional level repetitively throw at velocities close to 100 miles per hour. To accomplish this impressive task, high power output is required, and it must be efficiently transferred from the legs up to the ball with precise timing. Exploring how lower body power is transferred up the kinetic chain to result in high velocity fastballs is an active area of research. Currently, scientists are trying to establish what variations of lower body power assessments demonstrate the kinetic transfer that occurs in pitchers. Ideally, the power assessment would correlate to fastball velocity. Having a testing battery that represents power transfer in pitchers would be a great way for scouts to help identify emerging talent. In addition, a desired test could also help sport scientists and coaches identify experienced pitchers whose power transfer needs improvement. Lastly, evidence is emerging that efficient transfer of lower body power can decrease elbow varus torque, which is a key factor in ulnar collateral ligament injuries of the elbow. There is a need for a reputable power test in baseball pitchers, but currently there is no consensus on the best practice. This study aimed to contribute evidence to the emerging foundation of power assessment tests in pitchers. The goal of this study was to examine the correlation of bilateral counter-movement jump (BCMJ) variables to fastball velocity.

Methods: BCMJ and fastball velocity data were collected. The BCMJ variables were: jump height, mean overall power, maximum overall power, eccentric impulse, concentric impulse, counter-movement depth, and modified reactive strength index (mRSI).

Results: Mean overall power (r = -0.49) and concentric impulse (r = -0.21) were significantly correlated to fastball velocity. Jump height, maximum overall power, eccentric impulse, countermovement depth and mRSI were not significantly correlated to fastball velocity.

Significance: Overall, this study adds evidence that concentric impulse and mean overall power are weakly correlated to fastball velocity. Additional studies should investigate these two variables using the BCMJ with a larger sample size. Also, further research should

evaluate concentric impulse in other jumps shown to be potentially more related to pitching power transfer, such as the unilateral lateral to medial jump (ULMJ).

Keywords: Baseball; fastball velocity; bilateral counter-movement jump (BCMJ); baseball pitchers; power transfer;

GP-24

Title: Abdominal Muscle Activation and Lumbar Lordosis

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Abstract

Context: Excessive lumbar lordosis, or an abnormal curvature of the lower spine, is a common cause of low back pain and can impact on daily activities. Muscle imbalances, particularly weakness in the abdominal muscles, contribute to altered spinal posture. This study aims to determine how the activation of the rectus abdominus and erector spinae muscles affect lumbar lordosis. The hypothesis is that weaker abdominal muscles and stronger erector spinae lead to increased lordosis. Understanding these relationships will help identify targets for rehabilitation and improve interventions to reduce pain and prevent injuries related to excessive lordosis.

Methods: Eleven individuals (age = 20.7±1.3 years, 5 female, 6 male) without a history of low back pain participated. This study measured lordotic angles, abdominal muscle, erector spinae (ES), and rectus abdominus (RA)) activation during a one-minute treadmill walk., and strength to compare it to the extent of lumbar curvature present. Participants, who met the inclusion criteria, had range of motion of the hip and low back measured. Muscle activity was recorded using surface electromyography (sEMG) while participants walked on a treadmill. Surface EMG was during maximum lumbar flexion and extension contraction to normalize sEMG during the walk test. was also recorded. Lumbar angle was measured using handheld goniometry. Pearson Correlation analysis was used to determine the association between thoracic angle and muscle activity.

Results: Mean lumbar angle was 31.2 ±15.1°. Mean normalized sEMG activity for the RA was 11.8 ±12.0% and 18.4 ± 10.9% for the ES. Negative correlations were found between both RA (r(11) = --0.434, p = 0.182) and ES (r(11) = -0.479, p = 0.136).

Discussion: Participants with great lordosis had lower activity of both the RA and ES muscles while walking. Lower activity of the low back and abdominal muscle during physical activity has been associated with low back pain. Participants of the current investigation did not have low back pain. Given the small sample size in this study, further

research with a larger and more diverse population is needed to better understand the relationship between lumbar lordosis, muscle activation, and spinal posture.

Keywords: Lumbar Lordosis, Abdominal Activation

GP-25

Title: Abdominal Muscle Activation and Lumbar Lordosis During Sit-Stand and Stand-Sit

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Research Sponsor:

Abstract

Context: Excessive lumbar lordosis, or an abnormal curvature of the lower spine, is a common cause of low back pain and can impact on daily activities. This study aims to determine effect of lordosis on the activation of the rectus abdominus and erector spinae muscles during a sit to stand task. The investigation tested the hypothesis is that weaker activation during the sit to stand task would be seen in abdominal muscles and stronger erector spinae with increasing lordosis. Understanding these relationships will help identify targets for rehabilitation and improve interventions to reduce pain and prevent injuries related to excessive lordosis.

Methods: Eleven individuals (age = 20.7±1.3 years, 5 female, 6 male) without a history of low back pain participated. This study measured lordotic angle, and abdominal muscle (erector spinae (ES) and rectus abdominus (RA)) activation during a sit to stand and a stand to sit task. Participants, who met the inclusion criteria, had range of motion of the hip and low back measured. Muscle activity was recorded using surface electromyography (sEMG) while participants first stood from a sitting position the returned to the sitting position. Surface EMG during maximum lumbar flexion and extension contractions were collected to normalize sEMG during the task test. Lordotic angle was measured using handheld goniometry. Pearson Correlation analysis was used to determine the association between thoracic angle and muscle activity.

Results: Mean thoracic angle was 31.2 ±15.1°. Mean normalized sEMG activity for the RA during the sitting phase was 6.08±3.72% and 20.93 ± 6.73% for the ES. Mean normalized sEMG activity for the RA during the standing phase was 5.85±4.5% and 23.03 ± 10.52% for the ES. Statistical nonsignificant correlations were found between RA and ES during both the sitting and standing phases. The strongest positive correlation was found between RA and lordotic angle ($r(11) = 452$, $p = 0.163$) for during the standing phase and a negative correlation between the ES and lordotic angle ($r(11) = -0.310$, $p = 0.353$) during the sitting phase.

Discussion: The moderate correlation between RA activation and lordotic angle during the standing phase suggests that participants with greater lordotic curve needed more RA activity to stand and less ES activity while sitting. The results of the current study need to interpret with caution due to the low sample size.

Keywords: Lumbar lordosis, muscle activation

GP-26

Title: Nicotine and Vaping Harm in Appalachia vs. Nationwide: Protocol for a Systematic Review of Unique Risk Factors

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Research Sponsor:

Abstract
Background

In 2024, 10.1% of U.S. high school students reported using nicotine products, with 1.63 million using e-cigarettes. West Virginia leads the nation in youth nicotine use, with 27.0% of high schoolers using e-cigarettes (vs. 7.8% nationally) and 6.7% smoking cigarettes (vs. 1.7% nationwide). Despite declining national trends, the Appalachian region continues to have higher smoking and vaping rates, with 20% of adults smoking, compared to 16% in non-Appalachian areas. Identifying regional determinants is crucial for developing targeted prevention and intervention strategies to reduce nicotine and vaping-related harm in Appalachia. This systematic review aims to assess nicotine and vaping-related harm in Appalachia, identify key risk factors contributing to these disparities, and evaluate the strength of the relationship between individual- and macro-level determinants and the nicotine and vaping burden in the region.

Methods

This systematic review is being registered in PROSPERO to ensure methodological rigor. Following PRISMA guidelines, we will conduct a comprehensive search in PubMed and Google Scholar, using terms such as “nicotine,” “vaping,” “e-cigarettes,” “Appalachia,” “United States,” “policy impact,” and “health disparities.” Gray literature, including government reports and nonprofit health assessments, will also be reviewed.

Inclusion and Exclusion Criteria: Inclusion: Observational studies (cross-sectional, cohort, case-control), systematic reviews, and policy analyses examining nicotine/vaping harm in Appalachia and the broader U.S. Studies focusing solely on smoking cessation, lacking Appalachian-specific data, or conducted on animal models will be excluded.

Preliminary Findings

Nicotine and vaping use in Appalachia exceed national averages, with several key risk factors contributing to these disparities. Adolescents with severe depressive symptoms are twice as likely to vape, and those with a history of childhood trauma have a 64% higher likelihood of vaping. A preliminary literature search suggests that limited access to healthcare, particularly cessation resources, is a significant determinant of nicotine use burden in Appalachia.

Plan of Analysis

Based on the preliminary findings, this study aims to assess individual- and environmental-level upstream factors associated with the burden of nicotine and vaping harm in Appalachia compared to national trends. High-quality Appalachia-based studies are scarce, so this study will be conducted in two phases:

Phase One: Data extraction will be conducted, including study design, sample size, health outcomes, and policy effectiveness. A narrative synthesis will explore primary and peripheral factors, offering qualitative analyses of regional disparities.

Phase Two: Data quality will be assessed, and an appropriate meta-analysis (either random-effects or fixed-effects) will be conducted to obtain pooled estimates for key determinants. A meta-regression analysis will further examine the magnitude and direction of the relationship between socioeconomic factors, healthcare access, and mental health indicators in driving nicotine and vaping disparities in Appalachia.

Conclusion

Findings will inform public health education, health promotion efforts, and policy recommendations to mitigate vaping-related harm in the region.

Keywords: vaping, Appalachia, nicotine use, regional determinants, systematic review

GP-27

Title: Social Media and Academic Motivation: A Qualitative Exploration of College Student Engagement and Success

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Abstract
This qualitative research paper explores how social media use influences academic motivation, engagement, and success among college students. This study examines the ways in which social media serves as both a tool for academic collaboration and a source of distraction, shaping students' educational experiences in complex ways. Drawing from existing literature on digital communication, educational psychology, and social learning theories, this study investigates the benefits and challenges of social media use in academic settings. Using qualitative methods such as semi-structured interviews and focus groups, the research provides an in-depth exploration of how students navigate social media in relation to their academic goals. The findings contribute to discussions on digital literacy, student well-being, and the evolving role of social media in higher education.

Keywords: Social media use, Academic motivation, Academic success, Higher education

GP-28

Title: Mapping coastal vegetation to evaluate salt marsh decline in South Carolina, USA

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Research Sponsor: Department of Navy #M0026322P0030

Abstract
Accelerating sea-level rise and increasing storm surge events pose a substantial threat to salt marsh ecosystems. Classification and mapping that integrates remote sensing and fieldwork can identify areas vulnerable to salt marsh decline and die-off. The objectives of this research were: 1) conduct an accuracy assessment to evaluate a vegetation map of Marine Corps Recruit Depot Parris Island (MCRDPI), a sea island in South Carolina, USA, and 2) develop a multisensor approach to improve the vegetation map and quantify changes in salt marsh productivity and resilience over time. In 2022 and 2023, we established permanent vegetation plots within major coastal vegetation types, used cluster analysis and ordination to delineate vegetation types, and then mapped 23 land cover types using supervised deep learning classification. This included two salt marsh types, soft marsh and hard marsh, which are dominated by smooth cordgrass (Spartina alterniflora) and differentiated by grass height and density and level of regular tidal inundation. Accuracy assessment field validation points (N = 525) were collected in 2023 and 2024. To determine the vegetation map's accuracy, we created a confusion matrix which compared the map's expected land cover type to the type recorded in the field. The accuracy assessment yielded an overall accuracy of 62% and a kappa statistic of 0.6. Soft marsh, which is the most extensive vegetation type on MCRDPI covering 41.4%, had a producer's and user's accuracy of 84% and 58%, respectively. Combining soft and hard marsh into one salt marsh type resulted in a producer's accuracy of 79.8% and an improved user's accuracy of 82.9%. To identify trends in salt marsh productivity and improve the 2022 vegetation map, we developed a multisensor approach that incorporates LiDAR data, multispectral imagery, and cover estimates from field training points to separate hard and soft marsh types into nine classes that represent the height (short, intermediate, tall) and percentage cover (<20%, 20-50%, >50%) of S. alterniflora stands. In summer 2025, vegetation and elevation surveys will be conducted within each S. alterniflora class to further refine the multisensor approach. Thereafter, we will delineate

the extent of marsh cover classes using previous year's spectral imagery to create a time-series of marsh change over the past two decades and identify trends in salt marsh productivity, areas of salt marsh die-off, and the conditions under which sea-level rise and storm surge intensification are dampening salt marsh ecosystem stability and resilience.

Keywords: Salt Marsh, Sea-level Rise, Remote Sensing, Accuracy Assessment, Resilience

GP-29

Title: Effects of In-Stream Large Woody Debris Management on Streamside Salamander Populations

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Research Sponsor:

Abstract
The addition of large woody debris (LWD) into streams is an increasingly common habitat restoration method used to support brook trout populations and other sensitive freshwater species. Wood jams create localized reductions of water velocity, increase organic matter retention, intensify overbank flows, and promote habitat heterogeneity. These changes enhance interaction between the floodplain and the stream which can influence forest habitat variables such as leaf litter, soil pH, moisture, and invertebrate abundance. Salamander demographics reflect the stability of these forest habitat variables, and decreases in populations can indicate environmental disturbance, stress, or change. Evaluating the impact that this trout-targeted management has on salamanders is increasingly important as amphibian populations are facing several challenges to their viability such as disease, habitat loss, and changing climate patterns. This study aims to quantify the effect that LWD management actions have on terrestrial and aquatic dwelling salamanders. To investigate the influence of LWD management on salamander abundance and species richness, we will conduct terrestrial flip-and-search transect surveys and in-stream leaf litter bag sampling in 3 streams in the central Appalachian Mountains in the Monongahela National Forest, West Virginia. These streams have varying ages of LWD addition (5, 7, 10 years), which we used to define the study sites. We hypothesize that salamander abundance and species richness will increase with the age of LWD additions, and that salamander abundance and species richness will be higher in riparian regions of streams treated with LWD compared to stream regions not treated with LWD. Using data from the summers of 2024 and 2025, we aim to conduct N-mixture occupancy modeling with site covariates and perform an ecological community analysis to evaluate the impact of LWD management on streamside salamander populations.

Keywords: ecology, salamanders, abundance, management, Appalachia

GP-30

Title: Functional Trait Differences Influence Interception Ability for Evergreen and Deciduous Tree Species

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Research Sponsor: National Science Foundation, award DEB: RaMP #2319718

Abstract
Ecology is everywhere, especially with trees in everyday outdoor spaces. As urbanization and impervious surface area increases, flooding and pollution from surface runoff will further impact human and ecosystem health. Urban trees can reduce stormwater runoff during precipitation events and mitigate flooding by intercepting water. Previous studies suggest that evergreen trees intercept more water than deciduous trees, especially during the dormant season; however, this evidence is from a limited number of species and geographic areas. Our work aims to identify which urban tree functional traits are most effective at intercepting and diverting water during precipitation events. Specifically, we asked: (1) which traits of urban trees determine their interception ability? and (2) how does the importance of these traits differ across seasons? We used HOBO tip rain buckets to measure precipitation events and partition canopy interception into throughfall (water that comes through the canopy) and stemflow (water that comes down the trunk). Multiple individuals of five deciduous tree species, one broadleaf evergreen species (Ilex opaca), and one needleleaf evergreen species (Pinus strobus) were instrumented in urban areas of Charleston and Huntington, WV. Trait data were collected for each tree including height, DBH, biomass, leaf area index, canopy width and volume, canopy cover, primary branch count, branch angle, bark thickness, and leaf type (deciduous, broad-leaf evergreen, or needle-leaf evergreen). We used linear mixed effects models and model selection using AIC to explore the relationship of each trait to the proportion of precipitation intercepted (hereafter “proportion interception”). Proportion interception differed as a function of tree leaf type ($p = 0.07$). During the leaf-off (dormant) period, broad-leaf evergreen species intercepted 77-87% of precipitation, deciduous species intercepted 2-46% of water, and needle-leaf evergreen species intercepted 6-56% of water. Primary branch count was positively related to proportion interception ($p = 0.09$) for the dormant period. Both evergreen species had a higher primary branch count, and larger deciduous tree species

had more primary branches than smaller deciduous trees. Mean bark thickness was not a significant predictor of proportion interception ($p = 0.5$), nor were traits related to tree size, such as DBH ($p = 0.98$) and tree height ($p = 0.71$). Our results suggest that leaf type and primary branch number are important traits that determine how much precipitation trees intercept during the leaf-off period. As climate change increases the intensity of storms during the dormant season, strategically planting evergreen trees may be one effective approach to mitigate flooding.

Keywords: Urban Forestry, Ecohydrology, Functional Traits, Interception, Flood Mitigation,

GP-31

Title: Functional type utilization rates under targeted grazing across the big sagebrush region

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Abstract
Big sagebrush (Artemisia tridentata) ecosystems span 76 million hectares of the western US, are widely used for livestock grazing, and are currently threatened by climate change, invasive species, and enhanced wildfire activity. Cheatgrass (Bromus tectorum) is an invasive annual grass from Eurasia that outcompetes native plants by germinating early and rapidly utilizing soil resources. Targeted grazing, strategically using livestock grazing to achieve management goals, has been effectively implemented in the western US to reduce cheatgrass by exploiting its phenological differences from native plants. However, plant functional type (PFT) specific utilization under targeted grazing in big sagebrush ecosystems have not been reported. Furthermore, targeted grazing utilization rates are likely to vary substantially depending on climate conditions, livestock species, and grazing timing and intensity. We quantified PFT specific utilization rates under seasonal targeted grazing regimes in sites representative of the range of conditions in big sagebrush ecosystems. We characterized multiple years of targeted grazing data for spring, summer, and fall for four sites in four representative big sagebrush ecoregions: the Great Basin, Colorado Plateau, Wyoming Basin, and Central Rocky Mountains. We synthesized additional utilization data under targeted grazing from published studies. We compared PFT biomass during grazing periods to ungrazed controls to derive utilization for each PFT, including cool-season annual grasses (cheatgrass), warm and cool-season perennial grasses, annual forbs, and perennial forbs. Preliminary results from two years of data indicate utilization varies by PFT and between years, likely influenced by annual precipitation between 2022 (dry) and 2023 (extremely wet). Across years, cheatgrass had higher utilization in spring (2022: 60%, 2023: 44%) than in summer (2022: 42%, 2023: 38%). Perennial warm-season grasses had higher utilization in summer (2022: 49%, 2023: 32%) than in spring (2022: 29%, 2023: 26%). Both functional types were utilized less overall in the

wetter year. Perennial forbs were utilized more in the wet year (spring: 48%, summer: 54%) than the dry year (spring: 17%, summer: 12%). In 2022, cool-season perennial grasses were utilized more in summer (45%) than spring (39%), while in 2023, this reversed (summer: 29%, spring: 44%). Our results suggest grazing timing influences which PFTs are consumed, and that summer grazing is less effective at removing cheatgrass biomass than spring grazing. Our results provide critical data for informing process-based models that represent targeted grazing and offer land managers insights for implementing and evaluating targeted grazing strategies across the big sagebrush region.

Keywords: Grazing, Invasive species, Climate change

GP-32

Title: Characterization of Imidazolium Salts Using the Stellaris 8 STED and Fluorescence Lifetime Imaging

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Abstract
In 1999, Dr. Robert Morgan discovered a ring-forming reaction using the Vilsmeier-Haack reagent, wherein a bipyridine base molecule formed a five-membered ring between the reagent and the nitrogens of the bipyridine. The scope of this reaction, as it relates to different quinoxaline-based structures and bipyridines, is currently being studied. The resulting molecule formed after undergoing this reaction is an imidazolium salt. These salts are notable for their five membered ring containing two non-adjacent nitrogen atoms and positive charge. As part of determining the scope of this reaction characterization must be done on the synthesized imidazolium salts. Some of the characterization methods being done include 13C and 1H NMR, UV-Vis, IR, fluorescence, and fluorescence lifetime. Fluorescence lifetime imaging is a tool that has a wide berth of uses in a number of growing industries. The fluorescence lifetime specifically is defined as the time it takes a population of fluorophores to decay to roughly 37% of its initial value. This process occurs after a fluorophore (fluorescent molecule) is hit with a photon, exciting an electron from the ground to an excited state. After a period of time, described as the lifetime, the electron is returned to the ground state, through the process of fluorescence or phosphorescence. Fluorescence lifetime imaging microscopy (FLIM) refers to the technique of measuring the fluorescence decay of molecules in a sample. The fluorescence lifetime will be found in three distinct/different conditions, in crystalline form, in solution, and after spin-coating in a matrix. The molecule will first be imaged, as is (crystalline), to get a reference lifetime value. After this the lifetime will be found of the molecule in a solution of ethanol or other organic solvent. The final way will be after spin-coating with a PVA or PMMA polymer, a

method which will allow thin films of the molecules to be imaged. Lifetime has already been determined for at least one molecule in the solid phase with more planned. This research could give information on the potential applications of these molecules in the future. Imidazolium ions have already found uses in ionic liquids and as sensors. Research has also been done that used this class of molecules as a way to sense hemoglobin in solution by using their lifetime. With the information on lifetimes gained by this research these molecules could also find potential uses in biological and cancer imaging.

Keywords: Lifetime Imaging, Imidazolium Salt, Synthesis, Vilsmeier-Haack

GP-33

Title: Efficacy of Weekly vs Daily Iron Treatment and Menstrual Suppression in Teenage Girls with Heavy Menstrual Bleeding

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Abstract
Introduction: Iron deficiency is a common concern among adolescent females, especially those with heavy menstrual bleeding (HMB). While daily oral iron supplementation is the standard treatment, weekly iron dosing has been explored to improve adherence and minimize side effects. Studies suggest that weekly iron supplementation can be as effective as daily supplementation in improving hemoglobin (Hb) levels and iron stores, though findings remain mixed (Beaton et al., 1999; Pasricha et al., 2021). This study evaluates the impact of daily vs. weekly iron supplementation on Hb and ferritin levels over 12 weeks in adolescents with iron deficiency and HMB.

Methods: This randomized pilot study enrolled 20 adolescent females (ages 12–18 years) from Pediatric Hematology/Oncology and Adolescent Gynecology clinics. Participants were randomized to receive daily (325 mg ferrous sulfate) or weekly (325 mg ferrous sulfate) supplementation. Hb and ferritin levels were measured at baseline, 6 weeks, and 12 weeks. Menstrual patterns were classified as Heavy/Prolonged, Amenorrhea, Infrequent/Light, or Monthly Menses. Improvement was defined as transitioning to a less severe category. A Linear Mixed Model (LMM) assessed treatment and time effects, while a Kruskal-Wallis H test analyzed differences across time points.

Results: At baseline, 94.4% (17/18) of participants had Heavy/Prolonged bleeding. By 6 weeks, 83.3% (15/18) experienced improvement, though all three non-responders were in the Weekly group.

For Hb levels, the Weekly group showed a significant increase from 6 to 12 weeks ($p = 0.0006$), whereas the Daily group showed a steady increase over time. No overall significant difference between groups was found ($p = 0.261$).

For Ferritin levels, a Kruskal-Wallis H test indicated significant increases across time in both groups (Daily: $H = 22.77$, $p < 0.001$; Weekly: $H = 18.47$, $p < 0.001$). The Weekly group

showed a rapid ferritin increase from Baseline to 6 Weeks ($p < 0.001$), while the Daily group exhibited a gradual increase. By 12 Weeks, ferritin levels were similar in both groups.

Among those with menstrual improvement, there were no significant differences in Hb or ferritin changes between treatment groups ($p > 0.05$).

Conclusion: Both daily and weekly iron supplementation effectively improved iron biomarkers, with weekly dosing leading to a faster ferritin response, while hemoglobin improvements were more gradual but significant. However, the Weekly group had non-responders in terms of menstrual improvement, suggesting individualized treatment strategies may be needed. These findings support both regimens for treating iron deficiency in adolescents with HMB while emphasizing the importance of monitoring individual responses.

Keywords: iron deficiency anemia, menorrhagia

GP-34

Title: A Study of Machine Learning Models' Ability to Predict Coronary Artery Disease Progression

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Abstract
Coronary Artery Disease (CAD) is a leading cause of morbidity and mortality worldwide, and early identification of disease progression is critical for timely intervention. This study explores the application of an open-source machine learning (ML) model specialized and trained for ECG interpretation to predict CAD progression in patients at early stages of the disease. By leveraging a dataset of longitudinal ECG recordings from patients with confirmed CAD, we train a deep learning model to detect temporal changes in key ECG biomarkers—such as ST-segment deviations, QT interval prolongation, heart rate variability, and QRS-T angle shifts—associated with disease worsening. The model analyzes ECGs from multiple time points, identifying subtle electrophysiological changes indicative of disease acceleration. Performance is assessed by comparing model predictions to historical patient outcomes and clinical diagnoses. This research aims to determine the feasibility of AI models in forecasting CAD progression, ultimately assisting clinicians in risk stratification and early therapeutic decision-making.

Keywords: Coronary Artery Disease, Generative AI, Machine Learning

GP-35

Title: Hydrogen Peroxide Mediated Cytotoxicity in HK-2 Cells is attenuated by Pterostilbene in HK-2 Cells.

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Abstract
Natural products have shown promise in reducing nephrotoxicity by the cancer chemotherapy agents cisplatin and doxorubicin that generate reactive oxygen species (ROS) such as hydrogen peroxide (H2O2). Pterostilbene is a constituent in blueberries that possesses antioxidant and anticancer activity. The hypothesis for this project is that pterostilbene will reduce the oxidative stress in cells associated with cancer chemotherapeutic agents. A human proximal tubular epithelial cell line, HK2, were exposed to 0-2000 uM hydrogen peroxide (H2O2) for 24h in the presence of 0-10 uM PTER. Cells were also incubated for 24h with 0-30 uM Cisplatin in the presence of 0-10 uM PTER. All HK2 cells were preincubated 1 hour with 0-10 uM of pterostilbene and followed by 24h coincubation with 0-2000 uM hydrogen peroxide or 0-30 uM cisplatin. Upon completion of the incubation, cell viability was assessed using the MTT assay and trypan blue exclusion. A minimum of 4 independent experiments were conducted for each western blot analysis. LC3B protein concentrations were evaluated for autophagy levels In HK2 cells treated with PTER and H202. LC3B protein concentrations were increased in cells treated with 5uM and 10uM PTER and 1mM of H202, signifying increased autophagy. 4HNE protein levels were also evaluated for oxidative stress in HK2 cells. PTER at 5 and 10 uM reduced cisplatin cytotoxicity ($p<0.05$). Based on the MTT studies, PTER reduced H2O2 cytotoxicity. Pterostilbene alone did not appear to change cleaved caspase 3. Cells exclusively treated with H2O2 did not display increased cell membrane leakage. These results indicate that PTER reduced damage by H2O2 and cisplatin.

Keywords: Pterostilbene, Oxidative stress, HK2, LC3B, 4HNE

GP-36

Title: A Complex Case of Streptococcus anginosus Bacteremia and Liver Abscess in a Patient with Cholangiocarcinoma

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Abstract
Cholangiocarcinoma is a rare and aggressive malignancy of the biliary tract with a poor prognosis. It is often complicated by infections due to obstruction of the biliary tract. We present a case of a 66-year old male with cholangiocarcinoma who developed a hepatic abscess and Streptococcus anginosus bacteremia following an unsuccessful Whipple procedure attempt due to extensive peritoneal adhesions. Despite multiple interventions including endoscopic biliary compression, chemotherapy, and supportive care his condition deteriorated with the malignancy resulting in metastatic disease.

This case highlights the importance of early recognition of infectious complications of cholangiocarcinoma. The obstructive nature of the malignancy allows bacteria like Streptococcus angiosus which are usually comensal bacteria to become opportunistic and cause infections. Streptococcus angiosus also has a high propensity to form abscesses. Biliary obstruction from the malignancy likely allowed the bacteria to flourish along with the patient's immunosuppressed state due to his chemotherapy regimen. Early identification and targeted antibiotic therapy are crucial for the management of these infections.

Cholangiocarcinoma can present many surgical challenges. Metastatic disease and extensive adhesions can limit the curative treatment options. Emerging targeted therapies such as FGFR2 and IDH1/2 inhibitors show promising development of improved treatment strategies. A holistic including oncology, gastroenterology, surgery, and infectious disease specialists is essential in managing complex cases similar to this patient.

Keywords: Malignancy, Cholangiocarcinoma, Hepatic Abscess

GP-37

Title: Postpartum Depression Screening Among New Mothers: Comparing EPDS Scores with Maternal Factors

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Abstract
The purpose of this study is to analyze the incidence of positive Edinburgh Postnatal Depression Scale (EDS) screenings among postpartum women who did not attend a postnatal visit within four to eight weeks after delivery. We will be studying postpartum mothers over 18. The subjects will be mothers who were delivered and received prenatal care within the Marshall Health Network by Marshall Health Physicians.The incidence of positive EDS screenings in women who did not attend a postnatal visit will be directly compared to the number of positive EDS screenings in women who attended a postnatal follow-up.

Postpartum women who did not attend their postnatal visit within the 4-8 week period after birth will be contacted via the phone to participate in a phone survey. Informed consent will be obtained verbally over the phone. The Edinburgh Postnatal Depression Scale (EDS) score will be calculated. If patients score above a 10 on the EDS or have any suicidal thoughts they will be contacted by a Marshall Health Network nurse to schedule an in-person or telehealth visit.

The results of the EDS scores will be compared to postpartum women who attended their postnatal screening within the 4-8 week window. The electronic health records will be evaluated and statistically analyzed to evaluate if there is a difference in the number of positive depression screens in mothers who did and did not attend their postnatal visit.

Keywords: Maternal Health, Postpartum depression

GP-38

Title: Recognition Memory Before and After Injections of THC in Two Mutant CB1R Mice Strains

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Abstract
Cannabinoids, like THC, are a promising analgesic treatment option for a variety of pain conditions, but their long-term use leads to developing tolerance to the antinociceptive effects and THC is known to impair cognition and memory posing a problem to their utilization as an effective therapeutic for chronic health conditions. Normal cannabinoid signaling involves agonist binding to and activation of the CB1 receptor to initiate signaling. Once components in the signaling pathway are activated, the receptor becomes desensitized where it can no longer bind agonist and initiate signaling, then the CB1R becomes internalized where it can either be degraded or recycled back to the membrane for signaling. Six-point mutant (6PM) mice express serine/threonine to alanine point mutations for six putative G protein-coupled receptor kinase phosphorylation sites in the C-terminus tail of cannabinoid receptor 1 (CB1R) that are necessary for internalization. This mutation causes the CB1R to remain at the membrane in a desensitized state due to the receptor not being able to be internalized where it can be trafficked or recycled. Eight-point mutant (8PM) mice express serine/threonine to alanine point mutations to the six GRK phosphorylation sites for internalization as well as two GRK phosphorylation sites necessary for desensitization of the CB1R, blocking Beta-arrestin2 recruitment to both sites. In previous studies, 6PM mice displayed a reduced response to the antinociceptive and hypothermic effects of THC compared to wildtype mice, while the effects of THC on learning and memory in these mutants are currently unknown. The goal of this study was to determine whether there were any differences between the two CB1R mutants in novel object recognition memory and if seven-day injections of THC impair recognition memory in the two CB1R mutant mice strains. The novel object recognition protocol consists of two days of testing, the first being a three-minute habituation session where the mice are allowed to freely move and explore the open field arena. The second day consists of a three-minute training session where mice freely explore two identical objects placed in the arena. After a four-hour interval between sessions, mice are tested for recognition memory

in the three-minute testing session by replacing one object with a new, different shape and size object. Drug naïve male and female wildtype, 6PM, and 8PM mice completed one testing session of the novel object recognition protocol while the THC-treated group of wildtype, 6PM, and 8PM mice completed a baseline novel object test before THC administration began and completed another novel object recognition test 4 days following the last dose of THC. The results of this study will give insight into the role these CB1R mutations may have in the effects THC has on memory and cognition.

Keywords: Cannabinoids, CB1Rs, Memory, Antinociception

GP-39

Title: Bilateral Non-neoplastic Heterotopic Submandibular Glands Discovered Post-Mortem: A Case Study

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Abstract
The submandibular glands are salivary glands located under the mandible that secrete saliva into the oral cavity. They are derived from the first branchial arch and arise predominantly during weeks 6 and 7 of embryological development. The occurrence of heterotopic submandibular glands is an uncommon anatomical variation that is usually found unilaterally. There are few known reports of bilateral heterotopic submandibular glands; this paper describes a case of bilateral heterotopic submandibular glands that were discovered incidentally during routine dissection of a cadaver for medical education purposes and subsequent histological examination. The heterotopic glands were located in the carotid triangle at the level of the hyoid bone and appeared to receive blood supply from the facial artery and innervation from the facial nerve, similar to that of typical submandibular glands in normal anatomical location. Venous drainage was into the facial vein and communicating jugular vein. Dissection of each bilateral heterotopic submandibular gland revealed a duct oriented toward the oral cavity, suggesting it was a functional salivary gland. Histological analysis of the glands and nearby deep cervical chain lymph nodes revealed normal salivary gland and lymph node structure, with no evidence of neoplasia. This is one of a few reports, to our knowledge, of rare bilateral non-neoplastic heterotopic submandibular glands identified in a cadaver.

Keywords: ENT, Submandibular, Glands

GP-40

Title: Psychiatric Care in Rural Appalachian Emergency Departments: A Five-Year Retrospective Study

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Research Sponsor: Marshall Journal of Medicine

Abstract
Emergency departments (EDs) in rural Appalachian regions face unique challenges in managing patients with psychiatric conditions. Limited specialized resources and a lack of standardized protocols for physical exams and medical clearance often result in unnecessary delays, prolonged patient stays, and inefficient use of emergency medical services. This study aims to address these gaps by analyzing how current psychiatric workups, particularly lab tests and other diagnostics, influence decisions about admission or discharge. By examining the connection between initial patient symptoms, test results, and eventual outcomes, this research seeks to identify opportunities for streamlining psychiatric evaluations. Additionally, the study will assess the impact of social factors, such as poverty, on the severity of psychiatric conditions and compare care outcomes based on whether treatment is provided by physicians, physician assistants, or nurse practitioners. As the COVID-19 pandemic has influenced psychiatric care demands, the study will also evaluate trends in patient presentations before and after the pandemic. The goal is to develop evidence-based guidelines to improve the quality and efficiency of psychiatric care in EDs, reduce patient wait times, and provide tailored training for ED staff. Findings from this study will help create standardized protocols for deciding when to admit or discharge patients, ensuring safer, more effective care for vulnerable populations in resource limited settings.

This study will involve a retrospective review of medical records for patients treated in the emergency departments (EDs) at Cabell Huntington Hospital and St. Mary's Medical Center over the past five years (Jan 1 2020 - Jan 1 2025). The records will be filtered to include patients presenting with psychiatric-related complaints such as altered mental status, suicidal or homicidal ideation, violent behavior, overdose or substance use, anxiety, psychosis, depression, manic episodes, withdrawal symptoms, paranoia, dementia, or delirium. For each patient, demographic information such as age, gender, race, and employment status will be collected. The study will document whether specific lab and

diagnostic tests were performed and if the results were normal or abnormal. Routine tests such as complete blood count (CBC), urinalysis, acetaminophen, ethanol, salicylate levels, and urine drug screens will be prioritized, while optional tests such as comprehensive metabolic panels (CMP), radiologic imaging studies, and pregnancy tests will also be included when applicable. Medications administered in the ED that are related to psychiatric care will be recorded. The study will evaluate the length of ED stays by recording the time from the patient's arrival to medical clearance and final disposition, which will be categorized as discharge home, transfer to a psychiatric facility, or admission to the hospital. Additionally, recurrence rates will be assessed by identifying patterns of patients frequently returning to the ED with similar psychiatric complaints compared to those whose symptoms were resolved. The level of training of the healthcare provider involved in each case will also be documented as physician (MD/DO), physician assistant (PA), or nurse practitioner (NP). Finally, the collected data will be analyzed to identify patterns and correlations, such as the relevance of specific lab tests in determining patient outcomes, trends in the recurrence of psychiatric complaints, and the impact of demographic factors or provider training on care and disposition decisions. The findings aim to provide insights into improving psychiatric care in rural Appalachian ED settings.

Keywords: Psychiatric Emergency Care, Rural Appalachia, Medical Clearance Protocols, Emergency Department Efficiency, Mental Health Disparities

GP-41

Title: Sebaceous Carcinoma as a Presentation of Muir-Torre Syndrome

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Abstract
Muir-Torre syndrome (MTS) is a rare, autosomal dominant condition that is within the spectrum of Lynch syndrome (hereditary nonpolyposis colorectal cancer (HNPCC)). Sebaceous adenomas are among the most specific manifestations of MTS. Other malignancies include tumors of the colon, rectum, and genitourinary systems, such as endometrial, ovarian, urothelial, and prostate cancer. Individuals at risk for MTS are identified using the Mayo score, which assesses risk based on family history of Lynch syndrome-associated cancers, personal history of these cancers, and age at diagnosis of a sebaceous adenoma or visceral malignancy. We present a case of a firm, red-yellow papule on the upper extremity, which was revealed by a biopsy to be a sebaceous adenocarcinoma. Immunohistochemistry was significant for the loss of MSH2 and MLH1.

Keywords: Muir-Torre, colorectal cancer, malignancy, sebaceous adenomas, Lynch syndrome

GP-42

Title: Unusual Cause of a Mobile Subcutaneous Nodule: Trichoblastoma with Clinical Mimicry

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Abstract
Trichoblastomas are rare, benign follicular neoplasms of the dermis and subcutis that originate from the germinal cells of the follicular hair structure. Typically, a trichoblastoma develops as a solitary, slow-growing nodule, most commonly on the face and scalp. The classic clinical appearance of this lesion is a well-circumscribed, skin-colored, firm nodule that measures less than 1 centimeter (cm). Subcutaneous nodules are often diagnosed as benign lesions, such as lipomas, based on clinical appearance; however, they can occasionally be components of more consequential lesions. We present a case of an 84-year-old man who presented with a 1.8 by 1.4 cm skin-colored subcutaneous nodule of the lower extremity with a striking resemblance to a lipoma upon excision; however, the lesion was subsequently diagnosed as a trichoblastoma on histology. This case demonstrates the importance of biopsying and excising any growing subcutaneous nodules with detailed histological analysis to ensure accurate diagnosis and management.

Keywords: trichoblastoma, neoplasm, subcutaneous nodule, germinal cell

GP-44

Title: The Pharmacogenetics of Fluvoxamine: A Precision Medicine Approach

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Abstract
Precision medicine can be defined as “medical care based on the specific biological characteristics of the disease process in individuals” and is reshaping health care by tailoring treatments to an individual’s genetic makeup. Pharmacists, as medication experts, have been at the forefront of advancing individualized patient care, particularly through pharmacogenetics—the study of how genetic variations influence drug response. Fluvoxamine, sold under the brand name Luvox, is a selective serotonin reuptake inhibitor (SSRI). It is primarily prescribed for obsessive-compulsive disorder (OCD) and major depressive disorder (MDD), but it is also used off-label for conditions like anxiety and post-traumatic stress disorder (PTSD). Like other SSRIs, fluvoxamine increases serotonin levels in the brain, but patient responses can vary widely, making pharmacogenetics an important tool for optimizing therapy. Fluvoxamine is primarily metabolized by cytochrome P450 enzymes, specifically CYP2D6 and CYP1A2. Variations in these enzymes affect how the drug is processed, influencing both its effectiveness and potential side effects. Poor CYP2D6 metabolizers may have higher drug concentrations, increasing the risk of side effects such as nausea and sedation, while ultra-rapid metabolizers may clear the drug too quickly, reducing its efficacy. CYP1A2 activity, which can be influenced by genetic polymorphisms and external factors like smoking, further affects fluvoxamine metabolism. Pharmacogenetic testing for CYP2D6 and CYP1A2 variants can help personalize fluvoxamine dosing, minimizing side effects while improving therapeutic outcomes. Guidelines from organizations like the Clinical Pharmacogenetics Implementation Consortium (CPIC) support pharmacogenetic-based prescribing, reinforcing the value of precision medicine in psychiatry. As pharmacogenetics continues to evolve, pharmacists will remain integral to optimizing fluvoxamine therapy based on genetic insights. Incorporating genetic testing into routine practice can enhance treatment precision and improve mental health outcomes.

Keywords: Pharmacogenetics, Fluvoxamine, Precision medicine, CYP2D6, Drug metabolism

GP-45

Title: Using probiotics to reduce diet-induced gut inflammation: Will this stall initiation/progression of hematological malignancies?

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Research Sponsor: WV-INBRE

Abstract
WHO defines Obesity as abnormal or excessive fat accumulation that presents a risk to health. West Virginia has the 2nd highest adult obesity rate with childhood obesity 4th in the US. Western diet i.e. high fat diet (HFD) is a major contributor to the growing rate of obesity over the last several decades. Western diet Promotes inflammation which has been correlated to obesity. The consumption of a HFD has been observed to enhance the gut inflammation and low-grade systemic inflammation. And also causes an imbalance in the gut microbiota composition (Dysbiosis).

Myelodysplastic Syndromes (MDS) are a group of diverse bone marrow disorders in which the bone marrow does not produce enough healthy blood cells. In MDS, these stem cells may not mature and may accumulate in the bone marrow or they may have a shortened life span, resulting in fewer than normal mature blood cells in the circulation. Low blood cell counts, referred to as cytopenia, are a hallmark feature of MDS. HFD causes gut inflammation which in turn progresses MDS in MDS susceptible patients.

Previous research has shown that diet induced gut inflammation alters gut microbiota and cause low grade systemic inflammation and progresses MDS like phenotypes in MDS susceptible mice. Our study aims to understand how probiotics help in mitigating the alterations in gut microbiota and diet induced gut inflammation and how probiotics helps in slowing down the progression of hematological malignancies like MDS.

To test our hypothesis, we used C57/BL6 mice (Wild type) and Double knockout (DKO) (TIFAB and miR-146a co-deleted) which are MDS susceptible mice. We fed them with HFD (40%) and low-fat diet for 15 weeks and administered probiotics (Lactobacillus casei) as powder by mixing in water over various time periods (for like 5 and 3 weeks).

Complete blood count was performed to assess Haemopoietic stem and progenitor cell (HSPC) populations. And Flow cytometry was performed for intestinal inflammatory cells and bone marrow cytokines. Spleen and body weights were calculated to evaluate the

systemic immune response. Gut microbiome was studied using minION to examine the effects of probiotics on gut microbiota composition.

The results showed that probiotics helped in reducing the high fat diet induced alterations in gut microbiome and also showed significant impact on blood parameters, body weights, spleen weights, intestinal inflammatory cells and bone marrow cytokines.

Understanding this will help in designing novel therapeutics to lessen the initiation and progression of disease in obese individuals.

Keywords: Probiotics, Gut microbiome, Obesity, High fat diet, Double knock out mice

GP-46

Title: Beyond Blood Sugar: The Multifaceted Benefits of Continuous Glucose Monitoring

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Abstract
Introduction: Type II Diabetes is a prominent chronic disease in the United States which can be debilitating for individuals who live with the disease. Traditional point-of-care glucose meters can be painful and difficult to use consistently, leading to suboptimal glucose monitoring and management. Continuous glucose monitors (CGM) provide an opportunity for patients living with diabetes to have greater control over their glucose levels throughout the day, while encouraging them to make necessary adjustments to their lifestyle and become more adherent to their diabetes medications. Research has demonstrated that CGMs can lower A1c levels independently without additional interventions, though the mechanism behind this effect remains unexplored. Purpose: This study aims to assess how CGM use influences patient behavior, including diabetes medication adherence, dietary choices, and physical activity. Methods: A mixed-methods survey was conducted with patients at Marshall Pharmacy who used Dexcom or FreeStyle Libre CGMs. The survey incorporated both Likert-scale and open-ended questions to gather insights into patients' experiences and behavioral changes. A validated tool, such as the Hill-Bone compliance scale, was incorporated within the survey to assess adherence patterns. Results: The findings suggest that CGM use positively influences multiple aspects of diabetes management. Patients reported improved adherence to their diabetes medications, increased engagement in physical activity, and healthier dietary choices. Conclusion: CGMs appear to play a multifaceted role in improving diabetes outcomes by fostering better medication adherence, diet, and exercise habits. By providing real-time glucose data and reducing the burden of traditional monitoring methods, CGMs may encourage patients to take a more proactive approach to managing their condition.

Keywords: Diabetes, Continuous glucose monitor, Adherence, Medication, Lifestyle

GP-47

Title: Pharmacogenomics of Atorvastatin(Lipitor)

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Abstract
Atorvastatin is a widely prescribed statin used primarily to manage hyperlipidemia and reduce the risk of cardiovascular diseases, including heart attacks and strokes. It functions by inhibiting HMG-CoA reductase, an enzyme critical in the cholesterol biosynthesis pathway, leading to a decrease in low-density lipoprotein (LDL) cholesterol levels in the blood. Despite its therapeutic benefits, atorvastatin use is associated with potential adverse effects, particularly muscle-related side effects like myopathy and rhabdomyolysis. Pharmacogenomic research has identified the SLCO1B1 gene, which encodes transporter proteins (OATP1B1 and OATP1B3) involved in the hepatic uptake of statins, a key genetic factor influencing atorvastatin metabolism. Variants in SLCO1B1, particularly the *5 allele (rs4149056) and *15 allele (rs4149056 and rs2306283 combined), can reduce the transporter's function, leading to higher systemic statin levels and an increased risk of muscle toxicity. Personalized dosing strategies based on SLCO1B1 genotyping may help mitigate the risk of these adverse effects, thereby optimizing atorvastatin therapy for individuals at risk of statin-induced myopathy. Pharmacists play a crucial role in managing these pharmacogenomic issues by interpreting genetic test results and adjusting dosing accordingly. By using genetic testing to tailor atorvastatin dosing, pharmacists can help reduce the risk of adverse effects and ensure safer, more effective treatment for individuals who are at higher risk.

Keywords: atorvastatin, SLCO1B1, Pharmacogenomics, pharmacists

GP-48

Title: The Pharmacogenomics of Ibuprofen

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Research Sponsor:

Abstract
Precision medicine has become a leading approach in modern healthcare. According to the National Institutes of Health (NIH), it is “an innovative approach that takes into account individual differences in patients’ genes, environments, and lifestyles.” By having an individualized approach we see an improvement in outcomes and efficacy for patients.

Pharmacogenomics, a key component of precision medicine, examines how genetic variations influence drug metabolism and response. Pharmacists play a critical role in integrating pharmacogenomic knowledge into patient care, ensuring safer and more effective medication use. Pharmacists are the drug experts responsible for making sure every medication that reaches the patient results in positive outcomes. Here we present the pharmacogenomics of ibuprofen, commonly known as Motrin or Advil. Ibuprofen is a well-known and commonly used nonsteroidal anti-inflammatory drug (NSAID) for pain relief and inflammation reduction. Variants in the CYP2C9 gene can significantly affect ibuprofen metabolism, leading to altered drug clearance and potential toxicity. Understanding these genetic differences allows for more precise dosing recommendations, ultimately enhancing patient outcomes and minimizing risks associated with ibuprofen therapy.

Keywords: Casey Hambrick

GP-49

Title: In-vitro Evaluation of FLLL22: A Promising Anticancer Agent with Broad Spectrum Activity

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Abstract
Cancer is the second leading cause of death worldwide and in the United States of America. Although tremendous improvements have been made in the management of cancer patients in recent years, treatment failures are common due to intrinsic or acquired resistance and drug-associated toxicities which demand development of new, safe and efficacious agents. Previous studies from our laboratory revealed that FLLL22, a synthetic curcumin analog, is highly potent against non-small cell lung cancer cell lines and induced apoptosis. However, its activity against other cancer types is unknown. In the present study, we tested the efficacy of this compound against NCI60 cell line panel. NCI60 cell line panel is a unique tool to screen compounds for their broad anticancer activity against a panel of 60 cell lines comprising of leukemia, non-small cell lung cancer, breast cancer, prostate cancer, etc. The cell growth was measured by CellTiter-Glo and the efficacy was assessed by determining the GI50, TGI and LC50 values. The GI50 ranges from 0.01 μM to 18.3 μM, TGI ranges from 0.06μM to 100μM, and LC50 from 0.22μM to 100μM. Notably, the drug demonstrates promising anti-cancer activity against majority of cell lines with GI50 in the sub μM range, only two cell lines have GI50 above 1 μM. In addition to its growth-inhibiting effects, the compound also demonstrates potent cell-killing activity, particularly in the SR leukemia line (LC50 = 0.222 μM). The compound's potential in targeting melanoma is also evident, with the MDA-MB-435 cell line showing an LC50 of 0.476 μM and the SK-MEL-2 line exhibiting an LC50 of 0.713 μM. In conclusion, FLLL22 is a promising lead compound for further preclinical and clinical development including its mechanism of action, in vivo efficacy and pharmacokinetics. Additionally, exploring effective drug combinations with other chemotherapy or targeted drugs to further enhance its therapeutic efficacy and overcome drug resistance mechanisms is warranted.

Keywords: FLLL22, Curcumin Analogue, NCI-60 Cell Lines, CellTiter-Glo, LC50

GP-50

Title: Preparation and Characterization of 5-Fluorouracil (5FU) Loaded Silver Nanoparticles for Delayed Wound Healing.

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Abstract
Background: Chronic wounds, often associated with diabetes and other metabolic disorders, pose significant challenges to effective healing. Silver nanoparticles (AgNPs) have demonstrated antimicrobial and effective healing properties, making them promising candidates for delayed wound healing. Our lab previously demonstrated that 5-Fluorouracil (5FU), a chemotherapy drug commonly used to treat cancers such as colon, rectal, breast, stomach, and pancreatic cancer, has the potential to regulate cellular proliferation and inflammation in wound healing.

Objective: This study aims to develop and characterize 5FU-loaded AgNPs and evaluate their potential to enhance delayed wound healing in vitro. We hypothesize that the topical application of these nanoparticles will improve wound healing outcomes by leveraging the antimicrobial properties of AgNPs and the regulatory effects of 5FU on adult human dermal fibroblast proliferation and inflammatory responses.

Methods: 5FU-loaded AgNPs were synthesized using a green chemistry approach and characterized through UV-Vis spectroscopy, scanning electron microscopy (SEM), and zeta potential to assess size, morphology, stability, and drug loading efficiency. The wound healing potential was assessed in vitro using a scratch assay on adult human dermal fibroblast cell cultures, measuring cell migration and proliferation over time. Cytotoxicity was evaluated using an MTT assay.

Results: Preliminary characterization confirmed the successful synthesis of stable 5FU-loaded AgNPs with an average size of 25 nm. In vitro studies demonstrated enhanced fibroblast migration and proliferation in treatment groups compared to controls, with optimized nanoparticle concentrations promoting cell viability while minimizing cytotoxicity.

Conclusion: Our findings suggest that 5FU-loaded AgNPs may serve as a promising topical therapeutic for improving delayed wound healing. Future studies will focus on targeting the adipokine, adiponectin, and in vivo validation to further explore their clinical potential.

Keywords: Silver nanoparticles, 5-Fluorouracil, wound healing, adipokines, nanomedicine.

GP-51

Title: Evaluation of the Anticancer Activity of FLLL12, a curcumin analog, against the NCI-60 cell line panel

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Abstract
Cancer is the second leading cause of death in the United States and worldwide. Despite tremendous advances in early diagnosis and treatment, an estimated two million new cancer cases will be diagnosed, and 618,120 cancer deaths are projected in the U.S. in 2025. The investigation of new anticancer agents is crucial for the development of effective cancer therapies. Our laboratory has previously reported the in vitro and in vivo efficacy and pharmacokinetic properties of FLLL12, a potent synthetic curcumin analog. In this study, we evaluated the cytotoxic effects of FLLL12 against the NCI-60 cell line panel, which comprises a range of human cancer cell lines representing different tumor types, including leukemia, lung cancer, colon cancer, CNS cancer, melanoma, ovarian cancer, renal cancer, prostate cancer, and breast cancer. The CellTiter-Glo assay was used to measure cellular growth after exposing the cells to various concentrations (log10 -8 to -4) of FLLL12 for 72 hours. Optical densities were measured, and percent growth inhibition (GI) was calculated. The GI50, TGI, and LC50 values were determined for each cell line to evaluate the compound's potency. Additionally, the zero control and mean optical densities for each time point were recorded for analysis. The compound FLLL12 demonstrated significant antitumor activity across all tested cell lines, with notable potency in leukemia, non-small cell lung cancer, colon cancer, CNS cancer, melanoma, and ovarian cancer. The GI50 values ranged from 0.18 μM to 23.7 μM, indicating that FLLL12 is highly potent against some cell lines while others are relatively resistant. The LC50 values ranged from 0.924 μM to 68.2 μM, suggesting that FLLL12 also strongly induced cell death. In conclusion, FLLL12 is a promising lead compound for further preclinical and clinical development including its mechanism of action and in vivo efficacy.

Keywords: FLLL12,Curcumin Analog,NCI-60 cell line panel,CellTitre-Glo assay,LC50

GP-52

Title: Impact of Western diet on the Gene expression of HSPCs following Influenza immunization in mice.

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Abstract
Vaccines are necessary to prevent a number of infectious diseases; however, their effectiveness often varies according to both diet as well as body weight. Many studies show that vaccine protection is often reduced in most people with obesity. For example, obese people are twice as likely to get the flu, even after influenza vaccination, when compared to healthy weight people after vaccination. This study seeks to fully understand the role of hematopoietic stem and progenitor cells (HSPCs) in how diet-induced obesity effects influenza vaccination efficacy. HSPCs are an exceptionally rare stem cell population located in the bone marrow. These cells produce and maintain all blood and immune cells, which defend the body against infections. Previous research has shown that obesity from diet changes both the types and the quantities of immune cells produced by the HSPCs in the bone marrow. This research specifically investigates how a Western diet, typically high in fats and sugars alters the gene expression of HSPCs during Influenza vaccination in mice.

To test our hypothesis, we procured male C57/BL6 mice that have been maintained post-weaning on either a high-fat diet (60 kcal% fat) for the DIO group or a low-fat diet (10 kcal% fat) for the control group over a period of 15 weeks. The mice were then injected with either the vehicle control or the influenza vaccine, where the control group received PBS and vaccinated group received Flulaval, a trivalent influenza vaccine. The four groups of mice being low-fat diet with PBS, low-fat diet with Flu vaccine, high-fat diet with PBS, high-fat diet with Flu vaccine.

Complete blood counts and flow cytometry were performed to assess the HSPC populations. Spleen to body weight ratios were calculated to evaluate the systemic immunity changes and Gene expression changes in the HSPCs were studied using RNA sequencing.

The results showed that high fat diet caused a significant change in the gene expression of the HSPCs. Understanding how these changes occur may help us develop strategies for better vaccine responses among obese people, such as targeted vaccine additives or additional treatments to better protect those at higher risk.

Keywords: Obesity, Vaccines, High fat diet, HSPCs, Gene Expression

GP-53

Title: Regulation of human Th9 cell differentiation by lipid modulators targeting PPAR-γ and acetyl-CoA-carboxylase 1.

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Research Sponsor: Marshall University/ School of Pharmacy

Abstract
T lymphocytes contribute to host defense and inflammation producing cytokines in response to antigenic stimuli. CD4 T cell activation induces dramatic changes to cellular metabolism for supporting their growth and differentiation into effector subsets. Distinct subsets have been named Th1, Th2, Th9, Th17, Th22, Tfh and Treg based on their characteristic effector cytokines and transcription factors expressed. Th9 cells are one of the most recent subsets identified. While the cytokines IL-4, TGF-β and IL-21 promote differentiation into Th9 cells, metabolic factors regulating this process remain poorly understood.

To assess the role of lipid metabolism in human Th9 cell differentiation, naïve CD4 T cells were purified from blood of healthy volunteers and cultured in the presence or absence of compounds targeting PPAR-γ, acetyl-CoA-carboxylase 1 (ACC1), and AMP-activated protein kinase (AMPK) for four days. On day 4, cells were restimulated with PMA plus ionomycin in the presence of brefeldin A and stained for IL-9 and Foxp3. Supernatants were measured for IL-9 and IL-5 by ELISA and RT-PCR was used to analyze the gene expression of various transcription factors.

Th9 cell differentiation significantly increased PPARG expression, and the PPAR-γ agonist rosiglitazone suppressed IL-9 in a dose-dependent manner. The rosiglitazone-mediated suppression also occurred in the presence of the glucose metabolism inhibitor 2-deoxy-D-glucose, suggesting it was independent of glycolysis. On the other hand, the PPAR-γ antagonist GW9662 had no significant effect on IL-9 production. Next, the role of fatty acid synthesis was tested by treating cells with inhibitors of ACC1 (TOFA) or AMP-activated protein kinase (AMPK; dorsomorphin). We demonstrate reciprocal functions for these enzymes, as ACC1 inhibition substantially increased IL-9 production, whereas AMPK inhibition resulted in undetectable levels. TOFA also decreased expression of ACACA, the gene encoding ACC1, demonstrating regulation at the transcriptional level. Finally,

combining TOFA treatment with exogenous oleic acid restored IL-9 back to the levels in control Th9 cultures, suggesting that ACC1 suppresses Th9 differentiation through fatty acid synthesis.

Overall, our data demonstrate that lipid regulators associated with intracellular fatty acid accumulation suppress Th9 cell differentiation. These findings may have clinical implications for conditions associated with elevated IL-9 production.

Keywords: Th9 cells, Fatty acid metabolism

GP-54

Title: Small Class, Big Results? The role of pharmacy class size in Exam Performance.

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Research Sponsor: Not Applicable

Abstract

Objective: To evaluate trends between first-time pass rates (FTPR) on the North American Pharmacist Licensure Examination (NAPLEX) and class sizes from schools of pharmacy (SOP) in the year 2024.

Methods: Utilizing the National Association of Boards of Pharmacy (NABP) North American Pharmacist Licensure Examination (NAPLEX) Passing rates for 2022-2024 graduates, four categories were created by extracting out SOP FTPRs in 2024. Out of 143 pharmacy schools, the categories included those with a FTPR of 90% or higher, a FTPR ranging from 89.9% to 70%, a FTPR between 69.9% and 50%, and a FTPR below 49.9%. The average class size of the schools within each group was then calculated. A r-value and R^2 value was then calculated to test for correlation between FTPR and class sizes.

Results: SOP with a FTPR of 90% or above had an average class size of 56 students, comprising 15 schools and 840 students. The category that had a FTPR of 89.9% to 70% had an average class size of 80 students with 81 schools and 6455 students included. Schools with an FTPR ranging from 69.9% to 50% had an average class size of 64 students, including 42 schools and 2,681 students. The group with an FTPR of less than 49.9% had an average class size of 32 students, consisting of 5 schools and a total of 160 students. The correlation analysis performed yielded an r-value of 0.2599. The R^2 value of 0.0675 shows that only 6.75% of the variance within the FTPR can be explained by class size.

Conclusions: The findings of this study suggest a weak relationship between class size and FTPRs on the NAPLEX for the 2024 year. Larger class sizes demonstrated more association with higher pass rates, however, this correlation is not strong. This data shows that the remaining 93.25% of the variation is influenced by other factors. These results indicate that class size alone was not a strong indicator of NAPLEX success in the 2024 year. This study can be expanded on in the future by expanding on factors such as the number of faculty, the SOPs affiliation to medical institutes, cost of attendance, and acceptance rates to analyze for other possible correlations within SOPs.

Keywords: First Time Pass Rate, NAPLEX, Class Size

GP-55

Title: Assessment of Pharmacy Faculty Workload Perception

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Research Sponsor: N/A

Abstract
Faculty workload among pharmacy schools in the United States varies greatly, as there is no standardized distribution of faculty responsibilities across institutions. This study aims to assess workload allocation among faculty from pharmacy education institutions across the country. Through direct surveying of pharmacy faculty, we seek to understand how various institutions assign and quantify teaching, research, and service requirements, which directly impact job satisfaction and productivity. Previous research has focused on faculty workload distribution in general academic settings, but not specifically in pharmacy schools. This gap in literature highlights the significance of our study, as it has the potential to improve faculty well-being, increase productivity, and enhance retention. To conduct this study, an anonymous Qualtrics survey was sent to all registered American Association of Colleges of Pharmacy (AACP) faculty in the country using their publicly available directory. The survey was designed to collect a range of data from faculty members, such as demographic information, workload distribution, and willingness to participate in future related studies. Both numerical and descriptive data were analyzed for trends among responses. Participant confidentiality was maintained throughout the study. The outcomes of this study could drive improvements in pharmacy faculty workload management by providing insights that inform policy recommendations for more balanced workload distributions. Ultimately, these findings could foster the continued success of pharmacy education in the U.S. by enhancing faculty well-being and productivity.

Keywords: Workload, Academia, Pharmacy, Perception, Allotment

GP-56

Title: Unlocking Mental Wellness: The Impact of Clomipramine

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Abstract
Objective: To provide clinical insight on the pharmacogenomics of Clomipramine (Anafranil) for other healthcare providers and patients.

Methods: PharmGKB, The Merck Manual, and Lexidrug were used to provide relevant information for the use of Clomipramine (Anafranil) for its specific clinical indication.

Results and Discussion: Precision Medicine can be defined as “medical care based on the specific biological characteristics of the disease process in individuals.” As medication experts, pharmacists play a key role in creating and providing personalized patient care, particularly in the area of pharmacogenetics (understanding the role that human genetic variation plays in determining the response of a drug). Clomipramine (brand name Anafranil) is a tricyclic antidepressant that is primarily indicated for treatment of obsessive-compulsive disorder. It also is used off-label for major depressive disorder and panic disorder. Patient responses to clomipramine can differ due to genetic factors, which is why pharmacogenetics is such a valuable tool for enhancing treatment and improving patient outcomes. In our presentation, information will be provided on the mechanism of action, the dosing guidelines, common and severe side effects, and issues regarding pharmacokinetics and pharmacogenetics for Clomipramine/Anafranil. Important guidelines outlined by CPIC and DPWG for Clomipramine and specific enzymes that impact clinical recommendations will also be highlighted. Finally, this presentation will feature any interesting items for the specific medication to share with other healthcare providers. As the field of pharmacogenetics advances, pharmacists will continue to play a major role in refining medication therapy using genetic information.

Keywords: Pharmacogenomics, Precision Medicine, Educational Poster

GP-57

Title: The Pharmacogenetics of Citalopram

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Abstract
Precision Medicine has become the governing paradigm in health care today. Precision Medicine is a medical approach that tailors therapies to the unique biological characteristics of an individual's disease. Being health care drug experts pharmacists have been leading the way in the development and delivery of individualized patient care, specifically in the field of pharmacogenetics/pharmacogenomics. Pharmacogenetics is the study of how genetic variations influence an individual's specific response to medication therapy. Here we present the pharmacogenetics of Citalopram. Citalopram also known as Celexa®, is a drug within the class of Selective Serotonin Reuptake Inhibitors (SSRI's). It is prescribed to treat depression, obsessive-compulsive disorder, eating disorders, alcoholism, panic disorders, premenstrual dysphoric disorder, and post-traumatic stress disorder. Citalopram is largely metabolized by the cytochrome P450 enzyme, CYP2C19. The scientific literature indicates that some patients with variants of the gene CYP2C19 suffer poor clinical outcomes indicating dose adjustments be considered.

Keywords: Pharmacogenomics, Celexa®, Pharmacy

GP-58

Title: The Pharmacogenetics of Escitalopram

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Abstract
Mental health has been a major area of study for scientists. They have found that pharmacogenetics have played more a role that previously thought

Pharmacists as health care's drug experts have been in the forefront in the development and delivery of individualized patient care, specifically in the field of pharmacogenetics/pharmacogenomics.

Pharmacogenetics – understanding the role of human genetic variation in determining drug response

Here we present the pharmacogenetics of Escitalopram

SSRI- escitalopram, lexapro, anxiety and depression

Keywords: antidepressants, mental health, anti anxiety, pharmacogenetics

GP-59

Title: Formulation and Characterization of Quercus infectoria Chitosan Topical Gel for Wound Healing.

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Abstract
Background: Effective wound healing requires optimized drug delivery systems that ensure controlled release and bioavailability of therapeutic agents. Quercus infectoria (QI) has been reported to exhibit antimicrobial, anti-inflammatory, and wound-healing properties. Chitosan, a biocompatible and biodegradable polymer, serves as an ideal carrier for topical drug delivery due to its film-forming ability and promoting wound healing through its intrinsic bioactivity and controlled release properties.

Objective: This study aims to formulate and characterize a chitosan-based topical gel incorporating Quercus infectoria extract and assess its physicochemical properties to determine its suitability for wound healing applications. We hypothesize that chitosan-based QI gel will exhibit optimal spreading and controlled release of QI for enhanced wound healing.

Methods: The QI chitosan gel was formulated using a hydrogel-based approach and characterized for physicochemical properties, including pH, viscosity, spreadability, and gel stability. The drug release profile was evaluated using an in vitro diffusion study.

Results: The QI chitosan gel demonstrated optimal viscosity, pH, and spreadability, ensuring ease of application for a topical wound. The in vitro release study indicated sustained release of QI over 24 hours.

Conclusion: The QI chitosan topical gel demonstrates promising physicochemical properties for wound healing applications. Future studies will focus on in vitro and in vivo evaluation of wound healing efficacy to further validate its clinical potential.

Keywords: Quercus infectoria, chitosan, topical gel, wound healing, drug release.

GP-60

Title: Comparison of PLGA and Chitosan Nanoparticle Delivery Systems for Optimized Drug Release

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Research Sponsor: N/A

Abstract
Background: Nanoparticle-based drug delivery systems offer promising strategies to enhance the targeted delivery and controlled release of therapeutic agents. Poly(lactic-co-glycolic acid) (PLGA) and chitosan nanoparticles have emerged as effective carriers, each with distinct physicochemical properties that influence drug encapsulation and release. This study compares PLGA and chitosan nanoparticles loaded with 5-Fluorouracil (5-FU) to evaluate their suitability for topical drug delivery application.

Objective: We aim to formulate and characterize PLGA and chitosan nanoparticles for 5-FU delivery and compare their physicochemical properties, encapsulation efficiency, and drug release kinetics. We hypothesize that PLGA nanoparticles will exhibit a sustained drug release profile, while chitosan nanoparticles will provide a faster release, making them suitable for topical drug delivery applications.

Methods: PLGA nanoparticles were synthesized using the solvent evaporation method, while chitosan nanoparticles were prepared via ionic gelation. The formulations were characterized for particle size, zeta potential, and morphology using Scanning Electron Microscopy (SEM). Drug encapsulation efficiency, drug loading, and release kinetics were also evaluated to compare their performance as drug carriers.

Results: PLGA nanoparticles exhibited larger particle sizes, sustained 5-FU release, and higher drug loading, indicating potential for prolonged therapeutic effects. In contrast, chitosan nanoparticles had smaller particle sizes, higher surface charges, and a faster drug release profile, suggesting their suitability for immediate drug delivery. SEM analysis revealed distinct morphological differences between the two nanoparticle systems. Drug release studies demonstrated that PLGA nanoparticles provided a slower, controlled release, while chitosan nanoparticles exhibited a rapid drug release.

Conclusions: PLGA and chitosan nanoparticles offer unique drug release characteristics that can be optimized for specific therapeutic applications. PLGA nanoparticles are better

suited for sustained drug release, while chitosan nanoparticles provide a faster release profile. These findings highlight the potential of tailoring nanoparticle-based drug delivery systems to meet specific clinical needs. Future studies will focus on in vitro and in vivo evaluations to further explore their biomedical applications.

Keywords: PLGA, chitosan, nanoparticles, targeted drug delivery, 5-Fluorouracil.

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